

**A co-design approach to exploring physical activity, stress, and wellbeing in
two British police forces**

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Thesis submitted to Cardiff Metropolitan University in fulfillment of the requirements
for the degree of Doctor of Philosophy

December 2022

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Declaration

I declare that this work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

I declare that this thesis is the result of my own investigations, except where otherwise stated.

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A list of contributions from this work is provided below.

Thesis research outputs

Journal Publications

Oliver, H., Thomas, O., Neil, R., Moll, T., Copeland, R. J. (2022). Stress and psychological wellbeing in British police force officers and staff. *Current Psychology*.

<https://doi.org/10.1007/s12144-022-03903-4>

Research Reports

Oliver, H., & Thomas, O. (2021). Physical activity, health and well-being project: Gwent Police Control room 'Exertime!'. Commissioned and funded by South Wales and Gwent Police. In collaboration with Dr Scott Pedersen (University of Tasmania).

Oliver, H., & Thomas, O. (2021). Physical activity, health and well-being project: South Wales Police Control room 'Exertime!'. Commissioned and funded by South Wales and Gwent Police. In collaboration with Dr Scott Pedersen (University of Tasmania).

Oliver, H. & Thomas, O. (2017). Health and Wellbeing in South Wales and Gwent police forces. Commissioned by South Wales and Gwent Police and funded by Police Mutual.

Invited Keynote Presentations

2019: Invited presentation: 6th Union Sportive Des Polices D'Europe (USPE) European Police Sport Conference, Turin, Italy, November. (Title Health, wellbeing and

physical activity in two Welsh police forces).

2018: Invited keynote: Oscar Kilo 'Upbeat' Raising the game in police wellbeing conference, London, UK, March. (Title: Match fit: Impact of sports, social and physical activity on police wellbeing).

Conference Communications

Oliver, H., Thomas, O., Neil, R, Moll, T., & Copeland, R. (2019). A multi-methods study into health and wellbeing in two Welsh police forces. Research paper presented at the annual Public Health Wales Conference, Newport, Wales.

Oliver, H., & Thomas, O. (2018). Match fit: The positive potential of sports, social and physical activity. Research paper presented at the annual Emergency Services Show, Birmingham, England.

Oliver, H., & Thomas, O. (2017). Health and wellbeing and resiliency in South Wales and Gwent Police. Research paper presented at the Psychological Hazards Awareness conference, Wakefield, England.

Oliver, H., & Thomas, O. (2017). Health and wellbeing research in South Wales Police. Research paper presented at the Police Sport UK AGM, Bushey, England.

Oliver, H., & Thomas, O. (2017). Health, wellbeing and resiliency: A scoping study. Research paper presented at the South Wales Police Wellbeing Summit, Cardiff, Wales.

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Acknowledgements

There are a number of people who made the research presented in this thesis possible. First and foremost, I feel very lucky to have had such a pragmatic and understanding Director of Studies in Professor Owen Thomas. I have felt so supported throughout this process. Across two external police organizations, a global pandemic, and other significant challenges, this is extraordinary. Thank you. I would also like to thank my supervisors, Professor Rich Neil, Dr Tjerk Moll and Professor Robert Copeland. Along with Owen, you all helped me to put any stumbling block into perspective, leave meetings with a smile on my face and I will always be grateful for your time and guidance.

All of the police officers and staff from the partner forces who were involved, from colleagues in I.T. to participants themselves, thank you for your time and interest. It was a privilege to hear about your experiences and perspectives, and I sincerely hope that the insight and knowledge gained from this thesis contributes towards an improvement in your work-related stress and wellbeing. I would like to give special thanks to the steering group members: Matt Jukes, for providing the platform for the research, advocating it, and the opportunities you have offered to me since; Kathryn ‘the collar grabber’ Chadd, your tenacity and support were invaluable, and you are a true role model; Neil Lewis and Alisa Quartermaine, for similarly driving the research in a second police force – diolch yn fawr.

I am lucky to have incredible family and friends. To my partner Lee, when the thesis seemed unsurmountable you were calm, patient, and made it ok. Hannah, the greatest listener. My parents and brothers, never doubting me, reminding me there is life outside of a PhD, and providing a (mostly) welcome distraction. To everyone in research house, all at different stages of our journey but played a role in sharing experiences. In particular, Sian, Simone and Brooksy, from progress meetings to running club and PhDates, thank you for being a support network that I cannot imagine doing without. It really is all part of the process...

Abstract

The aim of this research was to explore stress and wellbeing in two British police forces, to discover what factors were important for police wellbeing and how the wellbeing of police force workers might be better supported. A collaborative (co-design) approach and the Double Diamond (Design Council, 2019) framework were used to guide the research. The sample population for this research was recruited from two UK police organizations.

Informed by the Demands Resources and Individual Effects model of work-related stress (Mark & Smith, 2008), Study 1 was a quantitative assessment of the factors associated with stress and wellbeing in the police forces. Work resources (perception of reward, control, support) and individual characteristics (medium and high physical activity behavior) were found to significantly moderate the relationships between work demands and perceived job stress to benefit psychological wellbeing outcomes. To gain deeper insight into physical activity as a potential driver for wellbeing, a series of qualitative enquiries were conducted in Study 2a and 2b. Focus groups were used to explore the relationship between physical activity and wellbeing in Study 2a, and individual interviews were conducted with inactive (low physical activity behavior) police force workers to establish the barriers and enablers to their physical activity behavior in Study 2b. Analysis indicated that psychological capability, social opportunity and motivation were influential in police physical activity behavior.

Building on the qualitative insights, Study 3 focused on the development of a context-specific physical activity intervention, co-designed with one department within the police force.

Using the Behavior Change Wheel (Michie et al., 2011), the outcome of this collaborative approach was a protocol for an ‘Exertime’ intervention. ‘Exertime’ was an e-health software program which prompted police staff to engage in short-bursts of physical activity throughout their shifts and was supported by supervisors encouraging their staffs’ participation.

Holistically, the program of research has advanced knowledge on work-related stress,

wellbeing, and physical activity, with practical implications for police force organizations. These include providing support for physical activity at work as a mechanism to maintain wellbeing and providing specific training for supervisors to manage favorable relationships with their staff. A series of learning points can be taken from the research to support future PhD researchers, their supervisors and the external organizations they work with in conducting ecologically valid research.

Chapter 1

Introduction

Introduction

Within this chapter, I provide the reader with an insight into the background of my research. I begin by setting the context within which the research took place. Following this, I provide an overview of my thesis; I outline the working relationship(s) with the organizations who were involved with this research program, and I present the structure of my thesis and explain where it sits in relation to the coronavirus (Covid-19) pandemic which occurred during my research journey.

Setting the context for the research

In 2010, a new coalition government was formed in the United Kingdom of Great Britain (UK) and police officer and staff remuneration and conditions were reviewed (Winsor, 2011). Following the review, British police working practices and terms of service underwent an extensive reform, in which central government funding to the British police service was reduced by 18% in real-terms (National Audit Office, 2015) and the total size of the workforce was reduced by 18% (44,000 personnel; National Audit Office, 2018). Specifically, police forces in England and Wales operated with 15% less police officers, 40% less police community support officers, and 21% less non-operational police staff between 2010 and 2018 (National Audit Office, 2018). The National Audit Office (2018) reported that the impact of these reductions was unknown, but that there was evidence of increased demand on police forces. Some limited research supported the idea that increased demand was being felt by the remaining workforce, both due to excess workload, and the nature of crimes changing to more complex and challenging offences in the same period (e.g., more cybercrime, sexual offences, terrorism; Hesketh, 2015). The ramifications of these funding reductions were likely to take further time to filter into police working conditions and the welfare of the workforce (Elliott-Davies et al., 2016).

To help determine the impact of the budgetary and workforce cuts on police health

and wellbeing, researchers have gathered police officer views. In the 2016 National Welfare Survey of 17,000 British police officers, 80% of respondents reported feelings of stress, low mood, or mental health difficulties in the previous year; 92% of which attributed these feelings to work. Further, 29% of respondents suggested that at least one of their sickness absence days from the past six months was due to stress, or the related mental health conditions of depression and anxiety (Houdmont & Elliott-Davies, 2016). The ill-health of the police workforce contributed to a 11.5% rise in sickness rates between 2015 and 2016 (Home Office, 2016). These numbers were likely to be conservative, however, as police reported attending work when they should have taken absence leave – demonstrating ‘presenteeism’ - or taking annual leave to cover ill-health related absences from work (leaveism; Hesketh, 2015). Therefore, the full impact of the working environment and demands of police work remained unknown.

As British police forces recognized that police work had adverse effects on health outcomes (e.g., causing sickness absence, fatigue, anxiety; Houdmont & Elliott-Davies, 2016), the Home Office (2018) announced a goal to improve police physical and mental health. In the approach, a plan was outlined to develop national resources, while also allowing for local force-based approaches to support health and wellbeing. Subsequently, Public Health England and the College of Police launched ‘Oscar Kilo’ (‘OK’), an evidence-based online resource with guidance and support for police forces in 2017, and the National Police Wellbeing Service in 2019 (see Phythian et al., 2021). Most recently, the Police Covenant presents a recognition from government to mitigate the adverse impact that policing can have on police officers, staff, volunteers, and their families (Home Office, 2022). Though these steps demonstrated the growing attention to, and concern for, police wellbeing, there is limited clarity over the impact and success of the support (Phythian et al., 2022), and there are calls for a more robust evidence base to develop tailored interventions for police

stress and wellbeing (Jackman et al., 2021). In my research program I sought to add to this evidence base, exploring what was important for police wellbeing at a local and regional level, and how it might be better supported. My research began in 2016, at the time in which police forces were reporting their highest sickness rates, and this thesis should be read within that context.

Thesis overview

On average, across British police forces, 4% of officers were on long-term absence leave in 2016 (Home Office, 2017b). According to the Health and Safety Executive (2007), much sickness absence can be avoided with better management of health and wellbeing. In 2016, anecdotal evidence existed for what might promote wellbeing in the police, but no systematic empirical research had been conducted (Elliot-Davies et al., 2016).

The aim of this thesis is to explore stress and wellbeing in two British police forces, hereby after referred to as the ‘partner police forces’. To develop a program of work to address this aim systematically, I looked to the field of occupational health psychology. Researchers in this field seek to understand the work – stress – health relationships, and what makes a healthy workplace where workers perform well and feel well (Houdmont & Leka, 2010). While 4% of the workforce was on long-term absence leave (Home Office, 2017b) the rationale and direction from the partner police forces was to focus on keeping the remaining 96% in work. This represented a shift from a reactive approach (i.e., reacting to stress to return the 4% of the workforce on absence leave back into work) to a proactive approach (i.e., preventing stress and/or its ill-effects in the 96% still in work). There is a body of research with police populations which is stress-based (Hart & Cotton, 2002), but, as well as understanding stress, to mirror the shift to a proactive approach, I also felt I needed to understand wellbeing. With this understanding, my research could provide an evidence base for the promotion of wellbeing in the police forces. In my thesis, I therefore lean on a stress

and wellbeing approach.

Stakeholder engagement

To address my research aim operationally, a steering group was formed consisting of the Head of People Services in each police force, my Director of Studies (DoS), and myself. The purpose of the steering group was to oversee the research progress and act as a conduit between myself and the wider workforce. I applied a ‘co-design’¹ approach to research, whereby over the course of the research program, the steering group met bi-monthly at a minimum, with more frequent meetings scheduled as the research progressed and at key points in the research journey. In the steering group meetings, I updated on research progress, and complemented the meetings with written monthly research updates. Through the meetings and updates I ensured I had a system involving the partner police forces at all stages of the research. To enhance this, the partner police force representatives in the steering group engaged different police force personnel in the meetings as required, to plan and facilitate the next steps, as well as providing organizational updates and insight. Over the course of the research program, wellbeing groups were created in both forces, in which representatives across departments would meet to discuss wellbeing developments and initiatives taking place in their police force. I also attended some of these internal meetings to gain further understanding of the organizational context and the current issues on the wellbeing agenda.

Structure of thesis

To explore stress and wellbeing in two British police forces, the thesis is organized into eight chapters comprising four empirical studies. Following this introduction, in Chapter 2, I review the work-related stress and wellbeing literature, focusing on the police context. This review informed my methodological approach, which is outlined in Chapter 3. Specifically, in Chapter 3, I provide insight into my philosophical beliefs and the framework

¹ The ‘co-design’ approach is explained in Chapter 3 ‘Methodological Approach’.

guiding the thesis. That is, my ontological and epistemological views and how they are reflected throughout the research.

In Chapter 4 (Study 1), I provide insight into the quantitative assessment of the factors associated with stress and wellbeing in the partner police forces. Chapter 4 includes a peer-reviewed paper accepted for publication in *Current Psychology*, and an Interlude to situate the findings presented in the paper back into the thesis. In the Chapter 4 Interlude, I spotlight the physical activity findings in Study 1, as these findings informed the subsequent research. As such, in this section I also review the potential value of physical activity for work-related stress and wellbeing.

In Chapter 5 (Study 2a and Study 2b), I present qualitative insights into the reported relationship between physical activity and wellbeing in the partner police forces. I illustrate the systematic process of my data collection by setting out two qualitative studies: the first, a series of focus groups; and the second, a series of individual semi-structured interviews.

In Chapter 6 (Study 3), I set out a physical activity intervention, co-designed with the partner police forces. The chapter includes a review of theories that have been used in workplace physical activity interventions. Then, leaning on my qualitative findings, I outline the intervention development process, following the Behavior Change Wheel guide (BCW; Michie et al., 2014). Within the process section I iteratively set out what I did at each step of the BCW and the findings associated at each step. In the final section of Chapter 6, I provide a description of the (planned) Exertime intervention in a protocol.

In Chapter 7, I present the overall findings of the thesis and discuss the relative contributions from each study. The theoretical, conceptual and practical implications are then presented alongside the contribution of these to knowledge. The strengths, limitations and future directions of my research are then discussed. In my final chapter, Chapter 8, I reflect on my doctoral journey. Specifically, I offer insight into my position within the research

process and provide a series of learning points that can be taken from my experience to support other PhD researchers, their supervisors, and external organizations in conducting research together.

Covid-19

All of the data presented in my thesis was collected before the Covid-19 pandemic, which started to impact life in the UK just before my intervention was planned to start. Figure 1.1 shows a timeline of my thesis against the timeline of the pandemic. The original plan for my thesis was to develop and deliver an intervention with the partner police forces in Study 3, but due to the uncertainty during the pandemic, the intervention was instead written as a protocol for a pilot trial (Study 3, Chapter 6). Within Chapter 6, I discuss how the intervention could be adapted for delivery within the pandemic restrictions. Within Chapter 8, I reflect on the rationale and impact the pandemic had on my research journey.

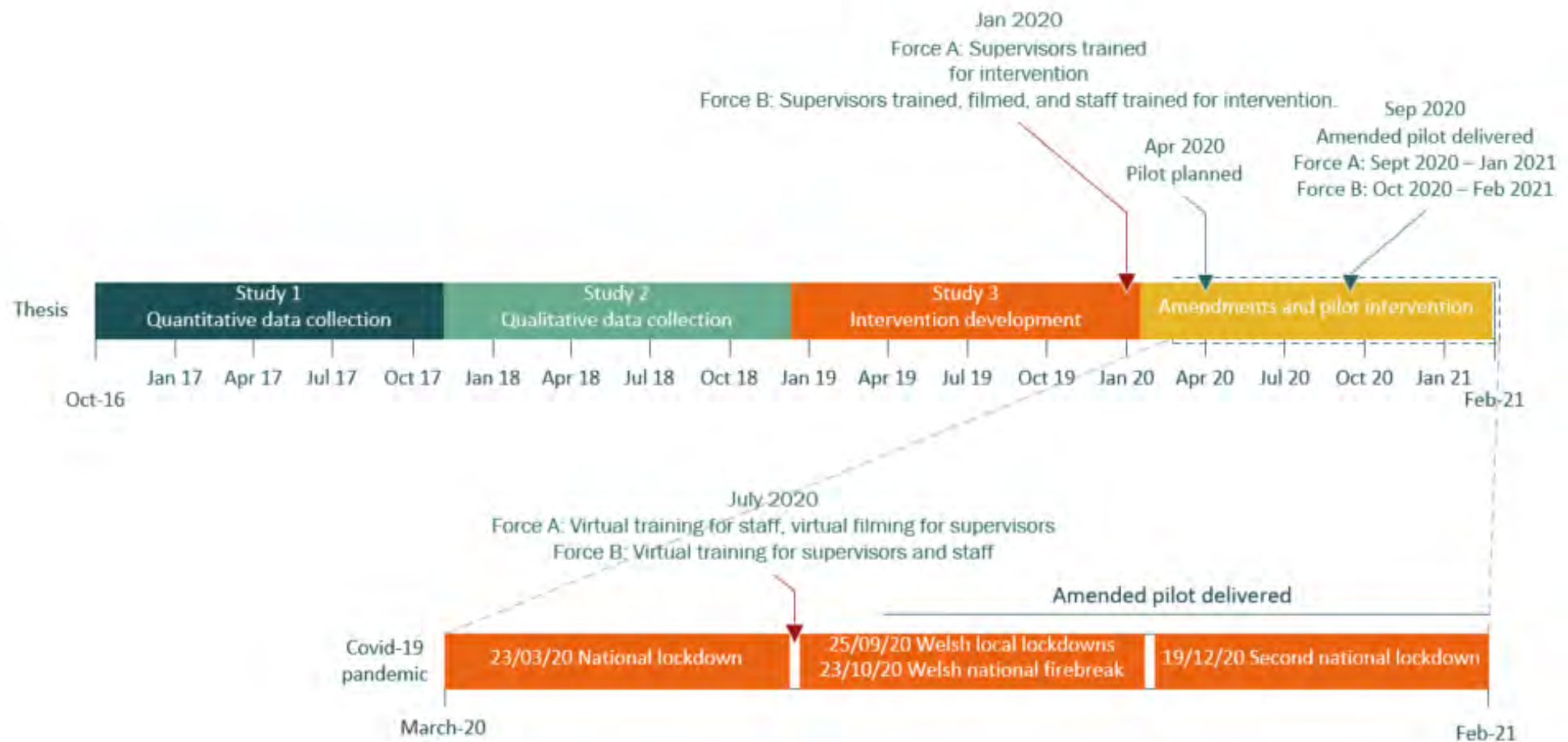


Figure 1.1 Timeline of thesis progress and Covid-19 developments.

Chapter 2

Literature Review

Introduction

Given the potential impact of the working environment on police health and wellbeing, in this chapter I aim to critically evaluate the work-related stress and wellbeing literature. In Chapter 1, I introduced some of the adverse effects of police work on different aspects of health, and so I begin this chapter by explaining my use of the terms *health* and *wellbeing*. I then continue to address the aim with a section focusing on work-related stress, a section on wellbeing, and a section on the police context. Within the work-related stress section, I review the literature on: (a) key structural theories and models; (b) key process theories and models; and, (c) contemporary developments in the literature. Then, within the wellbeing section, I provide critical insight into: (a) different conceptualizations of wellbeing; (b) the conceptualization that will inform the rest of my research program; and, (c) wellbeing interventions that have been guided by work-related stress literature. In the police-specific section, I give an overview of the stress and wellbeing research and interventions that have been conducted with this population. I conclude the chapter with the aim and objectives for this program of work.

Use of terms

The World Health Organization (WHO) define *health* as “a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity” (WHO, 1948). Although *wellbeing* is inextricably linked to health and central to its definition, the exact interpretation of wellbeing is not clear (WHO, 2021). I offer insight into the different perspectives on wellbeing in the wellbeing section. However, broadly, the term *wellbeing* is used to describe positive functioning and feeling well (Martela & Ryan, 2021). Within this chapter, I use the term *health* to refer to research that has considered physical, mental or social outcomes, including illnesses or ill-health (e.g., diseases, disorders, disabilities) and wellbeing. I use the term *wellbeing* to refer to wellbeing-specific research.

Work-related stress

Structural theories and models of work-related stress

Structural models and theories of work-related stress built on early theories in which stress, generally speaking, was considered an adverse response to a harmful external stimulus or environment (Cox & Griffiths, 2010). The stress response could result in a further negative response (strain), displayed in physical (e.g., raised blood pressure, reduced immune system) and psychological outcomes (e.g., reduced energy). However, early perspectives were simplistic and linear, suggesting that stress has negative outcomes and should be avoided for everyone, not considering that some people might perform well under stress (Cox & Griffiths, 2010). These limitations led theorists to develop structural theories and models of work-related stress, where researchers emphasized the interaction between the environment (e.g., work characteristics) and the individual, suggesting which of these factors might determine stress and resultant health outcomes (Cox & Griffiths, 2010).

Job Demand-Control and Job Demand-Control-Support models

One of the earliest and most influential structural (interactional) models is Karasek's (1979) Job Demand-Control (JDC) model. Within his model, Karasek identified two important aspects of work: 'job demands' refer to aspects of the job that require sustained effort, such as workload and time pressure; and 'job control' refers to an individual's ability to control their work. Karasek also proposed two hypotheses to explain the impact of job demands and job control on strain (a stress-related outcome). Specifically, jobs high in demand and low in control were "high strain" jobs and would be detrimental to health (strain hypothesis), but high job control could reduce or buffer the negative effects of high demands on health (buffer hypothesis). The JDC was extended by Johnson and Hall (1988) to include social support as a third factor (Job Demand-Control-Support model; JDCS). In the JDCS, low support was proposed to add to a "high strain" job, whereas work conditions of high

support could act as another buffer against ill-health. Expanding the strain hypothesis, Karasek and Theorell (1990) suggested that strain could be realized through *additive* effects (simple addition of high demands, low control and low support) or *interactive* effects (the combination of effects that poses greater risks to wellbeing and is only apparent under certain conditions; e.g., when control is low).

In reviewing JDC/JDCS literature in relation to psychological wellbeing, researchers have reported consistent support for the additive effects of the strain hypothesis (see e.g., Häusser et al., 2010; van der Doef & Maes, 1999), so a key contribution from JDC/JDCS research has been identifying the importance of job demands, job control and social support for employee wellbeing. The simplicity of the JDC/JDCS can be a strength, as it offers a predictive framework that is still used by researchers to identify work characteristics that are salient to work-related stress (e.g., Baka, 2020). However, despite the support for the additive effects, there is inconsistent evidence for interactive effects (e.g., buffer hypothesis; Häusser et al., 2010). The main criticism which could help to explain the lack of support for the interactive effects and buffer hypothesis in the JDC/JDCS is that it is narrow in scope, limited by only considering three work-related stress variables, when there are a plethora of other factors that have also been found to influence wellbeing in the workplace (e.g., performance feedback, rewards; Bakker & Demerouti, 2014). The model is further limited by its reliance on the assumption that all individuals have the same experience of work environments. For example, researchers using the JDC/JDCS assume that high control is a desirable state, but for some individuals this might be stressful (Mark & Smith, 2008). As such, a more refined understanding of individual differences in the experience of work-related stress is needed.

Effort-Reward Imbalance model

Siegrist (1996) included an intrinsic dimension in his Effort-Reward Imbalance (ERI) model to explain how work conditions might differ for individuals, by focusing on the

perceived reciprocity between effort and reward in the experience of stress at work. Work situations with low reward (e.g., lack of promotion), and high effort (e.g., work pressure) were suggested to predict high stress and adverse health effects, if the individual perceived a mismatch between the two (Siegrist, 1996). In the development of the ERI, the effort variable was split into two components: extrinsic effort, which represents external motivations or obligations imposed on employees; and overcommitment, which represents personal motivations, such as a need for approval and making excessive efforts at work (van Vegchel et al., 2005). Effort-reward imbalance and overcommitment are proposed to directly and adversely impact health (*additive hypothesis*), and these effects are suggested to be stronger for individuals high in overcommitment (*interaction hypothesis*; Siegrist, 2002).

The ERI was originally used to explain cardiovascular disease but has since been applied to various behavioral and psychological outcomes, including psychological wellbeing (van Vegchel et al., 2005). Siegrist and Li's (2016) systematic review of ERI research found that there was strong support for additive effects in predicting health at work, but limited support for the interaction hypothesis. As such, the pattern of findings from the research underpinned by the ERI are similar to the studies informed by the JDC/JDCS (i.e., the additive effects, not interactive effects, are supported; Häusser et al., 2010; Siegrist & Li, 2016). It has been suggested that the JDC/JDCS and ERI models have similar frameworks, but with different variables (Cox & Griffiths, 2010). Researchers have found the best prediction of health outcomes occur when the models are tested in combination (e.g., Jachens & Houdmont, 2019), purportedly because the inclusion of an intrinsic dimension and a greater number of work characteristics allows for a multi-dimensional view of stress (Jachens & Houdmont, 2019). There is a key difference to, and strength of, Siegrist's ERI though; where JDC/JDCS research concerns 'actual' levels of work characteristics, ERI research concerns individuals' 'perception' of work characteristics and whether or not an individual's

perception of effort matches their perception of reward (Mark & Smith, 2008). Although this important aspect builds on previous models in the acknowledgement of a role for perceptions, it needs further research attention as there are no proposed mechanisms for the processes underpinning any mismatch in perceptions of effort and reward (Mark & Smith, 2008).

Job Demands-Resources model and theory

Researchers who later introduced models of work-related stress were informed by the JDC/JDCS and ERI, by including the key work-related variables and also considering individual differences. For example, the Job Demands-Resources model (JDR; Demerouti et al., 2001) was developed into JDR theory (Bakker & Demerouti, 2017) to include a category of ‘personal resources’ in recognition of the intrinsic dimension identified in the ERI, and account for the different ways individuals respond to the same demand (Bakker & Demerouti, 2017). Personal resources (e.g., optimism) relate to the beliefs’ individuals hold, and, in a manner similar to job resources, are proposed to buffer against the negative effects of job demands. The specific job demands, job resources and personal resources in the JDR vary between occupations, creating a flexible framework which has been widely used across occupational groups with different wellbeing outcomes (Bakker & Demerouti, 2017). Two processes are suggested for job demands and job resources to impact wellbeing; job demands initiate a health impairment process which consumes resources and impairs wellbeing, and job resources initiate a motivational process which fulfils individuals’ needs and supports wellbeing (Bakker & Demerouti, 2014). These two processes are supported by the extant literature (e.g., Bakker et al., 2003; Katou et al., 2021), but further research is needed to explain the process(es) by which personal resources impact wellbeing, as this remains an issue unresolved within JDR theory (Bakker & Demerouti, 2017). JDR theory builds on the JDC/JDCS and ERI models through allowing a wider inclusion of work characteristics and personal resources, but still there is a focus on the structure of situations leading to stress,

without emphasis on the individual's engagement with work demands.

Overall, structural theories and models have provided some evidence for the key work characteristics that influence the experience of work-related stress. They offer researchers a way of measuring and predicting work-related stress and provide a platform from which to make recommendations to support employee health and wellbeing (Cox & Griffiths, 2010). Within the ERI and JDR, researchers have begun to recognize some aspects of intrinsic dimensions (ERI) or personal resources (JDR) that represent individual differences in the experience of stress. Yet, a 'black box' remains over how these dimensions operate and integrate with work characteristics (Siegrist & Li, 2016), and structural theories fall short of explanatory mechanisms for stress effects on health and wellbeing (Schaufeli & Taris, 2014).

Process theories and models of work-related stress

Transactional stress theory

Lazarus and Folkman (1984) developed the transactional perspective of stress, emphasizing the role of the individual in determining health outcomes and conceptualizing stress as a process involving: the demands an individual experiences; the cognitive evaluation of these demands; and, the stress related response (e.g., emotions and behavior). An individual's cognitive evaluation was proposed to include primary appraisal (i.e., whether the demand is considered a threat, a challenge, harmful or a benefit to their goals/wellbeing) and secondary appraisal (i.e., the evaluation of resources and options for coping to manage the identified demands). The individual has an active role in their stress response, as their appraisals shape their stress response. This perspective might help to explain why two employees might experience the same work and/or person-related demands and yet respond differently (Perrewé & Zellars, 1999).

In 1991, Lazarus extended the transactional perspective into the cognitive-motivational-relational theory of emotions (CMRT) to illustrate more clearly the synthesis of

stress and emotion. The term *appraisal* related to an evaluation of the significance of what is happening to the individual for their goals and wellbeing (Lazarus, 1991), highlighting a role for wellbeing within the stress process. In primary appraisal, an individual evaluates the demands faced in terms of their significance and implications for their personal goals (i.e., if the demands are relevant to their wellbeing). The meaning associated with the demands and their relationship with the environment was referred to as *relational meaning* (Lazarus, 1999). The relational meanings can be represented in terms of a harm or loss (damage already occurred), threat (possibility for damage), challenge (opportunity for growth) or benefit (positive outcome for goals/wellbeing already occurred) appraisal; each of which has different implications for the emotional response. If an individual perceives the demands are relevant to their wellbeing, they then consider coping options in a secondary appraisal.

Lazarus' perspective has promoted the need to explore, holistically, individual experiences of stress in various occupations and most contemporary theories of stress accept the transactional perspective and consider the role of appraisals (Biggs et al., 2017). Through the inclusion of appraisals, Lazarus' perspective has offered researchers a greater understanding of the idiographic processes that might occur when individuals' experience stress. However, the possible permutations are high; for example, Rodrigues et al. (2017) identified 112 stressors and 112 coping responses from the diary entries of 14 emergency response officers. Each stressor was met with a different response; this creates measurement issues for researchers operating within nomothetic research designs (i.e., which could be applied across or within occupational groups). Based on Lazarus' perspective, researchers have attempted to categorize stressor appraisals and the health-related outcomes that they are usually associated with (e.g., Cavanaugh et al., 2000), but this approach does not sufficiently reflect the range of appraisals (Brady & Cunningham, 2019). As such, unlike the nomothetic structural models of work-related stress, the specificity of research findings from the studies

informed by the transactional perspective cannot be generalized (Cox & Griffiths, 2010).

Lazarus emphasized that alongside appraisals, coping was an essential concept in the dynamic of stress. Coping is defined as the efforts an individual makes to manage demands which have been appraised to outweigh their resources (Lazarus & Folkman, 1984). Lazarus (1999) categorized coping into two main functions, problem-focused coping, whereby an individual attempts to manage the stressors or demands, and emotion-focused coping, whereby an individual attempts to manage their emotional response. Broadly, emotion-focused coping has been associated with negative health outcomes, and problem-focused coping with positive health outcomes (Biggs et al., 2017). However, Lazarus warned that coping efficacy depends on situational and individual differences to reach the most favorable health outcome, but to account for this, researchers are met with a huge amount of variation in stress and coping experiences. So, the challenge of measurement and difficulty in representing all the elements of the CMRT together permeates the research which applies Lazarus' perspective (Mark & Smith, 2008).

A framework for the stress process at work

Cox and Griffiths (1995) also adopted a transactional perspective to explain work-related stress at the organizational level. Their framework has five stages, developed from Lazarus and Folkman's theory through consideration of stressors and appraisals. Specifically, Cox and Griffith's first stage relates to the antecedent factors of stress (e.g., job demands or environment characteristics), and the second stage relates to an individual's cognitive processes (e.g., perception of the demands and their coping ability). The third stage of Cox and Griffiths process model relates to coping and the changes a person undergoes when in a stress state (e.g., mood change, tension). The fourth stage relates to the outcomes of coping attempts (e.g., ill-health), which, in the fifth stage, feedback to inform the next appraisal or attempt at coping. The fifth stage is a strength of the framework as it represents the reciprocal

nature of stress and advances structural models which are static and linear.

An important differentiation between Lazarus' theory and Cox and Griffith's model is that the latter offers occupational psychology a way of describing and measuring work-related stress that can be generalized across occupational groups, which has informed a practical risk management approach and the development of frameworks that enable organizations to assess stress in their workplace (Cox & Griffiths, 2010). One such framework, the Management Standards, was developed by the Health and Safety Executive (HSE), who are responsible for occupational health and safety in the UK. In relation to the stress process, the Management Standards are the general antecedent factors of work-related stress (stage one in Cox & Griffiths' model), termed 'psychological hazards'. The HSE Indicator Tool was developed to capture employees' personal appraisals of the 'hazards' (stages two – five in Cox & Griffith's model; Mackay et al., 2004). Using the HSE Indicator Tool enables the stress process to be measured at an organizational level and allows organizations to continually gauge their performance and address the hazards affecting their workers (Mackay et al., 2004).

Kinman et al. (2016) used the HSE Indicator Tool amongst prison officers in the UK and highlighted six out of seven hazard areas that had significant negative stress-related outcomes, and so should be targeted by interventions. The approach represents a step forward in terms of promoting generic, nomothetic measurement of transactional work-related stress, but there are still limitations. Kinman et al. (2016) used a benchmarking approach, comparing stress in prison officers to other UK organizations, however the benchmark dataset might not be comparable for organizations characterized by high stress (Houdmont et al., 2012). For more relevant comparisons, it has been suggested that the HSE Indicator Tool could be supplemented with additional measures of context specific stressors (Kinman et al., 2016). The use of the Tool should also be supplemented with user participation (e.g., in a

stakeholder focus group) to enable an appropriate prioritization process for interventions and to enhance contextual understanding (Mackay et al., 2004). However, as the user participation stage adds to the resource required to use the Tool it is a barrier for organizations, and the stage is often replaced or omitted (Mellor et al., 2011). Cox and Griffiths process model and the HSE tool have therefore built on Lazarus' concept in facilitating generic measurement of all of the elements in the stress process, yet it is still difficult for researchers to administer the process (Cox & Griffiths, 2010) and might miss job-specific stressors (Kinman et al., 2016).

Overall, the strength of process theories and models of work-related stress is the recognition of individual differences and understanding of the role of idiographic processes and mechanisms. But the idiographic understanding comes at a price of generalizability to occupational groups. The complexity of process approaches means they are difficult to measure empirically, unlike the simpler structural models of work-related stress, and so a conceptually accurate middle ground is required (Mark & Smith, 2008).

Contemporary developments

To advance the field there is a need to integrate structural models of work-related stress with the transactional perspective. Structural models provide frameworks for researchers to measure work-related stress variables and predict health outcomes consistently across or within contexts, but they do not depict the reality of the stress process, or encompass the explanatory mechanisms provided from the transactional perspective. Research that applies both approaches is rare, and without such application the developed knowledge of occupational stress is limited (Brough et al., 2018).

Demands Resources and Individual Effects model

The Demands Resources and Individual Effects (DRIVE) model of work-related stress (Mark & Smith, 2008) is seen as a key advancement to inform research into work-

related stress, providing a framework that integrates transactional theory with structural (interactional) models (Vallone et al., 2020; Williams et al., 2017). Mark and Smith (2008) developed the DRIVE model, allowing researchers to account for the main variables that might influence the perception of stress and suggested 12 relationships for how they might interact (see Table 2.1). The concept of appraisals is included through the mechanism of perceived job stress, which is proposed to mediate the relationships between work demands and health outcomes. That is, Mark and Smith proposed that work demands will not be associated, or will have a reduced association, with negative health outcomes if the individual does not perceive them to be stressful. The concepts of job demands, job resources and individual characteristics (personal demands and resources) were also included, and proposed to have direct and indirect effects with perceived job stress and health outcomes. Secondary appraisals, or perceptions of coping resources available, can therefore be included as a specific variable under the heading of individual characteristics, or under the perception of job resources heading.

Table 2.1. *DRIVE model relationships*

1	Work demands and resources will significantly relate to wellbeing outcomes
2	Work demands and resources will significantly relate to perceived job stress
3	Perceived job stress will significantly relate to wellbeing outcomes
4	Perceived job stress will significantly mediate the relationships between work demands/resources and wellbeing outcomes
5	Work resources will significantly moderate the effect of work demands in the prediction of perceived job stress
6	Work resources will significantly moderate the effect of work demands in the prediction of wellbeing outcomes
7	Work resources will significantly moderate the effect of perceived job stress in the prediction of wellbeing outcomes
8	Individual characteristics will significantly relate to perceived job stress
9	Individual characteristics will significantly relate to wellbeing outcomes
10	Individual characteristics will significantly moderate the effect of work demands on perceived job stress
11	Individual characteristics will significantly moderate the effect of work demands on wellbeing outcomes
12	Individual characteristics will significantly moderate the effect of perceived job stress on wellbeing outcomes

Due to Mark and Smith underpinning the DRIVE model with Lazarus' theory, it is a more conceptually representative model of stress and wellbeing than earlier interactional models of stress. Further, due to the integration of interactional models, it is easier to empirically test than Lazarus' transactional perspectives. The DRIVE model has been applied to samples of British nurses and university students (Galvin, 2016; Williams et al., 2017), Italian nurses (Zurlo et al., 2018), Eastern European care workers (Capasso et al., 2016) and general working samples (e.g., in China; Zhang & Smith, 2021). Using the DRIVE model enabled Zurlo et al. (2018) to compare their findings with Italian nurses to Williams et al.'s (2017) sample of British nurses. Doing so highlighted differences in the moderating effects of work resources in the relationships between work demands and health outcomes, as well as individual differences in the use of coping strategies. To elaborate, perceived rewards were more protective against the negative effects of job demands in the British sample than in the Italian sample, while more Italian nurses sought advice as a coping strategy and had lower levels of anxiety and depression than British nurses. Zurlo et al. (2018), therefore, put forward focused recommendations for each context to promote the wellbeing of nurses. As such, the DRIVE model is an important advancement in the literature as it allows for associations to be assessed across large organizational samples, and, as a result, evidence-based recommendations to be made. Consequently, Mark and Smith (2008) addressed the complexity issue of transactional theory, and limitations issue of structural models.

Similar to JDR theory, researchers utilizing the DRIVE model are encouraged to include specific variables relevant to their population of study under the concept headings alongside established predictors. By doing so, researchers have informed of the work characteristics (e.g., dealing with change; Williams, 2015) and individual characteristics (e.g., rumination; Zhang & Smith, 2021) that were significant for work-related stress in their context. To determine which characteristics hold the most predictive power (i.e., established

DRIVE model predictors or additional characteristics), a combined effects approach has been suggested, whereby all characteristics are combined into a single score (Smith, 2021).

Researchers and practitioners, therefore, have an option for straightforward analysis (combined effects approach) to determine the most salient factors for wellbeing, as well as an option to assess the microstructure of the DRIVE model (separate relationships of variables; Smith, 2021).

Despite the growing support for the DRIVE model, there are limited instances where all DRIVE model relationships (direct effects, mediation, and moderation) have been tested. Galvin (2016) did test the DRIVE model in its entirety with a sample of student nurses and trainee clinical psychologists and found support for the direct and mediation relationships. There was mixed support for the moderation relationships. However, some of the stressors were associated with ‘being a student/trainee’ (Galvin, 2016) and so it is a limitation that all of the DRIVE model relationships have yet to be explored in an occupational setting. In their review of the recent and extant literature base, Margrove and Smith (2022) recommended that future DRIVE model research should seek to confirm the proposed mediation and moderation relationships. The DRIVE model has, therefore, not yet been tested as extensively as the other models, but offers researchers a practical, yet theoretically informed, way of exploring work-related stress and wellbeing.

Work-related stress and wellbeing are two bodies of literature that have mostly been conceptualized and, as a result, operationalized separately (e.g., work-related stress, Cox & Griffiths, 2010; wellbeing at work, Fisher, 2014). To help synthesize the concepts of stress and wellbeing, and support further the utility of the DRIVE model, in the next section I will define wellbeing and critique the relevant wellbeing literature.

Wellbeing

Traditionally, there are two approaches to wellbeing: hedonic wellbeing, which

concerns happiness and maximizing feelings of pleasure; and, eudemonic wellbeing, which also concerns happiness, but through realizing human potentials in accordance with a ‘true self’ (Waterman, 2008). McMahan and Estes (2011) provided a useful example of the difference. They explained that while both fine dining and completing a marathon might create happiness and lead to hedonic wellbeing, the marathon is more likely to develop human potential and develop eudemonic wellbeing because it provides more potential for personal growth and self-development. Both perspectives have taken focus away from ill-health, and the perception that wellbeing was simply the absence of illness (e.g., depression), towards considering indicators of happiness. Nevertheless, there is still ongoing debate in the literature as to how to conceptualize and assess wellbeing (Martela & Ryan, 2021).

Diener (1984) suggested that hedonic wellbeing could be represented by three components: life satisfaction; positive affect; and, negative affect. Together, these components are termed ‘subjective wellbeing’ as they comprise a cognitive domain (life satisfaction) of how an individual evaluates their life, as well as an affective domain influenced by emotions (Diener et al., 1999). It has been demonstrated that the three components operate separately, diverging over time and in relation to different variables (Lucas et al., 1996), and, as such, must be measured separately. For example, life satisfaction can represent a judgement of wealth, health or relationships, which might be more stable than affect, reflecting recent or current emotions. Diener et al. (1999) explained that the processes underlying subjective wellbeing are bottom-up situational influences (e.g., external events, situations, demographics), which allow an individual to fulfill their needs and be happy, and top-down influences which reside in the individual (e.g., personality). Diener et al. also suggested that bottom-up factors cannot be measured objectively, as although they might make an individual happy, only the individual can report if they are happy. Diener et al.’s conceptualization has informed a lot of research into the predictors and consequences of

subjective wellbeing, intervention techniques, and cross-national comparisons (Waterman, 2008). However, there is some criticism that subjective wellbeing is not strongly guided by theory and focuses on wellbeing as an outcome, omitting important aspects of the processes leading to wellbeing (Ryff, 1989, 2014).

To operationalize eudemonic wellbeing, Ryff converged lifespan development theories and clinical theories of personal growth and mental health. As a result, she suggested six dimensions in a model of wellbeing: self-acceptance; positive relations with others; autonomy; environmental mastery; purpose in life; and, personal growth. These six dimensions relate to how an individual negotiates their way through life, in line with the eudemonic perspective that humans are motivated by more than the experience of pleasure (Ryff, 2014). Eudemonic wellbeing approaches are about the process (Martela & Ryan, 2021). Eudemonic wellbeing, therefore, offers a better account for wellbeing in situations where a decrease in happiness would be considered part of a healthy process than subjective wellbeing does. For instance, when grieving a loss there is still potential to grow, or feel connected to others (Henderson & Knight, 2012).

Although research into eudemonic wellbeing is increasing, the concept has received less research attention and is less well understood than subjective wellbeing (Martela & Ryan, 2021). There is no consensus on one theoretical approach to researching eudemonic wellbeing (Disabato et al., 2016). To elaborate, Ryff's six dimensions can be used to define eudemonic wellbeing and are based on nine theoretical foundations. Broadly, the nine theoretical foundations comprise perspectives on what it means to be in good psychological health (Jahoda, 1958), to be a fully functioning person (Rogers, 1961), who realizes their own potentials (Jung, 1933; Maslow, 1968), and has developed across the life span having faced challenges (Allport, 1961; Bühler, 1935; Erikson, 1959; Neugarten, 1973), to find meaning in life (Frankl, 1959). However, additional perspectives, such as self-determination theory

(SDT; Deci & Ryan, 1985) are also used to explain the phenomena of eudemonic wellbeing.

Through their SDT, Deci and Ryan suggested that humans are motivated by three psychological needs; autonomy (choosing one's own behaviors); competence (feeling able and effective when engaging in behaviors); and, relatedness (experiencing a connection with others). SDT has been aligned to eudemonic wellbeing, as when basic needs are met, individuals experience wellbeing and psychological growth (Ryan & Deci, 2001). Other examples aligned to eudemonic wellbeing include Csikszentmihalyi's (1975) flow theory. Flow is described as an optimal state that individuals' experience when they are engaged in challenging yet meaningful activities. There are nine dimensions to the conceptualization of flow (action-awareness, autotelic experience, challenge-skills balance, clear feedback, clear goals, concentration, control, loss of self-consciousness, transformation of time), which are suggested to be aligned to improved wellbeing (Csikszentmihalyi, 2002). More recently, Seligman (2011) has developed the PERMA theory of eudemonic wellbeing, in which five building blocks (positive emotion, engagement, relationships, meaning, accomplishment) are proposed to lead to wellbeing. This gives further examples of the array of theories and concepts that have been linked to eudemonic wellbeing (Henderson & Knight, 2012).

When considering a high number of concepts, the first issue is which to choose, then, there is a measurement challenge. Long scales are required to assess all dimensions (Ryff, 2014), and some researchers have suggested that eudemonic wellbeing is too complex (Kashdan et al., 2008) or even elusive (Henderson & Knight, 2012) to accurately measure. Others have proposed that complexity provides a more comprehensive conceptualization of wellbeing than subjective approaches and have found that eudemonic approaches explain more wellbeing variance than subjective approaches (McMahan & Estes, 2011). For individuals in dangerous jobs, such as the police, the eudemonic aspect of wellbeing might be relevant in understanding why such a job can be worthwhile and, as a result, provide a sense

of meaning (e.g., helping people and keeping them safe is worthwhile; Johnson et al., 2018).

Hedonic and eudemonic wellbeing do share some variance and there are some theoretical similarities between the two (Fisher, 2014; Kashdan et al., 2008). For example, the life satisfaction component of subjective wellbeing has been likened to the purpose of life dimension in eudemonic wellbeing (Kashdan et al., 2008). As such, rather than focus on the differences, researchers advocate integrating the two perspectives to move the field forward (Henderson & Knight, 2012; Waterman, 2008). One way to do so is to study individuals experiencing the same event (e.g., marriage, serious injury) or activity (e.g., work) and consider how this impacts their happiness (i.e., subjective wellbeing outcomes) as well as why (i.e., eudemonic wellbeing processes to the outcomes; Waterman, 2008).

Workplace wellbeing

Fisher (2014) provided a specific conceptualization of wellbeing at work. She depicted that wellbeing at work is multidimensional, including five components; positive affect at work; negative affect at work; subjective wellbeing at work (i.e., job satisfaction); eudemonic wellbeing at work; and, social wellbeing at work. The first three components stemmed from subjective wellbeing, with job satisfaction commonly used to operationalize life satisfaction. For eudemonic wellbeing, the constructs of job involvement, work engagement, thriving at work, flow and a calling at work have all been used to represent meaning or motivation at work (Fisher, 2014). Social wellbeing has been suggested as a third aspect of wellbeing distinct to hedonic/subjective wellbeing and eudemonic wellbeing (Fisher, 2014; Keyes, 2002). However, within the eudemonic approaches, social wellbeing is consistent with relatedness in SDT, and so needing to include social wellbeing separately might depend on which concepts are theorized to comprise eudemonic wellbeing. For example, Page and Vella-Brodick (2009) also proposed a multi-dimensional model of employee wellbeing, comprised of three components. Their psychological wellbeing

component was underpinned by Ryff's theoretical foundations of eudemonia, and as social wellbeing was captured in the dimension of 'positive relations with others' they did not include it as a separate component. The other two components in Page and Vella-Brodick's model are subjective wellbeing and workplace wellbeing, which includes job specific measures of subjective wellbeing (i.e., job satisfaction and work-related positive affect and negative affect). So, the researchers acknowledge that workplace wellbeing is multidimensional, and should include both subjective and eudemonic components, but use different sub-components within the dimensions. This issue is apparent in the wellbeing literature outside of the workplace too, as Huta and Waterman (2014) provided an overview of the operational definitions that researchers have used for hedonic and eudemonic wellbeing. They identified that there was consensus regarding the components of hedonia, but a need to delineate the elements of eudemonia. As an 'umbrella' concept, eudemonic wellbeing could cover anything that is not subjective wellbeing, and some researchers argued that subjective wellbeing might be a part of eudemonic wellbeing (Huta & Waterman, 2014).

To assess wellbeing in the workplace, there are ongoing issues with measurement due to multiple conceptualizations being adopted. To measure eudemonic wellbeing, Page and Vella-Brodick (2009) noted that Ryff's six dimensions might need to be tailored to be sensitive enough to apply to the workplace (i.e., to capture sense of purpose at work). Only recently have researchers developed a scale to measure eudemonic workplace wellbeing (Bartels et al., 2019). While this is a step forward to enable all concepts of wellbeing at work to be assessed, it might result in conceptual overlap with other workplace wellbeing components. For example, Wijngaards et al. (2022) put forward a taxonomy for researchers to follow to help select appropriate measures for wellbeing at work. Their taxonomy lists ten worker wellbeing constructs, that are, across eight conceptualizations, theorized to have a role in workplace wellbeing. Wijngaards et al. (2022) categorized constructs based on SDT

and cautioned researchers that eudemonic components would often contain hedonic aspects. The taxonomy demonstrates the variety of factors that are important in the study of wellbeing at work, and although a useful tool in terms of practicality, the potential to select the variables which suit the purpose of the researcher(s) still means that ‘wellbeing at work’ represents whatever the researcher conceptualizes it as (Fisher, 2014). Therefore, until there is a consensus on the components of wellbeing at work, researchers should ensure to provide justification for their conceptualization of wellbeing to conduct rigorous and reliable research (Fisher, 2014; Wijngaards et al., 2022).

A working definition of wellbeing

A term that has thus far been omitted from this review is *psychological wellbeing*. Bradburn (1969) provided an early definition of psychological wellbeing as the extent to which an individual experiences more positive than negative affect. Ryff’s six dimensions are often used to represent psychological wellbeing, but Johnson et al. (2018) explained that psychological wellbeing represents a broader conceptualization comprising both hedonic (subjective) wellbeing and eudemonic wellbeing. Johnson et al. (2018) offered the following definition, “*the affective and purposive psychological state that people experience while they are at work*” (p60). In the extant literature, researchers have suggested that both perspectives need to be integrated together to provide a conceptually accurate assessment of wellbeing generally (Henderson & Knight, 2012), and at work (Fisher, 2014; Page & Vella-Brodick, 2009). Given this proposition, I provide an integrated definition of wellbeing by considering the ‘process of wellbeing’ advocated by Ryff and ‘wellbeing as an outcome’ as promoted by researchers interested in hedonia. This is, arguably, conceptually appropriate as the fulfilment attained from achieving the factors associated with eudemonia could contribute to a sense of happiness (positive affect) and/or satisfaction. Consequently, wellbeing can be defined as, “an individual’s perception of their affect, underpinned by the processes they engage in to

maintain more positive than negative affect”.

The term psychological wellbeing will be used throughout this thesis to represent wellbeing in an integrated way, as it is consistent with both subjective and eudemonic approaches (Hesketh et al., 2015), is multidimensional (Dodge et al., 2012), and reflects an ongoing process (Henderson & Knight, 2012). In the earlier section on work-related stress, I suggested the DRIVE model as a way forward for the study of work-related stress and wellbeing. Previous researchers using the DRIVE model have also grounded their studies using the term psychological wellbeing, as opposed to subjective or eudemonic wellbeing, as both can be encompassed within the DRIVE model. Specifically, subjective wellbeing can be assessed as wellbeing outcomes in the DRIVE model (life satisfaction, job satisfaction, positive affect, negative affect; Williams et al., 2017). Eudemonic wellbeing is not directly referred to but can be inferred by the processes in the DRIVE model. To elaborate, the eudemonic perspective views wellbeing as a process that leads to positive functioning. For example, Ryff's self-acceptance dimension leads to positive functioning through awareness of personal strengths and weaknesses, and the personal growth dimension through developing potential (Ryff & Singer, 2008). Eudemonic wellbeing is, therefore, encompassed within the DRIVE model, as individuals base their appraisals of a potentially stressful situation and subsequent coping on what it means to their personal goals (Mark & Smith, 2008). If they perceive a stressor has meaning, and that they have resources (e.g., support at work, or high-quality relationships with supervisors) to cope successfully, and they do cope successfully, then they should, logically, feel a sense of fulfilment and experience positive wellbeing outcomes. Alternatively, if they perceive that they do not have the resources to cope successfully, and do not cope successfully, then they will continue to experience a negative emotion and feel a sense of unfulfillment and lower wellbeing. These experiences will inform future appraisals, and so individuals could potentially still experience a sense of fulfilment

from unsuccessful coping, if they felt that they were developing and could grow from the experience. Therefore, awareness of the stressful experience influences eudemonia, and so a stress and wellbeing process can be inferred from the DRIVE model. Both mental ill-health (e.g., depression, anxiety) and subjective wellbeing outcomes (e.g., positive affect) are needed to encompass the continuum of outcomes experienced from the stress and wellbeing process (Keyes, 2002). As such, psychological wellbeing indicators of both mental ill-health and mental wellbeing can be included within the DRIVE model to provide a conceptually accurate representation of stress and psychological wellbeing at work.

The theories and models reviewed are used by researchers to plan interventions that interrupt the stress process and improve worker wellbeing (Randall & Nielsen, 2010). Not only are accurate theoretical representations needed to develop effective interventions, but intervention research can also serve to test (and develop) theory (Randall & Nielsen, 2010). Therefore, in the next section, I briefly review workplace wellbeing interventions.

Wellbeing interventions

There are three categories of intervention that can occur at the individual level (preventing stress occurring in an employee) or organizational level (preventing causes of stress in the organization; Holman et al., 2018): primary; secondary; and, tertiary interventions. In primary interventions (e.g., job redesign, culture change) the aim is to improve the work situation. For example, the JDC has been used to redesign jobs to allow employees more control (Karasek, 1979), which can significantly improve mental health and sickness absence rates in office workers (Bond & Bunce, 2001). The suitability of strategies, however, depends on the industry, as increasing control in jobs with high levels of task uncertainty can lead to greater uncertainty (e.g., in research institutions; Sorensen & Holman, 2014). In secondary interventions (e.g., stress management training, positive health promotion) the mechanisms by which work is impacting wellbeing are targeted (e.g.,

individuals' perceptions, coping skills). For example, in job crafting interventions employees learn to self-manage their work environment and make changes they perceive will positively impact their wellbeing, through triggering motivational processes (according to JDR; Bakker & Demerouti, 2017). In tertiary interventions (e.g., counselling, return to work policies), support and treatment is provided for individuals experiencing significant problems with their wellbeing, without changing the work situation. Tertiary interventions are reactive as they occur after ill-effects of stress, and a change in focus from tertiary approaches to a positive and proactive approach that builds wellbeing has been recommended (Dewe et al., 2010).

Interventions developed to improve wellbeing are conceptualized at the same levels as work-related stress interventions (Johnson et al., 2018). To improve subjective wellbeing in the workplace, Holman et al. (2018) reported in a review that secondary interventions such as cognitive behavioral therapies (CBT) and mindfulness might be most effective. In CBT, employees identify misconceptions about stress and learn to develop new responses (Holman et al., 2018), while during mindfulness interventions employees learn to attend to their present thoughts, feelings, and emotions to facilitate adaptive coping that can reduce employee stress (Tetrick & Winslow, 2015). CBT was also found to be the most effective intervention for improving eudemonic wellbeing in a recent meta-analysis of the extant generalized literature (i.e., not focused on the workplace; van Dierendonck & Lam, 2022).

Workplace wellbeing interventions are typically delivered in response to a wellbeing survey (Bartels et al., 2019). Surveys can provide a lot of insight into workplace wellbeing but are not always underpinned by a model and/or theory. This makes it challenging to clearly understand what the data represents (e.g., what causes wellbeing / what the impacts of wellbeing are) or how to act upon it (e.g., whether to address the causes or the responses). Comprehensive wellbeing interventions that tap into the mechanisms are, therefore, rare (Bartels et al., 2019). Furthermore, hedonic interventions may increase wellbeing in the short-

term, while effects from eudemonic interventions are more effortful but potentially longer lasting. The combination of both might, therefore, be most beneficial (Huta & Ryan, 2010).

Eudemonic interventions include activities that focus on self-development (e.g., contemplating an ideal future or the best version of oneself), reflection (e.g., identifying personal strengths and turning those into actions), and are rooted in one of the eudemonic theories (e.g., writing gratitude letters to colleagues to develop relatedness in line with SDT; Michel et al., 2021; Mills et al., 2016). Mills et al. (2016) conducted a randomized control trial (RCT) of their wellbeing intervention with pre, post and follow-up measures, comparing an intervention group to a control group to determine the efficacy of hedonic and eudemonic activities. Participants engaged in a wellbeing session, where they identified workplace activities that made them happy (i.e., increased hedonic wellbeing), and that would contribute to a sense of fulfillment (i.e., develop eudemonic wellbeing). During the intervention participants were encouraged to engage in the activities identified, and at two-week follow up Mills et al. (2016) reported a significant increase in eudemonic wellbeing (particularly personal growth), but not a significant increase in hedonic wellbeing. The implication was that workplace wellbeing interventions should seek to improve personal development, as the eudemonic wellbeing had a lasting change compared to hedonic wellbeing. That is, if an intervention sought to target happiness only, it might only increase hedonic wellbeing whilst individuals were actively engaged in that activity (Mills et al., 2016).

There has been some criticism of RCTs in organizational wellbeing research, because unlike drug trials where a controlled environment is favorable, the workplace is a complex, social context where there are multiple influences on outcomes (Nielsen, 2013). Johnson et al. (2018) set out that the first step to workplace wellbeing intervention is engaging leadership and managers, suggesting that the implementation of interventions is as important as the intervention itself. Put simply, the question should not just be about whether or not an

intervention works (as determined by RCTs), but also about how and why it works, for who, and under what circumstances (Nielsen, 2013). Without attention to the context (the intervention environment and its specific opportunities and constraints) and process (how the intervention is conducted), understanding of what works for stress and wellbeing interventions will not progress (Biron & Karanika-Murray, 2014). The final part of my literature review, therefore, focuses on the police context.

Stress and wellbeing in the police

Police force workers are exposed to a wide range of stressors that put them at risk of suffering mental ill-health and/or low wellbeing (Jackman et al., 2021). Police-specific stressors are usually categorized into organizational stressors and operational stressors (McCreary & Thompson, 2006). Organizational stressors are associated with the culture in which police employees work, such as working with colleagues, administrative and management processes. Operational stressors are those associated with the nature of police work, such as job-related violence, exposure to danger and shiftwork. Additional categories of police stressors have also been recognized: extra-organizational stressors (e.g., exposure to a natural disaster; Biggs et al., 2014); external stressors (e.g., negative public accounts and media criticism; Violanti et al., 2018b); and personal stressors (e.g., family impacts; Jackman et al., 2021). Organizational stressors are found to be more stressful than operational stressors (Hart & Cotton, 2002; McCreary et al., 2017), because they are unnecessary, unavoidable, and uncontrollable (Purba & Demou, 2019). In their systematic review, Purba and Demou (2019) found that the specific organizational stressors consistently adversely associated with mental health outcomes were lack of support, job demand and pressure, and long working hours. The exposure to such stressors can result in physical disorders, such as cardiovascular disease (Hartley et al., 2011), chronic lower back pain (Gershon et al., 2009), and sleep impairments (Magnavita & Garbarino, 2017), as well as mental disorders, such as anxiety and

depression (Nelson & Smith, 2016), burnout (a syndrome of exhaustion; Violanti et al., 2018b), post-traumatic stress disorder (PTSD; Violanti et al., 2018a), and secondary traumatic stress, where PTSD symptoms are experienced by individuals close to people experiencing PTSD (e.g., in work; Maran et al. 2020). Further, police stress also has behavioral outcomes which can negatively affect families, leading to divorce, substance abuse, suicide (Woody, 2006) and harmful alcohol consumption (Houdmont & Jachens, 2021). Most research has taken a stress-based approach, with limited studies considering positive aspects of policing that might contribute to wellbeing (Hart & Cotton, 2002). However, it is now increasingly documented that there is low psychological wellbeing in the police (e.g., Cho et al., 2021; Jackman et al., 2021). This has even been recognized in comparison to other emergency services, as police reported more minor work stressors and more work-family conflict than workers in the fire and ambulance services (Brough, 2005).

There is ample literature that has drawn on structural models of work-related stress to investigate which work characteristics predict stress and health outcomes in the police forces. Generally, the strain hypothesis is supported, and the work characteristics of high demands and low control are associated with poor mental health but can be buffered by work-related social support (e.g., Hansson et al., 2017). However, police research has provided some findings that are at odds with the predictions of models/theories that might suggest they have different experiences of stress in comparison to other populations. For example, Baka (2020) applied the JDCA to a sample of Polish police and found that social support buffered the negative effect of operational demands on depression, but job control did not, contrary to JDCA predictions. This was possibly because there is little opportunity for control at work in the police, as duties are regulated by procedures and orders (Brough & Biggs, 2015). Instead, officers are trained to work together which might explain the significance of support in the experience of police stress (Baka, 2020). The role of social support for protecting police

wellbeing has been observed across studies (e.g., Brough et al., 2018; Hansson et al., 2017). The underlying mechanisms that explain the role of social support are not included in the JDCA, and so less frequently observed. However, Wolter et al. (2019) used the JDR to propose that support might fulfil a motivational process by helping police to cope with job demands, potentially through identifying shared values and perceptions of fairness.

Police research underpinned by the ERI has shown a consideration of individual differences and the intrinsic dimension of overcommitment. Allisey et al. (2012) assessed the ERI in relation to psychological distress amongst Australian police officers. They found that officers perceiving high effort, low reward and high overcommitment had high psychological distress. There were no interaction effects with individuals high in overcommitment. They did, however, find interaction effects for officers with Type A personality (e.g., achievement-striving individuals), and suggested that more individual differences needed to be included in work-related stress research. Cho et al. (2021) also used the ERI but found overcommitment was associated with better wellbeing in the Singapore police. This was explained by the police being perceived positively by the public in Singapore, and so officers might feel sufficiently rewarded in their work which prevented overcommitment relating to negative outcomes. In other cultures, public perceptions of the police are negative and an additional factor that contributes to high stress (e.g., in America; Violanti et al., 2018b). Therefore, by using models of work-related stress researchers can identify factors contributing to stress, but there is evidently a need to conduct culturally and context specific research (see Jackman et al., 2020). Studies can also be limited by the reliance on structural models, overlooking individual characteristics and underlying mechanisms in the experience of stress.

Studies which have integrated transactional stress theories can account for individual differences in the experience of work-related stress, and indicate that appraisals have an important influence on police wellbeing. For instance, Colwell et al. (2011) captured

cognitive appraisals and their implications for police officer wellbeing in the months following traumatic events. Colwell et al. (2011) supported transactional theory, as traumatic events had less negative impact on police officer wellbeing if officers interpreted a traumatic event in a positive way (e.g., as a learning experience [benefit]), than if they had interpreted it in a negative way (e.g., as causing harm). Appraisals are also emphasized in the stress and coping perspective of social support. In this view, support reduces the potentially negative effects of stress as coping potential is realized through the belief that support is available (Lakey & Cohen, 2000). In a UK police force, Jackman et al. (2020) found that perceived support (perceived availability of support from colleagues), received support (support actually received from colleagues), and the personality factors of extraversion and emotional stability were significant positive predictors of psychological wellbeing. Perceived support was the strongest predictor and so the implication was that irrespective of whether support was received, the appraisal that social support was available was beneficial for wellbeing.

Much of the research within the police that is informed by Lazarus' conceptualization has considered coping (e.g., Nelson & Smith, 2016; Rodrigues et al., 2017). Anshel (2000) developed a model for coping with stressful events in police work and represented a clear role for appraisals as put forward in the CMRT. For instance, threat appraisals, which Lazarus suggests are highly stressful, are explained to be common in policing due to the frequency with which police are met with uncertain and dangerous situations. Anshel also considered individual differences (e.g., personality, coping style, confidence) along with an explanation for which coping strategies were adaptive for police to protect health and wellbeing outcomes. The model has subsequently informed research to consider how police can best manage and/or cope with stress. For example, Anshel and Brinthaup (2014) suggested that whilst police tend to use approach coping (e.g., seeking information, confronting a problem), they might benefit from knowing when to use avoidance coping (e.g., stay away from a

perceived threat) to protect their wellbeing. However, avoidance coping can prolong painful emotions as the stressor is not addressed, and so ‘best practice’ for coping is complicated (Arble et al., 2018). Although Anshel simplifies this to some extent in presenting a linear model, the representation of individual differences is listed next to, rather than within, the model, and so *how* these factors interplay with appraisal and coping is not covered. There is also no specificity for how adaptive coping should then be assessed. As such, Anshel’s model has informed a broader and more conceptually accurate understanding of coping in the police, but refinement of the model is needed to raise its utility (e.g., so that it could be used to monitor adaptive coping in the police).

Hart and Cooper (2001) introduced a model for organizational health, which has been used in the police to better represent the ongoing stress process (Hart & Cotton, 2002). Through the model, they suggested that coping responses are informed by previous work experiences which can contribute both positively and negatively to police officers’ wellbeing. Hart and Cotton (2002) found that organizational factors (e.g., leadership practices, appraisal and recognition processes, coworker relations) contributed more negatively to police wellbeing, than individual coping, which had a negligible influence on wellbeing. They argued that leadership behavior training is a more valuable stress management intervention in the police than teaching individuals how to cope with stressful situations at work, because it increases organizational accountability and sustains improvements in practices. Another organizational level framework, informed by Cox and Griffith’s process model, is the Stress Management Competency Framework. The framework facilitates measurement of line manager behaviors that are related to the effective management of stress at work (Yarker et al., 2008). Houdmont et al. (2019a) used this framework with line managers in the English police force and identified four areas where police officers had increased odds for stress-related outcomes, if they identified their line managers had development needs. The four

areas were: managing and communicating existing and future work; managing the individual within the team; managing difficult situations; and, managing emotions and having integrity. Although the study represents a step forward in terms of allowing nomothetic measurement of line manager behaviors and stress-related outcomes from a transactional perspective, no mediation analyses were conducted, and so the explanatory mechanisms for why line manager competencies were associated with poor mental wellbeing were not assessed. That is, while the organizational level frameworks are a development for enabling police research to measure multiple factors in the stress process (e.g., factors beyond those in structural models), understanding of the underpinning processes is still needed.

To provide insight into underpinning processes, explore how stressors are appraised and/or why they might be particularly potent for police, some researchers have conducted qualitative studies. For example, Demou et al. (2020) found that organizational changes in the Scottish police force were stressful because of the way in which they were applied (e.g., at short notice and with a lack of training), not just because of the changes themselves. Improved understanding of police experiences of stressors can then, in turn, better inform what interventions might be required to address stressors. Through conducting a world café method, whereby police staff and officers participated in a series of small group conversations to discuss workplace impacts on their wellbeing, Clements et al. (2021) summarized four stressors (workload, reduced occupational health services, management, mental health stigma) and a suite of interventions that participants suggested to address them. Primary level interventions included leadership training to normalize wellbeing conversations, secondary interventions included job crafting at the team level, and tertiary interventions included internal and external employee assistance programs (EAPs). The research provided insight into the perspective of police force workers, but the group level data makes it unclear where suggestions came from, and so who experienced each wellbeing

issue. The researchers drew upon the JDR, and so the emphasis is on the work characteristics that relate to stress and wellbeing, rather than the underpinning processes that might make suggested factors stressful, or why each intervention might relate to wellbeing. A reason for Clements et al. (2021) employing the world café method was that the participatory approach can increase participant ownership and buy-in to the resultant initiatives, however the initiatives have yet to be implemented and evaluated.

Overall, research in the police context reiterates the reality that the police are an occupational group experiencing stressful environments that contribute to low psychological wellbeing. Police encounter specific stressors (e.g., operational, organizational, extra-organizational, personal; Jackman et al., 2021) and there are mixed findings for some relationships proposed in structural models of work-related stress (e.g., control; Baka, 2020). Social support, however, is consistently found to have positive associations with stress and wellbeing (e.g., Hansson et al., 2017). Police specific models are available, leaning on Lazarus' conceptualization to explain stress at the individual (i.e., Anshel, 2000) or organizational (i.e., Hart & Cooper, 2001) level. However, their reach has been limited as researchers have opted to use frameworks that can be more easily measured (e.g., Houdmont et al., 2019a). The DRIVE model can be used to accurately represent and assess stress, integrating the best aspects of structural and transactional approaches. Nelson and Smith (2016) provided initial evidence to support the application of the DRIVE model to a police population, measuring stress, coping and mental health amongst Jamaican police officers (Nelson & Smith, 2016). They found that perceived job stress mediated the relationships between job demands and mental health outcomes, and, that coping predicted mental health outcomes. Although the potential moderating role of coping was not considered, emotional coping was associated with increased depression and anxiety. Nelson and Smith (2016) suggested that their research could be a starting point for ongoing measurement in the

Jamaican police and could inform targeted stress interventions. In the next section, I will review research which has conducted stress and/or wellbeing interventions in the police.

Interventions in the police

Research informed by structural models of work-related stress has provided findings that enable researchers to make evidence-based suggestions for primary intervention. For example, Violanti et al. (2018b) used the ERI when researching stress in American police officers, finding that overcommitment was associated with burnout. Officers who perceived extreme involvement at work were more exhausted and less effective at their work than officers who did not perceive extreme involvement at work (low overcommitment). Violanti et al. (2018b) suggested that this could be addressed in interventions at the organizational level by balancing effort (reducing workload) and reward (increasing finances or acknowledging accomplishments), as well as at the individual level by providing training for police officers to deal with stress in ways that permit withdrawal from work. However, in the extant literature base there is rarely any follow up to see if recommendations have been put in place. Of the interventions that have been conducted with the police service, secondary and tertiary interventions are most common (Brough & Biggs, 2010).

Patterson et al. (2012) reviewed stress management training in the police for psychological, behavioral and physiological outcomes, and reported that the efficacy of the interventions was inconclusive. The value of interventions has been questioned, as critical incident stress management (CISM) training has been found to increase stress when individuals experiencing PTSD relive traumatic events (Brough & Biggs, 2010). In a scoping review of CISM interventions, Richins et al. (2020) reported that they can be effective for police exposed to trauma when supported by the organization and senior management and delivered in a group-based peer support format. Therefore, as suggested by Johnson et al. (2018), information about the process (how interventions were delivered) are as important as

the intervention content. Regarding the type of intervention, mindfulness interventions have been reported to significantly reduce health complaints and negative affect in the police, with more successful outcomes found for individuals who perceive that colleagues held positive attitudes towards mindfulness, and valued such interventions (Krick & Felfe, 2020). EAPs are the most common tertiary intervention for police, but there is a skepticism over the value of EAPs (Brough & Biggs, 2010), potentially due to the mental health stigma in police forces which presents a barrier to help-seeking and can exacerbate stress (Jackman et al., 2021). Police report concerns that anyone showing vulnerabilities is seen as weak and so asking for support might have negative career implications (Demou et al., 2020; Jackman et al., 2021). Taken together, the research suggests that interventions can be more effective when the wider context and drivers of behavior are considered.

In a preventative approach, health promotion interventions in the police have been found to have positive but small effects on diet, sleep quality, stress, and smoking, and large effects on blood pressure (MacMillan et al., 2017). The most successful of these interventions included peer support, were informed by behavior change theory, and were in combination with structured exercise (MacMillan et al., 2017). Qualitative research has found that lack of exercise is a stressor for police for workers (Demou et al., 2020; Jackman et al., 2021), but is relatively unexplored as a potential intervention from a wellbeing point of view. The extant literature has focused on physical fitness in police officers because it is obligatory for work performance (i.e., it is assessment driven and not wellbeing driven; see Lagestad & van den Tillaar, 2014). Maran et al. (2018) did consider physical activity from a wellbeing perspective, and found that physical practice (e.g., body conditioning) and wellness (e.g., yoga, meditation) courses had mental health benefits for police officers, reduced perceived distress and increased the use of adaptive coping strategies. While these findings are promising, the intervention was not theoretically underpinned or detailed in terms of how the

intervention was developed and conducted. Further research is, therefore, needed.

In the wider literature, occupational health psychology interventions adopted by researchers have lacked theoretical underpinning, which limits the researchers' ability to understand why interventions are effective and improve health behaviors (Burgess et al., 2020). The same is evident in police specific research (e.g., Maran et al., 2018), but there are a few exceptions. Jones et al. (2021) delivered cognitive-behavioral one-to-one coaching sessions to senior British police officers and staff, applying a specific rational emotive behavior framework (REBT) and SDT to conceptualize wellbeing. Using REBT and SDT enabled Jones et al. (2021) to assess that the intervention targeted wellbeing mechanisms (i.e., reduced irrational beliefs) as well as improved outcomes (i.e., satisfied basic psychological needs). The social validation interviews following the intervention provided further explanation as to why participant needs had been met. For example, realizing that colleagues had been in the same situation satisfied police officers' needs for relatedness. The interviews conducted by Jones et al. highlighted that police officers might have benefited from an extra introductory session, as the intervention conversations with the coach were very different to the usual tactical conversations held between police officers. As such, key considerations to improve interventions within the police are to ensure that the interventions are theoretically underpinned and consider the context.

Summary, rationale and aim

In this chapter, I have reviewed the most influential theories and models of work-related stress and conceptualizations of wellbeing. I have emphasized the strength of research informed by structural models, that identifies the work characteristics contributing to the experience of stress, and the strength of transactional theories which represent the individual differences and processes underpinning the experience of stress. To advance the field, I presented the DRIVE model as a usable framework for researchers to take the strengths of

both. That is, to predict relationships between work and personal characteristics, whilst also accurately reflecting stress as a process with an explanatory mechanism of *perceived job stress*. I explained that the wellbeing literature has developed largely separately to the literature on work-related stress and new ways of thinking about utilizing these concepts together are needed for research to progress. Subjective (hedonic) wellbeing considers outcomes, but there is increasing interest into eudemonic wellbeing and the processes towards wellbeing. There is consensus that both should be considered in a more integrated approach (e.g., Henderson & Knight, 2012), however there is, currently, no consensus on a model for researchers to apply both perspectives in the context of workplace wellbeing. I have offered a definition of *psychological wellbeing* to encompass subjective and eudemonic wellbeing within my thesis, providing a holistic view of stress and wellbeing that advances from a more reductionist conceptualization of hedonic outcomes to also consider processes (i.e., eudemonia). As a multi-dimensional model of work-related stress that encompasses subjective and eudemonic wellbeing, the DRIVE model addresses this. In conclusion, the DRIVE model can be used to assess stress, the process of wellbeing and wellbeing outcomes.

Giving examples of police-specific research, I have emphasized that there is a need for researchers to understand the context. Specifically, I have identified differences in the relationships between work factors and wellbeing in the police, compared to some of the predictions in models of work-related stress, as well as differences between police forces. Further, I have suggested that an enhanced understanding of the organizational context could improve interventions. For example, by recognizing that police hide vulnerability and are used to tactical conversations only. I have also explained that theories and models are not often enough used to inform interventions in the police. Although structural models of work-related stress are widely applied, there are few instances where researchers have then conducted the interventions they recommended. Where research does report successful

interventions with the police (e.g., Maran et al., 2018), there is a need to improve reporting and theoretical underpinning, so that researchers can understand why it was successful and build on it. A strength in the literature is where intervention research provides detail on the development of the intervention, not simply that it worked, but who for and why. For example, in their review of CISM training, Richins et al. (2020) highlighted that organizational support and peer support are important for effective interventions with the police. The beneficial role of support is frequently highlighted in the police (e.g., MacMillan et al., 2017), and could be a factor to improve the application of future interventions. Police research is understandably stress-based, but to mirror the shift of the wider literature and integrate a wellbeing focus, researchers could begin to explore the factors that might keep police force workers in work and help them manage effectively and/or prevent stress.

Aim and objectives of the current research program

The aim of my research was to explore stress and wellbeing in two British police forces. Informed by my literature review, I set the following objectives to address this aim:

1. To assess the factors that are associated with stress and wellbeing in the partner police forces. Achieving this objective would allow me to identify where the stress process could be interrupted, or the wellbeing process enhanced, in targeted intervention;
2. To gain deeper insight into a key driver for wellbeing, from the perspective of the workforce. Achieving this objective would provide me with in-depth contextual detail and evidence to design a stress and/or wellbeing intervention;
3. To develop a theory-based intervention that would target the driver identified in objective two. Achieving this objective would advance the literature through clearly describing the theoretical underpinning and suggested mechanisms of my stress and/or wellbeing intervention (*why* it works), as well as the processes for *how* it should be conducted.

Chapter 3

Methodological Approach

Introduction

In this chapter, I present my philosophical stance and how this influenced the way in which I conducted my research. I then introduce a section on research approaches, in which I outline the Double Diamond (Design Council, 2019) framework that underpins my thesis and explain how this informed the studies within my thesis.

Philosophical underpinning

Research questions guide what we want to know (Demuth & Terkildsen, 2015), but the questions that we ask are guided by our philosophical positioning. That is, our worldview based on ontological, epistemological and methodological assumptions (Guba & Lincoln, 1994). Ontology relates to the nature of reality, or our perception of what is real (Guba & Lincoln, 1994). Epistemology relates to the nature of knowledge, or how we gain knowledge about something (Demuth & Terkildsen, 2015). What we believe about reality (ontology) and our relationship with what can be known (epistemology) constrains how we might go about finding it out (methodology; Guba & Lincoln, 1994). For example, if it is assumed that reality exists externally from researchers and can be accessed objectively (i.e., positivism) then quantitative (objective) methods are appropriate. Alternatively, if it is assumed that reality is internally shaped by researchers and is subjective (i.e., constructivism), then qualitative (subjective) methods are appropriate (Sparkes & Smith, 2014).

I believe that reality is ‘out there’, objects and structures are real and exist independently from me; however, I have a role in gaining knowledge about reality, or the phenomena in question. For example, in researching work-related stress, police staff and officers exist and have experiences before they participate in my research, but knowledge of their experiences will be subject to the research processes I adopt and my understanding. With consideration of a philosophical position, this suggests that my beliefs reflect a realist ontology and a constructivist epistemology, approaches that are integrated in *critical realism*

(Maxwell & Mittapalli, 2010).

Critical realism

Critical realism is grounded in the work of Bhaskar (1978) and bridges between positivist and constructivist traditions (Wiltshire, 2018). Critical realism is similar to positivism in that one external reality is assumed but diverges from positivism in the acknowledgement that there might be different perspectives on that reality (Wiltshire, 2018). This contrasts with constructivism, where multiple subjective realities are assumed (Sparkes & Smith, 2014). Bhaskar (1978) conceptualizes a stratified ontology in critical realism, in which reality is layered in three domains. The ‘empirical’ domain comprises what happened, directly or indirectly in our experience; the ‘actual’ domain includes what was in our experience, but also events that might have occurred, unobserved beyond our experience; the ‘real’ includes everything that is made up within reality – experiences, unobserved events, and crucially the causal mechanisms that made them happen. There are a plethora of factors that could affect outcomes, as phenomena occur in open systems and are dependent on the social, environmental, cultural, organizational conditions (to name a few) that are present at different times (Clark et al., 2007). For example, in a male-oriented occupation such as the police, socially constructed attitudes around masculinity and strength might influence individual perceptions and experiences of stress (Krick & Felfe, 2020). There is complexity in critical realist research, but the goal is to explain outcomes under particular circumstances (Clark et al., 2007). Within my thesis, I aim to understand what matters for workers within the partner police forces around stress and wellbeing, and how they might be better supported to improve their wellbeing, rather than seeking to understand a universal truth.

From an epistemological perspective, the stratified ontology renders objects and structures not easily knowable to a researcher, as the ‘actual’ and ‘real’ domains that need to be accessed are beyond the ‘empirical’ domain (Ryba et al., 2020). This distinguishes critical

realism from constructivism, which does not recognize that there is more to reality than what has been articulated by a researcher, as from a constructivist viewpoint reality was created by the researcher (Bergin & Owen, 2008). To know about the 'real' domain, causality is central. In the approach of constructivism, causality is not recognized as a plausible way of knowing. Rather, phenomena are 'known' through experience and interpretation; a view which is problematic if concepts such as stress and mental health are considered to be socially constructed (Bergin & Owen, 2008). While causality is central to the approach of positivism, critical realists differ in the description of causal mechanisms (Wiltshire, 2018). Positivists take on a regularity view of causation, emphasizing observable, replicable, statistical associations between variables that can be generalized to produce verifiable knowledge (Maxwell & Mitapalli, 2010). Critical realists on the other hand have a process approach to causality, theorizing more complex unobservable mechanisms for social structures (Maxwell & Mitapalli, 2010). As with positivism, quantitative methods might still be utilized to suggest causal processes, but through critical realism the researcher emphasizes the context in causal explanations, rather than the consistency and strength of that association (Ryba et al., 2020).

Both quantitative and qualitative methods are compatible with critical realist assumptions (Ryba et al., 2020; Wiltshire, 2018). Quantitative research might be used to study stable objects and structures, or to test a theory in a specific context, while qualitative research might be used to study phenomena that are more complex or underdeveloped (Ryba et al., 2020). McEvoy and Richards (2006) provided an example and rationale for combining quantitative and qualitative methods from a critical realist perspective. In their case study, quantitative methods were first employed to describe underlying patterns of practice in community mental health teams, then qualitative methods were used to corroborate findings and provide a broader view on the processes that they had presented. The combined methods approach enabled a comprehensive picture of primary care by researching reality from

different perspectives, and triangulating the data for the purpose of, what McEvoy and Richards termed, ‘completeness’.

Returning to my specific research context in the police, the critical realist perspective might enable me to explain the conditions under which work-related stress leads to impaired wellbeing for some police officers and staff. Further, the focus on contextual understanding might enable me to explain the suggested mechanisms in a theory-based intervention; understanding that is needed to advance intervention research (Biron & Karanika-Murray, 2014). A critical realist approach also permits multiple methods in research, which Lazarus (1999) and Ryff (2014) have both suggested is important for exploring stress and wellbeing respectively. To elaborate, Lazarus’ CMRT was informed by monographs of flight crew managing stress during World War II, providing the idiographic understanding of the stress process. Without the qualitative understanding, stress research might be limited to structural models which are criticized for their epistemological status as researchers attempt to account for *all* experiences of work-related stress (Schaufeli & Taris, 2014). The structural models facilitate quantitative assessment and description of the associations between work characteristics, stress and wellbeing outcomes in occupational settings, but should be supported by an exploration of why particular relationships are found (Schaufeli & Taris, 2014). Turning to wellbeing, Ryff argued that subjective (hedonic) wellbeing is too focused on the quantitative measurement of outcomes, and wellbeing processes (eudmonia) should also be operationalized. Qualitative methodologies are important too, to understand what it is about certain events, goals or activities that account for why they result in happiness (Waterman, 2008). Multi-methods are, therefore, needed in my research, to test the associations and causal mechanisms within stress and wellbeing theories in the police, and explore the theories within the wider context (Ryba et al., 2020). Critical realism has emerged as my philosophical stance that enables me to conduct multi-methods research, but to

approach it systematically, I need to align to a framework.

Research approach

In Chapter 2, I highlighted that stress and/or wellbeing interventions need to be contextually informed as well as theoretically underpinned. To achieve contextual understanding, I needed a research approach that engaged with police force workers. In his reflection on his service as an officer in the Metropolitan Police, John Sutherland explained that there was a need for change in policing, but that understanding of policing was needed for any change to be effective. He wrote, "...the government elected in 2010 regarded policing as a problem in need of fixing, and it became increasingly apparent that reform was something that was going to be done to policing – rather than *with* policing" (2020, p.237). Sutherland's perspective that police should be involved with changes in their organization is in line with partnership research approaches, in which researchers involve participants in the decision-making processes of their research (O'Cathain et al., 2019). Co-design is one such approach, literally meaning 'collaborative design' it stems from design thinking and offers researchers frameworks and methods to understand users and motivate their participation in research, services, and products (Robert et al., 2020).

Co-design

Co-design is a term used interchangeably with 'co-creation' and 'co-production', to cover a range of research approaches that include user involvement (Dudau et al., 2019). By way of distinction, Vargas et al. (2022) defined that co-design is an active collaboration to design solutions to problems. Co-design can be seen as a step towards co-production (the implementation of solutions), that sits within the overarching co-creation approach (Vargas et al., 2022). Co-design is increasingly used in health research to address the gap between research and end-user needs, and can benefit researchers, practitioners and health outcomes (Slattery et al., 2020). In their review of co-design in health research, Slattery et al. (2020)

identified that a co-designed approach should include ‘meaningful end-user engagement’ at all stages of the research process; specifically, in planning, finalizing the research question(s), data collection, and translating research findings. Engaging users across the research process is important to increase the relevance, utility, and impact of the research (Smith et al., 2022).

Gaining access to participants’ perspectives and experiential knowledge is valued in co-design approaches, and so they are aligned to interpretative and critical philosophies (Moll et al., 2020; Smith et al., 2022), including critical realism (e.g., Dermody & Fritz, 2019). In the area of health and wellbeing, co-design approaches have been used to develop digital mental health technologies with children (Bevan Jones et al., 2020), health and fitness apps with older people (Harrington et al., 2018), and games to improve physical activity and physical functioning for individuals with long-term conditions (Langley et al., 2020). Langley et al. (2020) synthesized their co-design research with a realist philosophy, as both are iterative, participatory and draw upon multiple evidence sources to address complex problems. Langley et al. (2020) highlighted that the key difference is that realists focus on ‘what is’, and co-design on what ‘ought to be’, but by sharing their evidence base with participants, data were rationalized in participants’ own context and used to inform ideas of what ‘could be’. Langley et al. (2020) structured their study on theory building workshops, however some co-design research can be limited by a lack of theory integration (e.g., Harrington et al. [2018] did not integrate theory in their research). Theory is needed to help researchers make causal mechanisms explicit, understand ‘why’ health outcomes and behaviors are impacted and ultimately, advance the field (Byrne, 2020).

Co-design approaches can be applied along with theory-based approaches; Robert et al. (2020) detailed examples in which experienced-based co-design (EBCD) is integrated with the Medical Research Council (MRC) guidance to improve the experiences of patients with chronic skin conditions. The MRC guidance is the most used theory-driven approach

(O’Cathain et al., 2019), providing researchers with a framework for developing and evaluating health interventions, which are all complex due to the number of components, outcomes, and difficult target behaviors involved (Craig et al., 2008). In the MRC guidance, four phases are set out for researchers: developing, piloting, evaluation and implementation. In addition, the need for theory to be utilized to understand the likely variables, processes and outcomes is emphasized. Although context is influential, it is only introduced in the evaluation phase of the MRC guidance (Skivington et al., 2021). As I needed to understand the context throughout my research to understand the conditions which influenced my findings, I therefore looked for a co-design framework that would allow me to apply an appropriate theory within the context of my partner police forces.

Double Diamond framework

The Double Diamond is one of the most influential frameworks for co-design processes (Robert et al., 2020). It has a wide application, for example in health and social care service improvements (Wolstenholme et al., 2017), cancer treatment (Guldbrandsen, 2017), supporting patients with mild cognitive impairment in living well (Collier, 2019), and in physical activity initiatives in schools (Daly-Smith et al., 2020). The Double Diamond was developed following a research project with 11 globally leading brands (e.g., Starbucks, Virgin Atlantic Airways) and was produced to represent the commonalities in their design processes in a simple, graphical way (Design Council, 2007). It has been widely applied because it is easy to understand (Guldbrandsen, 2017). The framework sets out two diamonds (see Figure 3.1) which represent processes of divergent thinking (exploring an issue widely) and convergent thinking (narrowing the issue into focused action; Design Council, 2019). The diamonds are divided into four distinct phases, two per diamond. The first half of the model, or the first diamond, is about understanding the problem. This has been suggested to be key to success as it is common for researchers to jump to ideas (Guldbrandsen, 2017). The

‘Discover’ phase involves understanding the people affected by the issues, and the insight gathered should be used in the ‘Define’ phase to define the challenge in a different way (Design Council, 2019). The second diamond is the second iteration of divergent and convergent thinking. In the ‘Develop’ phase a range of different answers to the problem should be sought and tested in the ‘Delivery’ phase. The aim is to gain feedback and continuously improve, rather than provide a finished solution (Design Council, 2019).

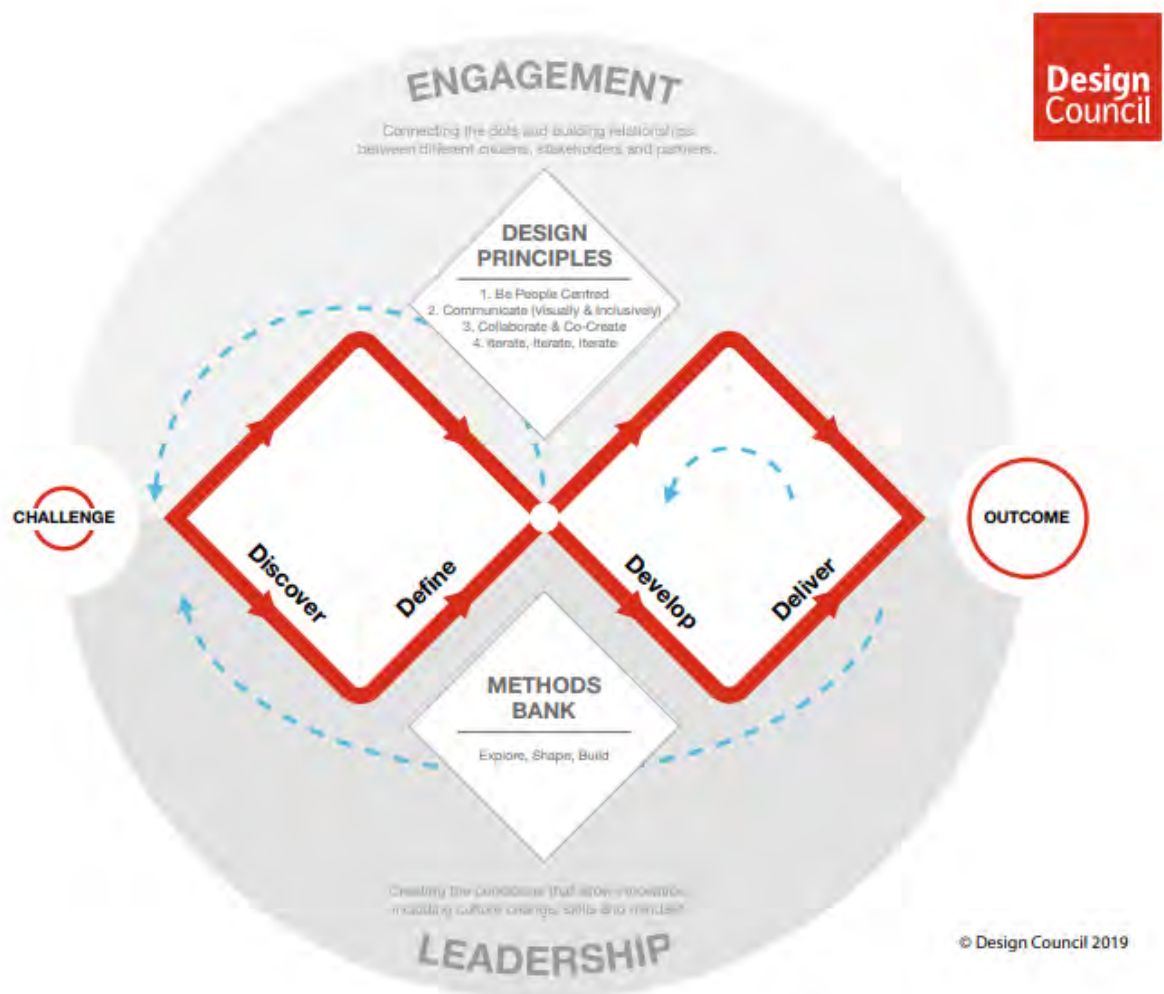


Figure 3.1 Double Diamond framework (Design Council, 2019)

The Double Diamond is not a linear approach, with dotted arrows used to represent the experience that something learnt in a later phase can take researchers back to the first ‘Discover’ phase (Design Council, 2019). Iteration is one of the principles of the Double Diamond, and the processes of divergence and convergence reflect the notion of exploring

and triangulating in critical realist approaches (McEvoy & Richards, 2006). Critical realist research strategies also take place through an iteration of rounds, working back from identifying phenomena, seeking explanatory mechanisms, and building on understanding from empirical evidence each time (Reed, 2009). The Double Diamond framework is, as such, well aligned to critical realism. Other design principles in the Double Diamond are to put people first, communicate visually and inclusively, and to collaborate (Design Council, 2019). As important as the principles are, the manner in which researchers connect with the users, or participants to support them in being part of the solutions is of equal value. Leadership (to facilitate open and agile projects) and engagement (to develop relationships with a range of people and partners) underpin all phases of the Double Diamond. These qualities are central to improving wellbeing in the workplace, according to Johnson et al (2018) who explained that building a healthy workplace starts with engaging top leadership.

Researchers using the Double Diamond framework are encouraged to use a range of methods, both quantitative and qualitative (e.g., Daly-Smith et al., 2020). Personas are a commonly used tool, where fictional characters are created based upon typical user characteristics, behaviors and goals to make a realistic character that participants can empathize with and consider in their ideas (Babich, 2017). Other examples include conducting user interviews, stakeholder workshops, quantitative benchmarking and surveys (Baytas, 2015). A portfolio of methods are offered by the Design Council, however, because of the flexibility, researchers must identify their own sequence and progression through the Double Diamond phases (Daly-Smith et al., 2020). In the next section, I outline my own application of the Double Diamond.

The studies in my thesis

Figure 3.2 shows the steps in my research mapped onto Double Diamond framework:

1. In Chapter 2, the ‘Discover’ process began through my attempt to understand the

problem of high stress and low wellbeing in the police. In my first study (Chapter 4), I continue this exploration by considering what factors are associated with psychological wellbeing in the partner police forces. Specifically, I conduct a quantitative assessment to systematically identify significant relationships between work-related stress variables, and find that ‘perceived job stress’ is a causal mechanism in the relationships;

2. I conclude Chapter 4 with an Interlude, in which I ‘Define’ physical activity as a factor that could be supported in the partner police forces, to reduce stress and benefit wellbeing;
3. In Study 2a and Study 2b (Chapter 5), I conduct qualitative enquiries to explore (‘Discover’) multiple perspectives of the workforce, gaining insight into the link between physical activity and wellbeing in the workplace;
4. In my third study (Chapter 6), I provide insight into the development of a physical activity intervention. First, I outline the Behavior Change Wheel (BCW; Michie et al., 2011) method which was used to develop the intervention, setting out the first two stages that ‘Define’ the focused action for the second Diamond;
5. Within Chapter 6, I present a second iteration of the BCW, engaging in qualitative research in a specific area of the partner police forces, to ‘Develop’ (co-design) the intervention with the end-users;
6. Once an idea had been realized through the final stage of the BCW, I began a ‘Deliver’ process, delivering a training session to the supervisors and middle management in order to gain feedback;
7. The feedback was used to improve (further ‘Develop’) the intervention. The final section of my third study (Chapter 6) includes a description and protocol of the

physical activity intervention, 'Exertime'.

Figure 3.2 shows a step beyond step seven, to indicate how the research continued beyond that which is presented in the thesis. As explained in Chapter 1, the Covid-19 pandemic impacted the planned pilot of my physical activity intervention, and so my thesis is written to conclude at the point, where I have achieved the research aim of exploring stress and wellbeing in the partner police forces and described an intervention to build on that exploration.

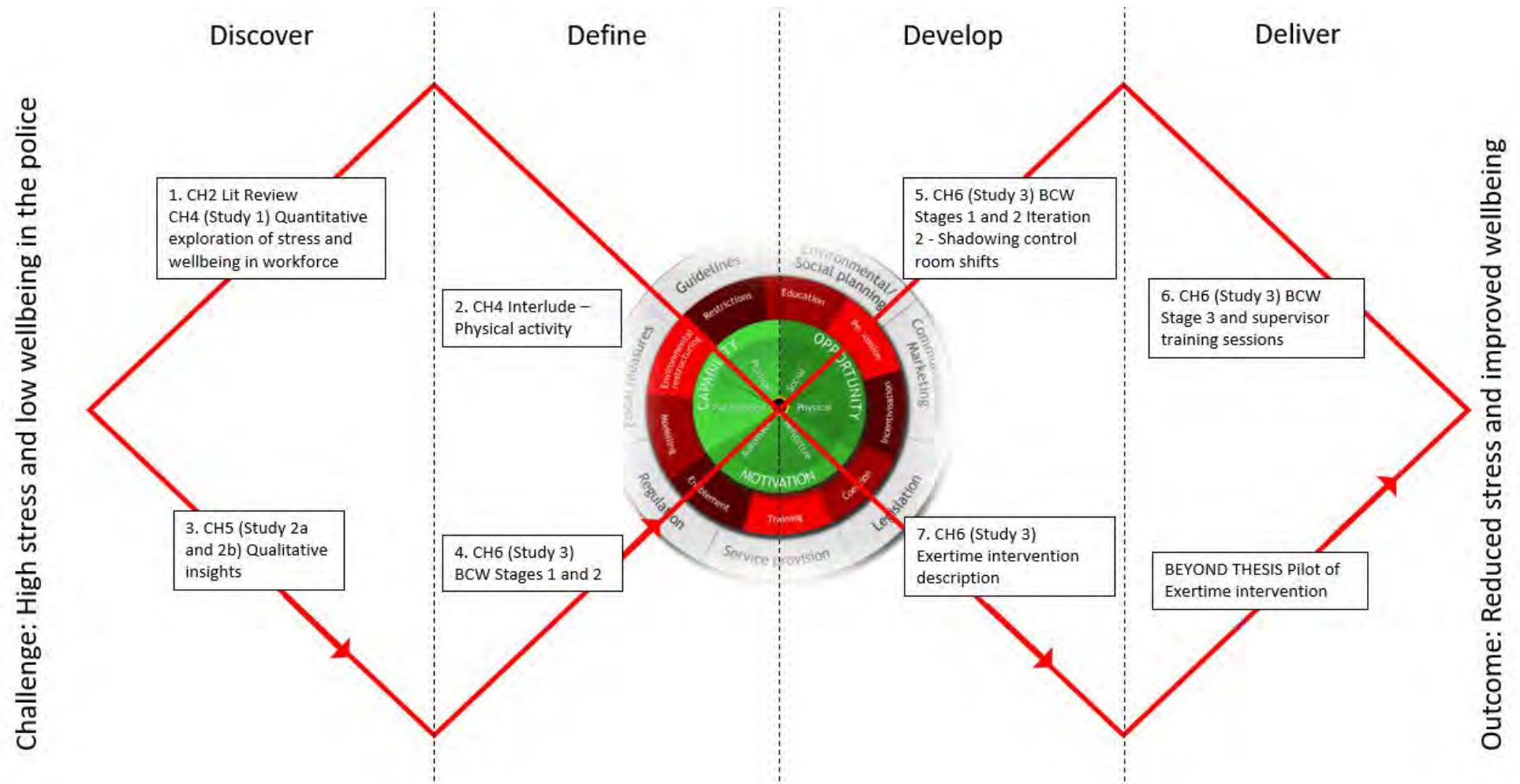


Figure 3.2 Double Diamond framework used to approach the thesis

Chapter 4

Study 1: A quantitative exploration of stress and wellbeing in the workforce

Introduction

In Chapter 3, I introduced the Double Diamond (Design Council, 2019) framework that underpins my thesis, setting out the divergent and convergent thinking processes that will be used to engage the workforce in a co-design approach. The Double Diamond begins with a ‘Discover’ phase – which in the context of my research equates to understanding the ‘problem’ of stress and wellbeing in the partner police forces (see Figure 3.1). In Chapter 2, I began the ‘Discover’ phase (Double Diamond Step 1; see Figure 3.2), by reviewing the literature on work-related stress and wellbeing, and introduced the DRIVE model (Mark & Smith, 2008) as a contemporary framework that would enable me to systematically explore these concepts further in the context of the partner police forces. I discussed my Chapter 2 findings with the steering group. Specifically, I produced a report on the work and individual characteristics that had been found in previous research to influence work-related stress and wellbeing. Together, within the steering group, we discussed the report and agreed upon a variable set to explore further in the partner police forces, and ‘Discover’ what the relationships with stress and wellbeing were.

The aim of this chapter is to quantitatively explore the factors associated with stress and wellbeing in the partner police forces. Two objectives were set to address this aim:

1. To assess the factors associated with stress and psychological wellbeing, informed by the DRIVE model (Double Diamond Step 1; see Figure 3.2);
2. To define the insight gathered into an area for focused action to support wellbeing in the workforce (Double Diamond Step 2; see Figure 3.2).

To achieve the first objective, I conducted a cross-sectional study (Study 1), which is presented as a paper published in *Current Psychology* (Oliver et al., 2022). To achieve the second objective, I end the chapter with an Interlude section. In the Interlude section, I demonstrate convergent thinking consistent with the second phase in the Double Diamond.

That is, I summarize the insight gathered from Study 1 and ‘Define’ the area that will be the focus for further action (Double Diamond Step 2; see Figure 3.2).

Stress and psychological wellbeing in British police force officers and staff -

Introduction

Across a range of occupational settings, individuals who do not manage stress effectively are more prone to negative health outcomes (Cox & Griffiths, 2010; Mark & Smith, 2008). Policing is a stressful occupation, that places officers and staff at risk of experiencing mental health conditions of anxiety or depression (e.g., Jackman et al., 2020; Nelson & Smith, 2016). Research into the stressors that affect police workers mental health has grown (e.g., Demou et al., 2020), with operational (e.g., working alone at night, attending traumatic events, injury risk) and organizational stressors (e.g., workload, role clarity, co-worker relations) prominent (McCreary & Thompson, 2006). Within the police, stressors have been associated with ill-health outcomes that include: physical disorders (e.g., cardiovascular disease; Hartley et al., 2011), mental ill-health (e.g., anxiety and depression; Nelson & Smith, 2016); and, impaired psychological wellbeing (e.g., Demou et al., 2020; Duran et al., 2018). Psychological wellbeing (PWB) is considered a positive indicator of mental health, represented by quality of life, positive affect, and negative affect (Dodge et al., 2012); with researchers suggesting it is important to consider both PWB and mental health, as the absence of mental ill-health might not indicate the presence of positive functioning, or PWB (Zhang & Chen, 2019).

To understand the relationships between stress, health and psychological wellbeing, various conceptualizations of stress have been developed, with Lazarus and Folkman’s (1984) transactional perspective commonly adopted (Cox & Griffiths, 2010). Here, the stress process involves four concepts: the demands an individual experiences; a cognitive evaluation of these demands (primary appraisal); perceived options for coping (secondary appraisal); and,

stress-related responses. Individuals play an active role in their stress response, as it is shaped by their appraisals and attempts to cope. This helps explain why two employees might experience the same stressors and yet respond differently (Mark & Smith, 2008).

Despite the popularity of Lazarus and Folkman's conceptualization, it has not informed all empirical study. Cox and Griffiths (2010) offered a taxonomy of work-related stress theories comprising two types of models: process models, which stem from Lazarus' transactional perspective and emphasize an individual's role in determining health outcomes; and, structural models, grounded in an interactional perspective that emphasize the work characteristics that might determine health outcomes (Cox & Griffiths, 2010). In short, researchers differentiate between two broad categories of working conditions; 'job demands' refer to aspects of the job requiring sustained effort that are detrimental to health (e.g., workload and time pressure) and 'job resources', which are health-protecting factors (e.g., control and support; Demerouti et al., 2001). Structural models have good predictive validity but are too narrow in scope to account for individual differences in the experience of work-related stress (Mark & Smith, 2008).

To measure the complex stress experiences of individuals within the workplace, Mark and Smith (2008) developed the Demands Resources and Individual Effects (DRIVE) model of work-related stress. The DRIVE model included variables that might influence the perception of stress and 12 relationships were proposed for how they might interact (see Figure 4.1 and Table 2.1). The concept of 'appraisals' from transactional theory was included through the mechanism of perceived job stress, which was suggested to mediate the relationships between work demands and health and/or wellbeing outcomes (e.g., anxiety, depression, job satisfaction). Consequently, Mark and Smith proposed that work demands would not be associated, or have a reduced association, with negative health outcomes if the individual does not perceive them to be stressful. The concepts of job demands and resources

were also included, situated alongside individual characteristics (personal demands and resources) in a multi-dimensional framework depicting direct and indirect effects with perceived job stress and health outcomes (see Figure 4.1). The DRIVE model accounted for the key variables that might influence perceptions of stress and integrated transactional theory within an interactional model, providing a suitable framework to inform research into work-related stress (Williams et al., 2017).

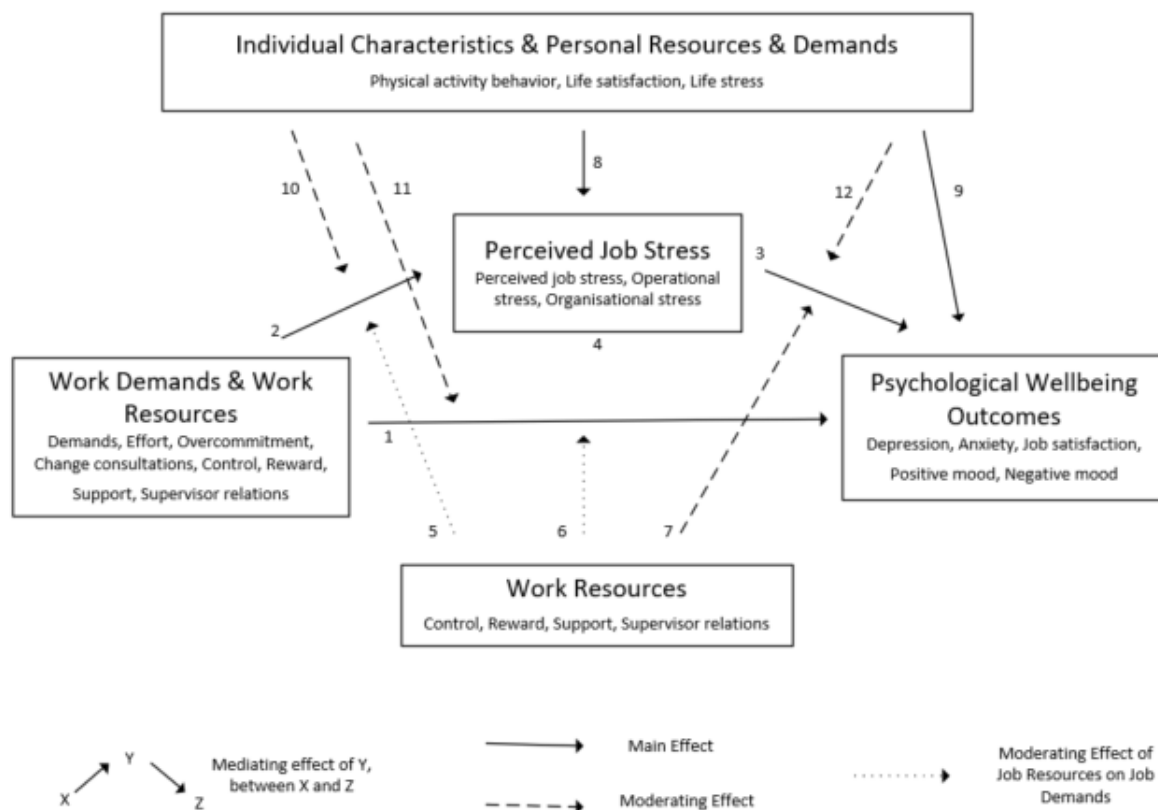


Figure 4.1. DRIVE model with study variables.

To facilitate exploration of the multi-dimensions of work-related stress and PWB within the DRIVE model, and to overcome some issues (e.g., participant load) of obtaining a holistic assessment of work-related stress, Williams and Smith (2012) developed the single-item Wellbeing Process Questionnaire (WPQ). Mark and Smith (2008) encouraged researchers to include measures for variables relevant to their population and context and introduce them into the DRIVE model under the headings of: work demands; work resources;

individual characteristics (personal demands and resources); perceived job stress and health outcomes. Other variables that have been added to the DRIVE model include rumination (Zhang & Smith, 2021), work-life balance, and burnout (Omosehin & Smith, 2019).

Elements of the DRIVE model have been tested with British nurses and university students (Galvin, 2016; Williams et al., 2017), Italian nurses (Zurlo et al., 2018), Eastern European care workers (Capasso et al., 2016), and Jamaican police officers (Nelson & Smith, 2016). There are, however, limited examples where the model has been tested in its entirety (e.g., Galvin, 2016) and research has yet to test the full model with an occupational sample – a limitation for a work-related stress model. For example, Capasso et al. (2016) only considered the direct effect relationships in the DRIVE model, and Nelson and Smith (2016) did not test for moderation relationships. Galvin (2016) did conduct a full testing of the DRIVE model predictions, but only sampled student nurses and trainee clinical psychologists. Galvin's findings were inconclusive. Specifically, although the mediating effect of perceived job stress on mental health outcomes were supported, results for other indirect effects were less conclusive. The moderation of work resources reducing the negative effects of work demands on mental health outcomes were not supported, although some individual characteristics (e.g., emotion-focused coping) reduced the relationships between work demands and perceived job stress. Given Galvin's findings were equivocal, and researchers are yet to test the full DRIVE model in an occupational sample, new research that explores *all* of the relationships of the model in an occupational setting is required.

Research is also needed to explore the placement of variables within the DRIVE model. Specifically, within the DRIVE model overcommitment is conceptualized as a work demand, but this is debated in the literature. Du Prel et al. (2018) found overcommitment to depend on the work environment (supporting it a 'state', or work-related characteristic), but it was originally conceptualized as intrinsic effort that is stable over time (suggesting it a 'trait',

or individual characteristic; van Vegchel et al., 2005). Nevertheless, the DRIVE model provides a guiding framework that enables researchers to accurately reflect and assess the stress and wellbeing process beyond a focus on PWB outcomes (Smith, 2021).

Research in a police context has largely focused on interactional models of work-related stress; but, there is a scarcity of research which integrates Lazarus' transactional perspective (Brough et al., 2018). Of the research which has provided an empirical application of Lazarus' model of stress, Brough et al. (2018) supported the mediating role of coping between work demands and psychological outcomes in the Australian police, while Nelson and Smith (2016) supported the mediating role of appraisals in their DRIVE model informed research with the Jamaican police. Despite these findings, research from an interactional perspective is needed to provide a conceptually accurate, multi-dimensional approach to understanding work-related stress and wellbeing in the British police. To provide a holistic picture of wellbeing in policing, research needs to consider non-operational 'staff' as well as police officers (Jackman et al., 2020).

One variable that has not been overtly considered within DRIVE model research, despite being proposed as a factor that protects against negative physical (e.g., Wood et al., 2018) and psychological (e.g., Gerber et al., 2010) effects of stress, and improves PWB (Zhang & Chen, 2019), is physical activity behavior. An in-depth review of models linking stress and physical activity is beyond the scope of this paper², but most research supports a reciprocal relationship (see Stults-Kolehmainen & Sinha, 2014). In one direction, stress has a negative effect on subsequent physical activity (so physical activity could be included as a health outcome in the DRIVE model). Another theoretical view is that physical activity protects against adverse consequences of perceived stress, by helping individuals to cope with stress, for example (see Salmon, 2001). So physical activity could also be included as an

² A review of physical activity and stress is provided in 'Chapter 4 Interlude'.

individual characteristic in the DRIVE model.

Research into physical activity in police populations has tended to focus on the physical fitness required by police officers (e.g., Lagestad & van den Tillaar, 2014), with few studies exploring the health-protecting relationship between physical activity and psychological outcomes. Exceptions include Gerber et al.'s (2010) findings that moderate-intensity exercise protected against stress-related complaints (physical and psychological) in Swiss police officers; and, Maran et al. (2018) noting that following a physical activity intervention perceived distress decreased, perception of wellbeing increased, and use of adaptive coping strategies increased, in Italian police officers. There is a need to better understand the interplay between physical activity, work-related stress and PWB outcomes (Häusser & Mojzisch, 2017), and apply the knowledge to policing, as there is some evidence to suggest physical activity behavior can be a resource for coping with stress in this context (e.g., Maran et al., 2018; Gerber et al., 2010). I therefore conceptualized physical activity as an individual characteristic within the DRIVE model.

Informed by the DRIVE model, I aimed to assess the factors associated with stress and PWB outcomes in British police force officers and staff. As the first study to assess all DRIVE model relationships in an occupational setting, this cross-sectional research provides new knowledge about the work characteristics (e.g., work demands, work resources) and individual characteristics (e.g., physical activity) that are significant in the experience of stress in the police. I set three objectives to address this aim:

1. Assess the factors directly predicting PWB outcomes in British police officers and staff (*direct* relationships);
2. Assess the mediating role of perceived job stress through the indirect relationships between work characteristics and PWB outcomes (*indirect* relationship);

3. Assess which factors moderate the relationships between work demands, perceived job stress and PWB outcomes (*moderation*).

Method

Participants

Employees at two British police forces (Force A and B) were invited via email to complete a survey about their work and wellbeing. There were 852 respondents, a completion rate of 11.94% (Force A: $N = 658$, 12.88% completion rate; Force B: $N = 194$; 9.57% completion rate). There were 428 male and 413 female respondents ($M_{age} = 41.66$ years, $SD = 8.69$). Participants were police officers (54.6%, $N = 465$), staff (37.3%, $N = 318$), and police community support officers (7.4%, $N = 63$), with a mean of 4.15 years of service ($SD = 1.68$). A post-hoc G*Power (Faul et al., 2009) statistical power analysis indicated that with a sample size of $N = 852$, 14 predictor variables, and a 0.05 criterion alpha level, the power exceeded .99.

Measures

I next provide a justification for the variable selection in my research and detail the items and measures selected (see Figure 4.1 for selected variables). For work demands, I included: demands; effort; change consultations and overcommitment. For work resources, I used: reward; control; support (from colleagues) and supervisor relations. These demands and resources are recognized as key work-related stress factors across multiple occupations (see Cox & Griffiths, 2010), with change practices and supervisor relationships deemed central to police wellbeing (Hesketh, 2015). Nelson and Smith (2016) suggested that research on work-related stress should consider the work-life interface. Therefore, perceived life satisfaction and life stress were measured as variables which individuals bring with them to work that potentially influence their workplace wellbeing. Physical activity behavior was included as an individual characteristic that benefits PWB (Zhang & Chen, 2019) and might influence the

experience of work-related stress (Häusser & Mojzisch, 2017).

Work-related stress and wellbeing process

The WPQ was used to measure work demands (demands, effort, overcommitment, change consultations), work resources (control, reward, support, supervisor relations), perceived job stress, life satisfaction, life stress, and PWB outcomes (anxiety, depression, job satisfaction, negative mood, positive mood). Williams (2014) demonstrated reliability using the Wanos method, and discriminant and concurrent validity against multi-item measures for all items of the WPQ. Participants rated their WPQ responses on a 11-point Likert scale, ranging from 0 (*strongly disagree*) to 10 (*strongly agree*) for items worded as statements. For example, for overcommitment: “I find it difficult to withdraw from my work obligations (*for example: work is always on my mind, I find it difficult to relax when I get home from work, people close to me say I sacrifice too much for my job*)”. Items formed as questions had response scales ranging from 0 (*not at all*) to 10 (*extremely*). For example, for depression: “How depressed would you say you are in general? (*for example: feeling ‘down’, no longer looking forward to things or enjoying things that you used to*)”. No items were reverse scored, so a high score reflected a presence of the relevant construct.

Physical activity behavior

The International Physical Activity Questionnaire-Long Form (IPAQ; Booth, 2000) was used to measure physical activity behavior. The IPAQ has demonstrated high repeatability, concurrent, and criterion validity (e.g., Craig et al., 2003). Over 27 questions, five physical activity domains were assessed using metabolic equivalent minutes (MET): leisure; domestic and gardening; work-related; transport-related; and sitting. To calculate MET minutes, participants were asked on how many days per week and how much time per day, they performed at least 10 continuous minutes of walking, moderate, or vigorous physical activity over the last seven days. In line with previous research (e.g., Craig et al.,

2003), total MET minute scores were used to categorize the sample into low (<600 MET minutes/week), medium (600 to 3000 MET minutes/week), and high physical activity (3000 MET minutes/week) groups. In relation to the WHO guidelines, the low group undertook less physical activity than recommended (i.e., below 150 minutes of moderate-intensity physical activity, and below 75 minutes of vigorous-intensity physical activity), the medium group undertook the recommended physical activity (i.e., between 150 – 300 minutes of moderate-intensity physical activity, or between 75 – 150 minutes of vigorous-intensity physical activity), and the high physical activity group undertook above the recommended physical activity (i.e., above 300 minutes of moderate-intensity physical activity, and above 150 minutes of vigorous-intensity physical activity; Bull et al., 2020).

Police specific stress

The Police Stress Questionnaire (McCreary & Thompson, 2006) assessed participants' perception of police specific stressors as some police specific contextual factors were not captured in the WPQ (cf. Mark & Smith, 2008). McCreary and Thompson (2006) reported high reliability and discriminant validity with general stress measures and two measures of police specific stress; the Police Stress Questionnaire – Operational (PSQ-Op), and the Police Stress Questionnaire – Organizational (PSQ-Org). The PSQ-Op includes 20 items describing different work stressors specific to operational policing (e.g., “Working alone at night”; $\alpha = .95$). The PSQ-Org consists of 20 items describing different organizational stressors relevant to policing (e.g., “Inconsistent leadership style”; $\alpha = .96$). Participants indicated how much stress each factor had caused them over the past six months on a 7-point Likert scale ranging from 1 (*no stress at all*) to 7 (*a lot of stress*). A mean was calculated for overall operational and organizational stress scores.

Procedure

Ethical approval was granted by the Cardiff Metropolitan University Research Ethics

Committee (reference: 16.10.O3S) and informed consent was obtained from all participants.

Data were collected through online surveys.

Data Analysis

Analyses were conducted using the IBM SPSS 27 package. First, correlational analyses were used to examine the relationships between variables for assumption checking. Linear regression analyses were then used to test the direct relationships in the DRIVE model to determine which factors were contributing to police PWB (objective 1). For example, relationship 1 predicts work demands and work resources significantly relate to PWB outcomes. Prior to running any regression analyses, data were screened for outliers, multicollinearity, linearity, homoscedasticity, and normal distribution of residuals (Tabachnick & Fidell, 2014). The physical activity behavior variable was re-coded into a dummy variable (low, medium, high) for inclusion in the regression models (Field, 2009).

The indirect relationships in the DRIVE model were tested using the PROCESS SPSS custom dialog (Hayes, 2018). Mediation analyses were conducted to test the mediating role of perceived job stress through the indirect relationships between work characteristics and PWB outcomes (relationship 4; objective 2). Parallel multiple mediation was used to simultaneously assess the role of the three work stress variables (perceived job stress, operational stress, organizational stress) as mediators. To estimate the significance of the indirect relationships, I used percentile bootstrap confidence intervals (based on 5000 samples and PROCESS model 4; Hayes, 2018), with seed 5235 for the random number generator.

Moderation analyses were conducted to test objective 3. For example, DRIVE model relationship 10 predicted that individual characteristics would moderate the relationships between work demands and perceived job stress. To test these relationships, work resources and individual characteristics (personal demands and resources) were included as potential

moderators in separate moderation analyses (based on 5000 samples and PROCESS model 1; Hayes, 2018), as depicted in the DRIVE model. To understand the interaction for any significant moderators, I probed the interaction at low, medium, and high levels of the moderator. Levels were determined by 16th, 50th and 84th percentiles, except for the categorical physical activity behavior variable (see measures).

Results

Assumption checking, descriptive statistics and correlational analyses

All predictor variables demonstrated acceptable tolerance ($>.1$) and VIF (<10) values, and correlation values below .80 indicating no multicollinearity (Field, 2009). Linearity and homoscedascity were assessed through visual inspection of scatterplots and did not show curvilinear relationships. Boxplots indicated that the independence of errors assumption had not been violated, but that there were four significant outliers on the support variable. As the outliers came from the intended sample population, they were retained (Tabachnick & Fidell, 2014). The Shapiro-Wilks test of normality indicated some variables were not normally distributed, mainly due to high kurtosis. No corrections were made as kurtosis effects are diminished in samples of over 200 (Tabachnick & Fidell, 2014). Descriptive statistics of, and Pearson's correlations between, continuous variables are provided in Table 4.1.

Direct relationships

All direct relationships were supported (see Table 4.3 and Appendix 1).

Direct relationships of work characteristics

Work characteristics were significant predictors of psychological wellbeing outcomes ($R^2 = .20 - .39$, $ps < .01$; relationship 1) and perceived job stress ($R^2 = .03 - .41$, $ps < .01$; relationship 2). Specifically, when perceived work demands (demands, effort, change consultations, overcommitment) increased, PWB outcomes deteriorated and perceived job stress increased. When perceived work resources (reward, control, support, supervisor

Table 4.1. *Descriptive statistics and Correlations between Work Characteristics, Individual Characteristics, Perceived Job Stress and Psychological Wellbeing Outcomes*

Variable	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. Demands	5.04	2.78	-																	
2. Effort	5.38	2.73	.63 ^b	-																
3. Changes	5.93	2.88	.29 ^b	.29 ^b	-															
4. Overcommitment	4.90	3.03	.43 ^b	.17 ^b	.43 ^b	-														
5. Reward	4.65	2.55	-.19 ^b	-.15 ^b	-.34 ^b	-.08 ^a	-													
6. Control	5.61	2.59	-.22 ^b	-.20 ^b	-.23 ^b	-.13 ^b	.50 ^b	-												
7. Support	7.11	2.40	-.05	-.05	-.06	-.11 ^b	.33 ^b	.29 ^b	-											
8. Supervisor rels.	7.20	2.61	-.08 ^a	-.07 ^a	-.15 ^b	-.04	.43 ^b	.30 ^b	.46 ^b	-										
9. Life satisfaction	6.55	2.55	-.10 ^b	-.13 ^b	-.10 ^b	-.13 ^b	.30 ^b	.27 ^b	.26 ^b	.20 ^b	-									
10. Life stress	4.97	2.74	.16 ^b	.13 ^b	.08 ^a	.20 ^b	-.04	.04	-.01	.02	-.20 ^b	-								
11. Job stress	5.84	2.37	.56 ^b	.49 ^b	.27 ^b	.46 ^b	-.17 ^b	-.26 ^b	-.07 ^a	-.07	-.16 ^b	.20 ^b	-							
12. Op. stress	2.63	1.54	.09 ^a	.13 ^b	.07 ^a	.12 ^b	-.07 ^a	-.11 ^b	.01	.01	.22 ^b	-.03	.10 ^b	-						
13. Org. stress	3.39	1.54	.10 ^b	.12 ^b	.02	.13 ^b	-.10 ^b	-.09 ^b	-.04	-.02	-.05	-.03	.09 ^b	.76 ^b	-					
14. Depression	3.93	2.81	.34 ^b	.32 ^b	.24 ^b	.36 ^b	-.21 ^b	-.15 ^b	-.18 ^b	-.16 ^b	-.41 ^b	.42 ^b	.34 ^b	.05	.07 ^a	-				
15. Anxiety	4.45	2.88	.34 ^b	.27 ^b	.25 ^b	.40 ^b	-.23 ^b	-.17 ^b	-.11 ^b	-.14 ^b	-.32 ^b	-.32 ^b	.39 ^b	.04	.07 ^a	.69 ^b	-			
16. Job satisfaction	6.20	2.55	-.24 ^b	.19 ^b	-.30 ^b	-.17 ^b	.51 ^b	.46 ^b	.38 ^b	.40 ^b	.46 ^b	-.08 ^a	-.30 ^b	-.10 ^b	-.16 ^b	-.38 ^b	-.35 ^b	-		
17. Positive mood	6.28	2.48	-.21 ^b	-.15 ^b	-.20 ^b	-.27 ^b	.33 ^b	.27 ^b	.30 ^b	.20 ^b	.51 ^b	-.29 ^b	-.28 ^b	-.08 ^a	-.11 ^b	-.51 ^b	-.46 ^b	.45 ^b	-	
18. Negative mood	4.27	2.80	.34 ^b	.26 ^b	.29 ^b	.33 ^b	-.23 ^b	-.17 ^b	-.15 ^b	-.14 ^b	-.35 ^b	.35 ^b	.30 ^b	.04	.07	.60 ^b	.56 ^b	-.31 ^b	-.59 ^b	-

^ap <.05. ^bp <.01.

Changes = Change consultations. Supervisor rels. = Supervisor relations. Op.stress = Operational stress. Org.stress = Organizational stress.

relations) increased, PWB outcomes improved and perceived job stress decreased. Overall, change consultations was a significant predictor of all PWB outcomes (relationship 1). For example, when perceived change consultations increased, anxiety increased ($\beta = .10, p < .01$). Perception of work demands ($\beta = .16, p < .01$), overcommitment ($\beta = .30, p < .01$) and reward ($\beta = -.12, p < .01$) were also significant predictors of anxiety.

For relationship 2, overcommitment was the only work characteristic that was a significant predictor of all job stress variables (perceived job stress, operational stress, organizational stress). For example, when perceived overcommitment increased, perceived organizational stress increased ($\beta = .09, p < .05$). Perceived control was the only work resource that was a significant predictor of perceived job stress and operational stress; increased perceptions of control decreased the stress experienced (see Appendix 1).

Direct relationships of individual characteristics

Individual characteristics (physical activity behavior, life satisfaction, life stress) accounted for more variance in the prediction of PWB outcomes ($R^2 = .21 - .30, ps < .01$; relationship 9), than in the prediction of perceived job stress ($R^2 = .00 - .05, ps < .05$; relationship 8). Perceived life satisfaction and life stress significantly predicted PWB outcomes (relationship 9). Specifically, when perceived life satisfaction increased, PWB outcomes improved, but when perceived life stress increased, PWB outcomes deteriorated. Physical activity was also a significant predictor of positive mood, as highly physically active individuals perceived higher positive mood than those low in physical activity (see Appendix 1). No individual characteristics significantly predicted organizational stress; and, physical activity was the only significant predictor of operational stress (relationship 8). Specifically, highly physically active individuals perceived lower operational stress than those engaging in medium physical activity.

Direct relationships of stress

Perceived job stress and organizational stress were significant predictors of PWB outcomes ($R^2 = .08 - .16$, $ps < .01$; relationship 3). When perceived job stress and organizational stress increased, PWB deteriorated. Operational stress did not significantly predict any PWB outcomes (see Appendix 1).

Indirect relationship

A series of parallel multiple mediation analyses were conducted (see Appendix 2). Perceived job stress significantly mediated the relationships between work demands (demands, effort, overcommitment) and PWB outcomes, and supported the DRIVE model mediation relationship (relationship 4). For mediation to be observed, work characteristics must be found to indirectly relate to PWB outcomes through the perception of job stress, although work characteristics can still directly relate to PWB outcomes. For example, the direct relationship between overcommitment and anxiety was significant; when perceived overcommitment increased, anxiety increased ($c' = .25$, 95% CI [.18, .32]; see Table 4.2). The indirect relationship from overcommitment to anxiety via perceived job stress was also significant ($a_1b_1 = .04$, 95% CI [.02, .07]). When perceived overcommitment increased, perceived job stress increased (a_1), which increased the anxiety experienced (b_1). Therefore, as perception of overcommitment increased, anxiety increased both directly, and indirectly through increased perception of job stress. Change consultations was the only work demand not significantly indirectly related to PWB outcomes through perceived job stress (all 95% CI included zero). In comparison, control was the only work resource which was significantly indirectly related to PWB outcomes through perceived job stress. When perceived control increased, perceived job stress decreased (a_1), which improved PWB outcomes (b_1). All 95% CI did not include zero. Therefore, perceived job stress significantly mediated the relationships between demands, effort, overcommitment, and control, and PWB outcomes.

Table 4.2. *Parallel multiple mediator model for overcommitment and anxiety.*

Consequent																				
Antecedent	M1 (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Anxiety)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Overcomm.)	a ₁	.19**	.03	.14	.24	a ₂	.04*	.02	.00	.08	a ₃	.05*	.02	.01	.09	c'	.25**	.04	.18	.32
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.03
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.11	.09	-.07	.29
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.84		3.38**	.28	2.82	3.94		2.14**	.53	1.10	3.18
R ²				.42				.03					.03					.25		
F				66.96**				3.31*					3.00*					23.32**		
Bootstrap indirect effects	a ₁ b ₁	.04 ¹	.01	.02	.07	a ₂ b ₂	-.01	.01	-.02	.00	a ₃ b ₃	.01	.01	-.00	.02					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

Overcomm. = Overcommitment. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Moderation

A series of moderation analysis were conducted (see Appendix 3). Although all moderation relationships in the DRIVE model were supported to some extent, most examples of significant moderation were through work resources moderating the relationships between work demands and perceived job stress (relationship 5), and individual characteristics moderating the relationships between work demands and PWB outcomes (relationship 11).

Work resources as moderators

Work resources (reward, control, support, supervisor relations) significantly moderated the relationships between work demands and perceived job stress (relationship 5). For example, perceived support was a significant moderator of the relationship between demands and operational stress (see Figure 4.2). At low perceived support, the relationship between perceived demands and operational stress was not significant. At high perceived support, the relationship between demands and operational stress was significant.

Specifically, as perception of demands increased, operational stress decreased ($\beta = -.07$, $t = -2.19$, $p < .05$). This suggests higher levels of perceived social support from colleagues improved the negative relationship between demands and operational stress. Work resources did not significantly moderate any relationships between work demands and organizational stress (relationship 5) or between organizational stress and PWB outcomes (relationship 7). Supervisor relations was the only work resource that significantly moderated the relationships between overcommitment and PWB outcomes (relationship 6, see Figure 4.3). The positive relationship between perceived overcommitment and negative mood was significant at all levels of perceived supervisor relations, but greater at higher supervisor relations.

Specifically, as perception of overcommitment increased, negative mood increased (high: $\beta = .28$, $t = 6.22$, $p < .01$; medium: $\beta = .23$, $t = 6.47$, $p < .01$; low: $\beta = .12$, $t = 2.41$, $p < .05$).

Therefore, perceiving higher work resource (supervisor relations) did not improve the

relationship between work demands (overcommitment) and negative mood.

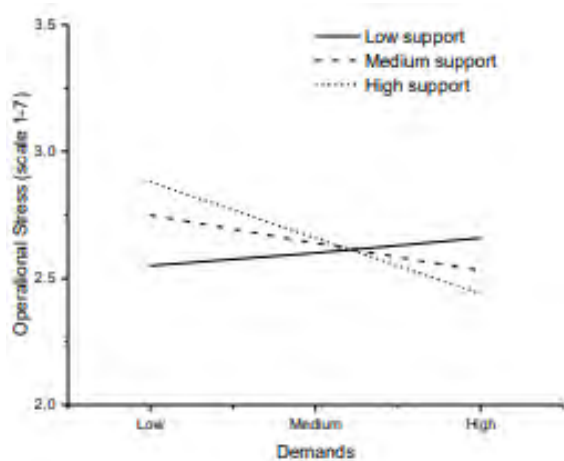


Figure 4.2. Support as a moderator of the relationship between demands and operational stress.

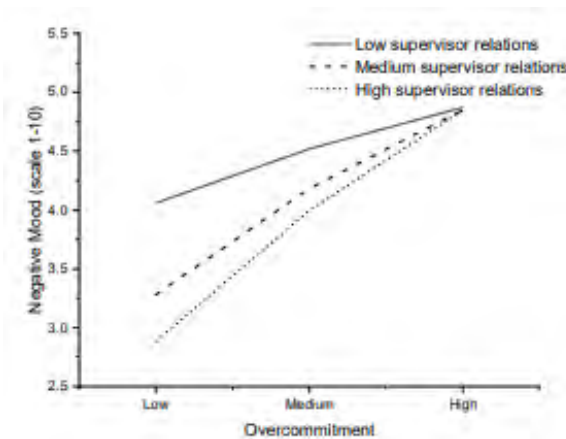


Figure 4.3. Supervisor relations as a moderator of the relationship between overcommitment and negative mood.

Individual characteristics as moderators

Individual characteristics (physical activity behavior, perceived life satisfaction, perceived life stress) significantly moderated the relationships between work demands and PWB outcomes (relationship 11, see Appendix 3). Specifically, where physical activity and perceived life satisfaction was high, perception of demands decreased and PWB outcomes improved. In comparison, where perceived life stress was high, perception of demands increased and PWB outcomes deteriorated. Physical activity behavior and perceived life stress significantly moderated all DRIVE model relationships (relationships 10, 11 and 12;

see Appendix 3). For example, physical activity significantly moderated the relationship between organizational stress and depression (relationship 12, see Figure 4.4). At low physical activity, there was a significant positive relationship between organizational stress and depression; as perception of organizational stress increased, depression increased ($\beta = .49, t = 2.75, p < .01$). At medium and high physical activity, the relationship between organizational stress and depression was not significant. Therefore, higher physical activity reduced the relationship between organizational stress and depression.

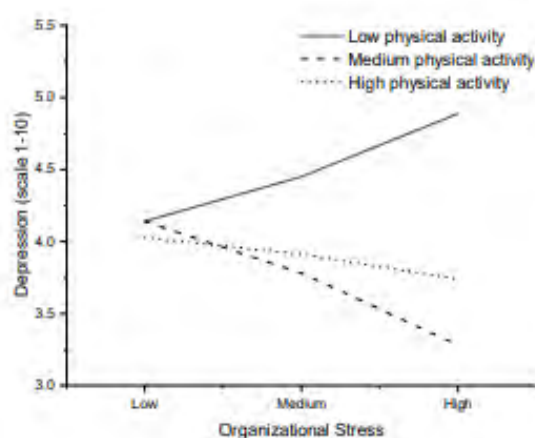


Figure 4.4. Physical activity as a moderator of the relationship between organizational stress and depression.

Discussion

In this study, the DRIVE model was used to assess: factors that directly predicted PWB outcomes (objective 1); the indirect relationships between work characteristics and PWB outcomes through perceived job stress (objective 2); which variables moderated the relationships between work demands, perceived job stress and PWB outcomes (objective 3) in a British police context. All direct relationships, and some indirect and moderation relationships were supported, evidencing the utility of the DRIVE model to inform work-related stress inquiry (see Table 4.3).

Parallel multiple mediation analyses supported the explanatory mechanism in the DRIVE model, as the relationships between work demands and PWB outcomes were

Table 4.3. *Summary of findings in relation to the DRIVE model relationships.*

DRIVE relationship		Summary
1	Work characteristics relate to PWB outcomes	All work characteristics, except for effort, significantly predicted PWB outcomes. Work demands significantly predicted decreased PWB, and work resources significantly predicted improved PWB.
2	Work characteristics relate to job stress	All work demands significantly predicted increased job stress. Control was the only work resource to significantly predict decreased job stress.
3	Job stress relates to PWB outcomes	Perceived job stress significantly predicted decreased PWB outcomes.
4	Job stress mediates the relationships between work characteristics and PWB outcomes	Perceived job stress significantly mediated the relationships between work demands, effort, overcommitment, control and PWB outcomes. Change consultations was the only work demand that was not mediated by job stress. Demands, effort and control mediations were explained through indirect effects only; overcommitment mediations had significant indirect and direct effects.
5	Work resources moderate work demands and job stress	All work resources significantly moderated the relationships between work demands and job stress. The moderations improved the relationships. No evidence for moderation in relationships with overcommitment or organizational stress.
6	Work resources moderate work demands and PWB outcomes	All work resources (except for control) significantly moderated the relationships between job stress and PWB outcomes, however the moderations did not always improve the relationships. No evidence for moderation in relationships with effort or anxiety.
7	Work resources moderate job stress and PWB outcomes	Reward and control significantly moderated the relationships between job stress and job satisfaction and negative mood.
8	Individual characteristics relate to job stress	Life satisfaction and physical activity significantly predicted decreased perceived job stress.
9	Individual characteristics relate to PWB outcomes	Life satisfaction significantly predicted increased PWB outcomes. Life stress predicted decreased PWB outcomes. Physical activity significantly predicted increased positive mood.
10	Individual characteristics moderate work demands and job stress	Physical activity and life stress significantly moderated the relationships between work demands and change consultations, and perceived job stress. Physical activity moderated to improve the relationships, and life stress decreased the relationships.
11	Individual characteristics moderate work demands and PWB outcomes	Physical activity and life satisfaction significantly moderated to improve the relationships between work demands and PWB outcomes. Life stress significantly moderated to decrease the relationships.
12	Individual characteristics moderate job stress and PWB outcomes	Physical activity and life satisfaction significantly moderated to improve the relationships between perceived job stress and PWB outcomes. Life stress significantly moderated to improve two relationships, and to decrease one relationship.
PWB = psychological wellbeing. Job stress = perceived job stress. Work demands = perception of work demands. Work resources = perception of work resources		

indirectly related through perceived job stress. This evidenced how appraisals play a critical role within the experience of work-related stress (Mark & Smith, 2008). Moderations were mostly due to work resources moderating the relationships between work demands and perceived job stress, and individual characteristics (physical activity behavior and home-life circumstances) moderating the relationships between work demands and PWB outcomes. This supported the multi-dimensional approach to workplace wellbeing advocated by Mark and Smith (2008), as work and individual characteristics (direct relationships, moderation), and perceived job stress (indirect relationships) were all significant in the experience of work-related stress. These findings illustrate the importance of integrating multiple factors and interactional relationships between variables to represent the real-life situation in work-related stress (Brough et al., 2018; Galvin, 2016).

Conceptual implications

This research was the first to test all 12 DRIVE model relationships within any occupational context, and the first to do so within a policing context. Previous research has applied the model in other student or trainee groups (e.g., Galvin, 2016), or only focused on the mediation relationship in a police context (Nelson & Smith, 2016). My research adds new knowledge by providing information on the contribution of different work and individual characteristics in the prediction of perceived job stress and PWB outcomes. I found that increased perception of all work demands increased perceived stress, but increased perception of control was the only work resource which significantly decreased the perception of stress (relationship 2). These findings add further support to the positive association of perception of control within stressful contexts (see Schaufeli & Taris, 2014).

The finding that work characteristics and PWB outcomes were indirectly related through perceived job stress (relationship 4) evidences the central tenet of transactional work-related stress theories and emphasizes how cognitive appraisals act as an underlying

mechanism between work characteristics and PWB outcomes (Nelson & Smith, 2016). Specifically, if work demands are present and perceived as stressful then they can be detrimental to PWB outcomes. This provides an initial explanation for why work characteristics are related to PWB, supporting calls to explore underlying mechanisms and go beyond only assessing work characteristics (Brough et al., 2018).

I found some support for work resources as moderators (objective 3); mostly in relation to improving the relationships between work demands and perceived job stress (relationship 5). For example, high perceived support from colleagues reduced the negative relationship between work demands and operational stress (see Figure 4.2) with similar findings observed for reward and control as moderators. Within police populations perceived support has been consistently found to moderate and protect against the negative effects of stress (e.g., Baka, 2020; Hansson et al., 2017), and, research which has applied the DRIVE model in a nursing context has also indicated that social support can reduce the relationship between work demands and anxiety (Zurlo et al., 2018). Collectively, such findings indicate that social support is a fundamental dimension for keeping mental health stable; and in line with Lazarus' stress and coping perspective, the findings suggest that if social support is perceived to be available, then demands might not be perceived as stressful (see Lakey & Cohen, 2000). Individual characteristics also moderated the relationships between work demands and PWB outcomes (relationship 11). Higher physical activity and perceived life satisfaction improved PWB outcomes; whereas, higher perceived life stress deteriorated PWB outcomes. Physical activity was the only individual characteristic that moderated all relevant relationships in the DRIVE model to improve perceived stress and PWB outcomes. This study is one of only a few to consider and support the inclusion of physical activity as a moderator variable in the study of work-related stress and PWB (Häusser & Mojzich, 2017).

Practical implications

Using the DRIVE model allowed identification of the individual (personal) and organizational (work) characteristics that directly predicted perceived job stress and PWB outcomes, which, in turn, informs options for intervention. Of the work demands considered, perceptions of overcommitment were a significant predictor of increased perceived job stress, operational stress, and organizational stress. Therefore, police forces could develop practices aimed at reducing perceptions of overcommitment. Overcommitment relates to the need for approval and perceived ability to withdraw from work (see van Vegchel et al., 2005). Consequently, supervisors could be coached to monitor staff efforts, provide positive feedback and offer reassurance that they are allowed to ‘switch off’. Of the work resources, perceived reward was a significant predictor across PWB outcomes, and perceived control was a significant predictor of decreased perceived job stress and operational stress. Research in US policing has suggested organizational practices that increase reward help reduce overcommitment (Violanti et al., 2018b). People typically join the police to fulfil a lifetime aspiration, and to make a difference to those in need (Duran et al., 2018). Therefore, in a demanding and stressful job, social reward or recognition might help police feel valued for their work and avoid over-working in the search for recognition. Social reward could come from the organization acknowledging individual and/or team accomplishments (Violanti et al., 2018b), or from the public informing police workers when they have had positive outcomes following engagement with the police (Carlson-Johnson et al., 2020).

My research supported the proposition within the DRIVE model that perceived job stress is one way through which work characteristics were related to health outcomes. Therefore, where work characteristics cannot be changed it might be worthwhile targeting perceptions of stress to indirectly improve health outcomes. Most interventions within the police sector are aimed at modifying an individual’s stress responses through targeting

appraisals, rather than reducing the stressors encountered (LaMontagne et al., 2016). For example, mindfulness-based interventions that focus on restructuring appraisals could be of benefit; especially given that such interventions have been previously reported to significantly reduce operational and organizational stress in the police (Bergman et al., 2016). Within my research, change consultations was the only work demand not mediated by perceived job stress, and only had a direct relationship with PWB outcomes. Irrespective of whether individuals perceived the organizational changes as stressful, it was negatively related to PWB. Consequently, primary interventions aimed at developing a suitable communication strategy might be most appropriate in addressing organizational change. It is important that workers understand the impact of new work arrangements, and that there is open communication regarding the changes, in order to combat the wellbeing risks (Weinberg & Doyle, 2017).

The research findings indicated that when individuals perceived high social support, perception of work demands and operational stress decreased. These findings, coupled with other social support research in a police context (e.g., Jackman et al., 2020), imply that police forces should promote support seeking cultures and increase awareness of the support systems available. Although I reinforce these implications, my findings showed that perceiving higher supervisor relations did not improve the relationship between overcommitment and negative mood. Based on all of the recommendations, a tailored supervisor training package seems appropriate. Supervisors could receive specific training to help understand the complexities of social support, monitoring overcommitment and offering reward, before police forces encourage a support seeking culture that they are not ready to provide.

For individuals who met or exceeded the WHO guidelines for physical activity (i.e., medium and high physical activity), no significant relationship between organizational stress

and depression was found. However, for those low in physical activity, as perception of organizational stress increased depression also increased. Therefore, meeting the daily guidelines for physical activity was a protective factor against work-related stress experiences (c.f., Gerber et al., 2010). These results suggest interventions that increase physical activity could be useful in improving PWB within a police context.

Strengths, Limitations, and Future Directions

This study has considered a multi-dimensional approach to understanding work-related stress in British policing, providing insight into the work and individual characteristics that were associated with PWB. Underpinned by the DRIVE model, I provided a conceptually accurate assessment of work-related stress with a rare integration of interactional and transactional perspectives using a large-scale and rigorous statistical analysis that tested the DRIVE model in its entirety. The study was the first to do so in an occupational setting. The novel sample and holistic approach enabled me to highlight the role that perception of job stress plays as an underlying mechanism for stress, answering calls for research that is designed to cater for the complexities of the stress process and thus advance the field (Brough et al., 2018). My inclusion of physical activity, and finding that physical activity acted as a moderator within the analyses, helps further connect the physical activity and occupational health psychology bodies of research.

Although implications for the work-related stress literature and police forces are evident, there are limitations to my research. The use of cross-sectional data limits the ability to infer causation and test the causal aspects of the DRIVE model. Further research using longitudinal studies could advance my work by informing whether work characteristics, perceived job stress and PWB outcomes mutually influence each other, or have unidirectional causal relationships. Other modelling approaches (e.g., structural equation modelling) could be used in future research to test more complex relationships (e.g., reciprocal and causal)

between variables in the DRIVE model and overcome some of the limitations of my regression-based approach.

The DRIVE model was used to assess relationships between variables in the experience of work-related stress. In line with some studies that have utilized the DRIVE model, future research could build on the findings and use a combined effects approach. Studies have used the combined effects approach to compare the predictive power of DRIVE model variables (see Smith, 2021). However, this approach did not align with my research aim and objectives to assess individual relationships, and my findings support the notion that individual work-related stress variables had different relationships with PWB outcomes. As another future direction, a qualitative approach could provide greater clarity on the role of physical activity. The measures I used provided limited insight into why physical activity protected against some of the negative effects of stress. Given the physical activity findings, it will be important to explore these relationships further to inform practical implications and help police forces to foster a proactive and preventative approach to stress (Gerber et al., 2010).

Conclusion

Using the DRIVE model of work-related stress to inform my enquiry, I assessed the factors influencing PWB in two British police forces. Increased perception of reward and control directly predicted decreased perception of job stress and improved PWB outcomes, whereas increased perception of overcommitment directly predicted increased perception of job stress and deteriorated PWB outcomes. Work characteristics and PWB outcomes were found to be indirectly related through perceived job stress, supporting that appraisals are an underlying mechanism in the experience of work-related stress. The perception of reward, control, support, medium and high physical activity moderated the relationships between work demands, perceived job stress and PWB outcomes and protected against the negative

effects of stress. The mediation and moderation relationships provided useful implications; specifically, police forces could aim to: change perceptions of stress; offer training packages for supervisors to support psychological wellbeing; and/or use physical activity to foster a preventative approach to work-related stress. Future research should explore qualitative enquiry and conduct longitudinal research to indicate causality in the relationships identified.

Chapter 4 Interlude

In Study 1, informed by the DRIVE model of work-related stress, I identified work and individual factors that were significant in police stress and psychological wellbeing and could, potentially, be targeted in an intervention. From the Study 1 findings I identified the following drivers for wellbeing as options to explore in my next study: (a) the appraisals in perceived job stress as the explanatory mechanism for work-related stress; (b) increased perception of reward, control and/or support as work characteristics that had direct and moderation relationships with decreased stress and improved psychological wellbeing outcomes; (c), supervisor relations as a work resource that had moderation relationships with stress and psychological wellbeing in an unexpected (detrimental) direction; (d) the work-life interface as perception of life stress and life satisfaction had direct and moderation relationships with stress and psychological wellbeing; and, (e) physical activity behavior as an individual characteristic that had direct and moderation relationships with decreased stress and improved psychological wellbeing outcomes.

To narrow down the insights gathered and establish which driver would be the main driver for psychological wellbeing taken forward in the rest of the research program (Double Diamond Step 2; see Figure 3.2), the findings from Study 1 were discussed with the steering group. To inform the discussions, I produced a research report of the Study 1 findings and presented on it during a steering group meeting. In a guide to the ‘Define’ phase in the Double Diamond, the Design Council (2015) suggests four main considerations; feasibility,

cost, passion for the idea, and, portability and size. These considerations were adapted and considered with the steering group alongside my Study 1 research report as follows:

- Feasibility was discussed in relation to which of the factors that predicted perceived job stress and psychological wellbeing outcomes we, as a research group, could feasibly influence;
- Cost was discussed in terms of potential additional resource that might be needed to support each potential factor;
- Passion for the idea was a consideration that required reflection on the reasons for following up each factor. In line with the rationale for the research program to focus on keeping workers healthy and happy in work, the steering group members wanted to know more about the potential value of physical activity in their workforce;
- Portability and size were discussed in terms of what outcomes might be realized from each factor. Here, physical activity behavior was perceived to be a factor that might influence a range of positive health-related outcomes both inside and outside of work.

In the steering group it was agreed that physical activity behavior was the driver for stress and psychological wellbeing that could be explored further, to understand the underpinning processes, barriers and enablers (in Study 2a and 2b) that could inform the development of an intervention (in Study 3). In this Interlude section, I will review the physical activity findings from Study 1 and summarize the existing research that explores the link between physical activity, work-related stress, and psychological wellbeing at work.

Spotlight on Study 1 physical activity findings

The statistically significant findings from Study 1 that related to physical activity behavior are summarized in Table 4.4. In the moderation analyses (DRIVE model relationships 10, 11, 12), the significant differences were between low and medium physical activity behavior, and low and high physical activity behavior. For example, at low physical

Table 4.4 *Summary of Study 1 physical activity behavior findings.*

DRIVE relationship		Significant physical activity behavior findings
8	Individual characteristics relate to job stress ³	High - low physical activity behavior significantly predicted decreased operational stress.
9	Individual characteristics relate to PWB outcomes ³	High – medium physical activity behavior significantly predicted increased positive mood.
10	Individual characteristics moderate work demands and job stress ⁴	Physical activity behavior significantly moderated the relationship between work demands and operational stress. At low physical activity, the relationship between work demands and operational stress was significant; as perception of work demands increased, perception of operational stress increased. At medium and high physical activity, the relationship between work demands and operational stress was not significant.
11	Individual characteristics moderate work demands and PWB outcomes ⁴	Physical activity behavior significantly moderated the relationship between effort and anxiety. At low physical activity, the relationship between effort and anxiety was significant; as perception of effort increased, anxiety increased. At medium and high physical activity, the relationship between effort and anxiety was not significant.
12	Individual characteristics moderate job stress and PWB outcomes ⁴	Physical activity behavior significantly moderated the relationship between organizational stress and depression. At low physical activity, the relationship between organizational stress and depression was significant; as perception of organizational stress increased, depression increased. At medium and high physical activity, the relationship between organizational stress and depression was not significant.
PWB = psychological wellbeing. Job stress = perceived job stress. Work demands = perception of work demands.		

³ See Appendix 1

⁴ See Appendix 3

activity behavior the relationship between effort and anxiety was significant; as perception of effort increased, anxiety increased. At medium and high physical activity, the relationship between effort and anxiety was not significant. This pattern was consistent across all the significant moderation analyses with physical activity behavior (see Table 4.4). The implication for the partner police forces was that significant differences could potentially be made to the wellbeing in their workforce by supporting inactive (low physical activity behavior) individuals to increase their physical activity behavior to reach the WHO guidelines (i.e., to engage in at least medium physical activity behavior).

Following on from the findings in Study 1, there was still a need to explore the underpinning mechanisms that might explain why physical activity behavior was beneficial for work-related stress and psychological wellbeing. Perceived job stress significantly mediated relationships between work characteristics and psychological wellbeing (DRIVE model relationship 4), but mediation with physical activity behavior was not tested in Study 1 as it was not a relationship put forward in the DRIVE model. To begin to understand the potential explanatory processes for the role of physical activity in work-related stress and psychological wellbeing in the police, I next summarize what has been proposed in the wider stress, wellbeing, and police specific literature⁵.

The potential value of physical activity

Physical activity has been defined as every movement of the body that is initiated by skeletal muscles (Caspersen et al., 1985). Physical activity is broader than exercise, which is a subset of physical activity that is planned, structured, repetitive and generally associated with the goal of improving cardiorespiratory fitness (Caspersen et al., 1985). The WHO provide evidence-based recommendations for how much physical activity individuals should

⁵ A review of the physical activity workplace intervention literature is provided in Chapter 6 – Study 3 ‘Development of the Exertime intervention’.

engage in to improve their health and recently removed the stipulation that physical activity should be assessed by bout length (e.g., 10-minute bouts of exercise; Bull et al., 2020). In the updated WHO guidelines, it is emphasized that doing a small amount of physical activity is better for health than doing none (i.e., any movement counts). Since 2010, the WHO physical activity guidelines have also included the recommendation to limit sedentary behavior, which refers to any waking behavior with an energy expenditure below 1.5 MET minutes whilst sitting, reclining, or lying (Barnes et al., 2012), and to include muscle strengthening exercises at least twice a week (Bull et al., 2020).

Physical activity and stress

It is widely accepted that physical activity can reduce stress, blunting the physiological and psychological response (Lox et al., 2006). To explain the psychological mechanisms underpinning physical activity and stress, exercise researchers have lent on Lazarus' conceptualization, and suggested that physical activity interacts with primary and secondary stress appraisals (Lox et al., 2006). For example, in the cross-stressor adaptation hypothesis, it is suggested that during exercise the brain and body experiences a challenge (i.e., stress which it can cope with) and adapts so that there is a decreased (physiological and psychological) response next time it is under stress. This adaptation is suggested to transfer and influence the response to stressors in non-exercise settings (e.g., the workplace; Lox et al., 2006). Gerber and Pühse (2009) proposed five pathways additional to the cross-stressor adaption hypothesis to explain the interplay between exercise, stress, and health. The stress-buffering pathway, in which exercise is suggested to protect against the negative effects of stress and prevent ill-health during stress events, has received most research attention and support (Klaperski, 2017). However, few studies have focused on occupational stress (Schilling et al., 2019). Those that have, reported that under high stress, employees with high physical fitness (Schmidt et al., 2016) and high physical activity (Gerber et al., 2020)

perceived less adverse impacts than their inactive colleagues.

Few researchers have provided theoretical explanations for the link between physical activity and occupational stress. Häusser and Mojzisch (2017) proposed the first theoretical model to do so; the physical activity-mediated Demand-Control (pamDC) model. In the pamDC, there are eight propositions to explain how work characteristics affect leisure-time physical activity (LTPA), health and wellbeing, underpinned by two mediating mechanisms. First, self-regulatory fatigue is suggested to mediate the negative effect of job demands on LTPA (proposition 2). The empirical evidence for this proposition suggests that it takes self-regulation (i.e., effortful control of one's behavior) to deal with high job demands, which depletes resources to engage in subsequent activities, such as LTPA after work. Research from Sonnentag and colleagues supports this mechanism, as exercise is conceptualized as an effective activity for workers to recover from job stresses, but the paradox is that high job stress reduces the likelihood that workers will engage in physical activity (Sonnentag, 2018). Second, perceived self-determination is suggested to mediate the positive effect of job control on LTPA (proposition 4). SDT provides the theoretical basis for this proposition, and supporting research suggests that experiencing autonomous motivation (i.e., engaging in an activity for the satisfaction associated with that activity) can spread from job activities to off-job activities. That is, if work activities fulfil feelings of autonomy (e.g., control, decisional freedom), then individuals experience higher self-determination which can promote physical activity elsewhere (Häusser & Mojzisch, 2017). As such, in the pamDC there are initial explanations for the link between physical activity and work-related stress. However, the extant literature tends to consider how work-related stress impacts physical activity behavior, rather than how physical activity behavior might impact work (cf. Stults-Kolehmainen & Sinha, 2014). The reverse pathway is predicted in the pamDC (proposition 8), but there is not yet direct empirical evidence for it (Häusser & Mojzisch, 2017).

Physical activity and wellbeing

Many people say that they ‘feel better’ after exercise (Buckworth et al., 2013), described as the ‘feel good’ effect (Biddle & Mutrie, 2008). To understand what is meant by this, researchers commonly measure affect (the subjective quality given to a feeling state e.g., pleasant or unpleasant) and mood (a global set of affective states that might occur for no obvious reason e.g., an anxious mood not linked to a specific event; Ekkekakis & Backhouse, 2009). Overall, there is consensus that physical activity and exercise improve affect (see Biddle & Mutrie, 2008). In exercise psychology, the distraction hypothesis (Bahrke & Morgan, 1978) and mastery hypothesis have been lent on to suggest the psychosocial mechanisms underpinning the relationships between physical activity and affect (Buckworth et al., 2013). Through the distraction hypothesis, it is maintained that being distracted and having a break from stressors and worries covaries with physiological mechanisms to improve mental health following exercise (Leith, 1994). Through the mastery hypothesis, it is maintained that when an individual completes an effortful task, they experience higher self-efficacy and feelings of accomplishment, or mastery (Buckworth et al., 2013). Self-efficacy refers to an individual’s belief in their ability to successfully carry out tasks and is a central process in social cognitive theory (SCT)⁶, one of the most widely applied theories in physical activity behavior (Bandura, 1977, 1991; Beauchamp et al., 2019).

Research into the affective outcomes following physical activity is aligned to the subjective wellbeing perspective, while research from the eudemonic wellbeing perspective would focus on the processes towards the affective outcomes. As is the case in the wider wellbeing literature, much of the research has focused on the impact of physical activity on subjective wellbeing rather than eudemonic wellbeing (Kimiecik, 2016). However, the

⁶ A more in-depth review of self-efficacy, social cognitive theory and other main theories of behavior change is provided in Chapter 6 – Study 3 ‘Development of the Exertime intervention’.

mastery hypothesis begins to tap into eudemonic processes, as, theoretically, physical activity can fulfil Ryff's six dimensions of psychological wellbeing, by increasing feelings of control, improving perceptions of the self (e.g., self-efficacy), and facilitating positive social interactions (Edwards et al., 2004). Studies rooted in SDT (e.g., Saunders et al., 2018) have found that fulfillment of autonomy, competence and relatedness can also explain how and if physical activity supports positive wellbeing (Kimiecik, 2016). The studies indicate that the quality of physical activity (e.g., if it is experienced as autonomy-supportive) is critical to eudemonic wellbeing, as opposed to the quantity of physical activity that is the focus in subjective wellbeing (Kimiecik, 2016). Another eudemonic wellbeing concept, Csikzentmihalyi's 'flow', has also been drawn on to explain why physical activity enhances affect and mood. When an individual enjoys a physical activity and experiences flow this will improve their wellbeing (Biddle & Mutrie, 2008). Although the nine dimensions of flow offer intuitive reasons as to why physical activity would impact wellbeing (e.g., manageable skills challenge, distractive elements), a systematic review found that few studies had attempted to explain the mechanisms underlying flow states in exercise (Jackman et al., 2019).

Overall, systematic reviews support a positive relationship between physical activity and psychological wellbeing (Weise et al., 2018; Zhang & Chen, 2019). However, the authors recommended that future research should explore the mechanisms that account for the relationships of physical activity with subjective and eudemonic wellbeing to advance the field (Zhang & Chen, 2019). So, the value of physical activity in improving subjective wellbeing is recognized, but whether this is through the proposed mechanisms of recovery, promoting psychological needs, or mastery needs to be illuminated (Weise et al., 2018).

Physical activity and the police

Most research attention surrounding physical activity and the police has considered police officer fitness (e.g., Lagestad & van den Tillaar, 2014; Schilling et al., 2019). In their

systematic review, Marins et al. (2019) found that research had focused on cardiorespiratory fitness, strength, and muscular endurance, as these variables are important health parameters required for police officers to perform operational duties (e.g., pursuits on foot, removing victims from accidents). It was recommended that police forces should increase promotion of fitness programs amongst their organizations, as police officers were classified as average on fitness components compared to the general population (Marins et al., 2019). In the UK, the National Welfare Survey found that only 24% of police officers engaged in the recommended physical activity guidelines (Houdmont & Elliott-Davies, 2016). Turning to my research, the direct relationship analyses in Study 1 supported that high physical activity was beneficial for the perception of operational stress (DRIVE model relationship 8; see Table 4.4). Therefore, an initial potential value of physical activity in the police is to support perceptions of operational demands (see Marins et al., 2019).

The moderation analyses in Study 1 indicated a potentially broader role and value of physical activity than the focus on police officer fitness. Physical activity behavior interacted with organizational stress and reduced the negative relationship with psychological wellbeing for police officers and staff who engaged in medium physical activity (i.e., if they met the WHO physical activity guidelines; DRIVE model relationship 12; see Table 4.4). However, there is limited research which considers physical activity in the police in relation to stress and psychological wellbeing (Oliver et al., 2021). Of the research which has, in a diary study of police employees across all roles in four police organizations, Sonnentag and Jelden (2009) found that participants perceived that physical sport activities (e.g., running, cycling) were useful for recovering from work stress, but tended to engage in these activities less after a stressful day. In particular, working long hours and situational constraints (e.g., missing information, failures in communication tools, equipment malfunctions) prevented sport participation. Instead, the police participants would be more likely to engage in low-effort

activities (e.g., watching TV, reading, listening to music) which were suboptimal for their recovery from work. The implication is that sport has a potential value in enabling police to psychologically detach and recover from work stresses (Sonnentag & Jelden, 2009).

However, as the low-effort activities were not physical activities, it would be interesting to know whether other forms of lighter exercise or movement hold similar value to sport (i.e., optimal recovery), or low-effort activities (i.e., suboptimal recovery) for the police.

Another potential value of physical activity for the police is as a coping strategy. In Anshel's (2000) conceptual model for coping, engaging in exercise is classified an adaptive form of avoidance coping and is suggested to have two stress-reducing benefits for the police: first, as a temporary escape from stress (in line with the distraction hypothesis); second, as an inoculation for stress (in line with the cross-stressor adaptation hypothesis). However, in a systematic review of coping in first responders, Arble et al. (2018) found that avoidance coping was related to impaired wellbeing in police officers compared to the other occupations (e.g., fire fighters, search and rescue personnel). They emphasized that exercise can be classified as approach or avoidant coping, as when exercising, some individuals contemplate stressors or relive painful experiences (approach), while others do not consider such experiences (avoidant). The unique pattern of coping in the police highlights the need for specific study of the role of physical activity in this occupation.

Due to the high stress experienced in work and limited time available to spend with family, Iwasaki et al. (2002) considered police workers a unique occupational group. Police who engaged in leisure coping (i.e., coping through engaging in leisure activities, such as physical activity) reported reduced stress in the short-term, and improved physical and mental health over time. Iwasaki et al. (2002) offered a variety of reasons as to why leisure coping was beneficial: it could provide a temporary escape from stress; socialization opportunities; experience of personal control/freedom; and, enjoyment. However, 'leisure' is subjective, so

while this might be physical activity for some, others might find it a chore, and perceive spending time with friends as leisure (Newman et al., 2014). Therefore, there is potential for physical activity to fulfil a variety of mechanisms that contribute to the experience of stress and wellbeing for the police, and a need to explore these possibilities further.

Conclusion

In this chapter, I have identified that physical activity was influential in the experience of stress and beneficial for psychological wellbeing in the partner police forces. In Study 1, work characteristics were associated with psychological wellbeing outcomes through the mediating mechanism of perceived job stress. I identified an underlying pattern whereby medium physical activity (i.e., meeting WHO guidelines) was a protective factor against the negative effects of stress. There is a need to understand the explanatory processes and *why* the concepts of stress, physical activity and wellbeing were linked. In the Interlude section, I identified several mechanisms in the wider literature that suggest the potential value of physical activity and might relate to the context of the partner police forces. Overall, physical activity might buffer the negative effects of work-related stress on health (Gerber & Pühse, 2009), provide detachment and recovery from work (e.g., Sonnentag, 2018), and/or offer a strategy for coping with stress (Anshel, 2000). Subjective wellbeing (i.e., affect and/or mood) might also improve in physically active police force workers, potentially through eudemonic wellbeing processes (e.g., fulfilling psychological needs, feelings of mastery, experience of flow; Biddle & Mutrie, 2008; Kimiecik, 2016). However, little previous research has considered the impact of physical activity on the stress processes of police employees whilst at work (cf. Häusser & Mojzisch, 2017), or considered physical activity from a wellbeing perspective in police forces (Oliver et al., 2021). Qualitative research is needed next to provide an insight into the processes that might explain the findings in Study 1, from the perspective of police officers and staff in the partner police forces.

Chapter 5

Study 2a and Study 2b: Qualitative insights from the workforce

Introduction

In this chapter, I aimed to gain deeper insight into physical activity as a potential driver for psychological wellbeing, from the perspective of the workforce. I set two objectives to address this aim:

1. To conduct focus groups to explore the relationship between physical activity and psychological wellbeing for the workforce (Study 2a);
2. To conduct individual interviews with inactive (low physical activity behavior) police officers and staff to establish the barriers and enablers to their physical activity behavior (Study 2b).

To clearly explain my procedures and stay close to the context, Chapter 5 is presented as two studies. In Study 2a, I address objective 1, and in Study 2b, I address objective 2.

Study 2a - Introduction

Physical activity is a protective factor for psychological wellbeing (Biddle & Mutrie, 2008), and a strategy for coping with stress (Park & Jang, 2019). Workers in stressful occupations, such as the police, are suggested to benefit from physical activity to reduce stress because it can support mood regulation, provide a temporary escape from stress, socialization opportunities, enjoyment, and experience of personal control and freedom (Iwasaki et al., 2002). As such, multiple reasons have been offered to account for the role that physical activity has in work-related stress. However, physical activity has only recently been theoretically integrated with occupational health psychology (Häusser & Mojzisch, 2017) and is relatively unexplored in police forces. Given that police force workers are an occupational group facing a unique combination of stressors that negatively impact their psychological wellbeing (Duran et al., 2018), there is a need to understand why physical activity might benefit this occupational group specifically.

Lagestad and van den Tillaar (2014) offered three reasons as to why physical activity

is important for police officers: (1) to have the physical fitness to deal with work-related demands that require physical force; (2) to keep healthy; and, (3) to support their psychological wellbeing. To date, research has focused on physical fitness (e.g., Marins et al., 2019), and health (e.g., Schilling et al., 2019), but not yet upon psychological wellbeing. Further, research has also focused attention on police officers, despite findings that lack of exercise is a stressor for both police officers and staff (Demou et al., 2020; Jackman et al., 2021). Consideration of the various roles in policing is therefore needed to enhance understanding of physical activity across the diversity of the workforce and to offer an equality of wellbeing support.

The aim of Study 2a was to explore the relationship between physical activity and psychological wellbeing in two British police forces. To develop knowledge of psychological health in the police, qualitative methods are required (Deschênes et al., 2018), and can elucidate the mechanisms underpinning the potential role for physical activity for police psychological wellbeing, rather than using quantitative methods with pre-determined responses. Focus groups were used to provoke an exchange of views from police officers and staff to add new knowledge to the understanding of physical activity, work-related stress and psychological wellbeing for this occupational group⁷.

Method

Design

Focus groups were employed to explore the relationship between physical activity and psychological wellbeing for the police workforce, as a range of participant perspectives can be explored simultaneously, providing exchanges and ideas that cannot be gained from an individual interview (Sparkes & Smith, 2014). Through group exchanges, focus groups could, therefore, produce insight into the relationship between physical activity and wellbeing

⁷ The individual interviews were used in Study 2b.

that would be less accessible with other methods (e.g., individual interviews). In a focus group, the researcher acts as a facilitator, encouraging interaction by inviting participants to share experiences and explore differences as well as similarities (Bloor et al., 2001). This can cultivate a broader understanding of the causal processes explaining the phenomena in question (Goddard et al., 2022), and so can address a key concern of the critical realist approach I set out in Chapter 3.

Participants

Purposeful random sampling was used, whereby participants were invited to take part in a research project exploring physical activity and wellbeing in the police. To ensure a range of voices were present in each focus group, and that both police officers and staff participated, a human resources (HR) administrator populated the focus groups. This also ensured that power relationships were avoided (i.e., a supervisor was not placed in the same focus group as someone who they directly supervised). Four focus groups were conducted (two in each partner police force) across a total of 20 participants (see Table 5.1). Participants were aged 26 to 55 years, with between two to 25 years' service in the police.

Table 5.1 Focus group participant matrix.

Force A			Force B		
Role	Level	Gender	Role	Level	Gender
Group 1 (N = 4)			(N = 5)		
Staff	Practitioner	Female	Officer	Middle Manager	Female
Officer	Constable	Female	Staff	Supervisor	Male
Officer	Sergeant	Male	Staff	Supervisor	Female
Officer	Inspector	Female	Officer	Constable	Male
			Staff	Practitioner	Male
Group 2 (N = 3)			(N = 8)		
Staff	Practitioner	Female	Officer	Constable	Male
Staff	Practitioner	Female	Officer	Constable	Male
Officer	Practitioner	Female	Officer	Constable	Male
			Staff	Practitioner	Female
			Staff	Supervisor	Female
			Officer	Sergeant	Male
			Officer	Sergeant	Female
			Officer	Inspector	Male

Materials

A focus group guide was piloted in one police force (Force A; $N = 4$). The focus group guide was structured so that participants were first asked about physical activity, then wellbeing, what possible strategies might support wellbeing at work, and any barriers or facilitators to workplace wellbeing interventions. When reflecting on the pilot focus group, I found it did not focus in sufficient depth on the research aim of exploring the relationship between physical activity and psychological wellbeing. Rather, participants had tended to complain about low wellbeing and the issues they experienced at work. Following the pilot, the focus group guide was amended to three sections: 1) physical activity and work; 2) the role of physical activity in wellbeing; and 3), included a ‘focusing exercise’. Focusing exercises are useful tools in keeping focus group participants on task (Bloor et al., 2001). Personas are a focusing exercise used in Double Diamond research (e.g., Jilka, 2019), in which a fictional person with typical goals and characteristics of the target user are depicted, and participants are asked how a product or concept might work for that persona (Babich, 2017). As such, personas could be used to guide focus groups discussions to explore the relationship between physical activity and psychological wellbeing for the fictional characters depicted, rather than centering on the participants’ work-related complaints.

For Study 2a, five personas were developed and added to the focus group guide (Appendix 4) to facilitate focus group participants in considering the role of physical activity for the wellbeing of inactive police officers and staff. I set up the personas guided by Babich’s (2017) example and then developed them further with the steering group to depict realistic context-specific details in the personas. Each persona was of a police force worker with low physical activity behavior, and entailed their fictitious demographic information, needs, motivations and goals. For example, ‘Katie’ was a police constable with caring responsibilities that were causing stress and taking a toll on her health, whereas ‘Callum’ was

a new officer on probation who wanted to make a good impression at work but had low confidence (see Appendix 4). The personas were used to prompt focus groups participants to discuss how physical activity might relate to the psychological wellbeing of each persona.

Procedure

A vlog and participant information sheet (Appendix 5) were put on the internal intranet in both partner forces inviting potential participants to take part in a research project exploring physical activity and wellbeing in the police. Prospective participants were asked to email the researcher, who provided a consent form (Appendix 6). When the consent form had been completed, the researcher gave the name and email address of the participant to the HR administrator who populated the focus groups.

All focus groups took place on police property. At the start of the focus group participants completed a demographics questionnaire. The focus groups lasted between one hour 42 minutes to one hour 54 minutes in length (M : one hour 48 minutes; SD : 4.99). The focus groups were transcribed verbatim by the researcher.

Analysis

Thematic analysis (TA) is a flexible method to qualitative analysis that can be applied in different guises and can be used in a critical realist approach (Braun & Clarke, 2022). Reflexive TA was used because I (the researcher) have a role in knowledge production (Braun & Clarke, 2019), by accessing the truth (which is ‘out there’, it has not been constructed or created by participants). In this method I am *developing* an understanding of the causal explanations for physical activity as a determinant factor for psychological wellbeing in the police force context.

Reflexive TA involves a six-phase process, which Braun and Clarke (2022) emphasize is not linear, but recursive. The phases, as they happened in Study 2a were:

1. Phase 1: Familiarization with the dataset: I began by reading and re-reading the focus group transcripts to immerse myself in the data;
2. Phase 2: Coding: In Chapter 4, using the DRIVE model enabled a conceptually accurate assessment of stress and wellbeing in the police. Therefore, I conducted deductive analysis, using the DRIVE model concepts to shape and develop initial code labels;
3. Phases 3: Generating initial themes: Codes which I perceived to share an idea (or central organizing concept), were grouped into themes. I used the DRIVE model as a thematic map to represent the themes and visualize how they might relate;
4. Phase 4: Developing and reviewing themes: To review the initial themes I asked analytical questions in this phase, such as; “What is missing here?”, “Have patterns been identified that are not really there?”, and “Do themes highlight the most important patterns in relation to the research question?” I identified that there were codes that sat outside of the DRIVE model thematic map, and while the research question to Study 2a could be answered, these codes were relevant to Study 2b. I therefore went back to Phase 3, to analyze the data that had not been captured deductively using the DRIVE model concepts from an inductive analysis approach;
5. Phase 3: Generating themes: I looked to develop themes that were driven by the data content;
6. Phase 4: Developing and reviewing themes: I revisited the analytical questions previously outlined to review themes;
7. Phase 5: Theme development, refinement and naming: I wrote a brief synopsis of each theme to explain what story each theme told;
8. Phase 6: Writing up: In writing up the analysis I refined the detail of the focus group contexts to bring the whole story together.

Rigor

To demonstrate rigor, the research questions, data collection and analysis have been clearly aligned to critical realism. Further, processes of member reflections, reflexivity and critical friends were used (Smith & McGannon, 2017). Member reflections are a co-participatory process that can provide participants with an opportunity to elaborate on their thoughts (Smith & McGannon, 2017). For this research, participants were involved in member reflections in two stages; after transcription with the initial themes that were developed from each focus group (Phase 3), and then again once all focus groups had been conducted and analyzed (Phase 5). That is, participants were able to read and comment on the analysis at these two stages, so that any gaps in the findings and interpretation could be discussed further.

During the research process, I kept a reflexive journal to provide insight into my own internal responses during the focus groups, and as to how understanding changed during the analysis process (Sparkes & Smith, 2014)⁸. This process can enhance critical engagement (Braun & Clarke, 2022), and supported conversations with critical friends. My supervisory team acted as critical friends; challenging the explanations put forward (i.e., the developing themes, names of themes), which I could better justify with use of the reflexive journal. The critical friends process was not to achieve consensus, rather to offer different perspectives and support the development of a coherent interpretation of a particular context (Smith & McGannon, 2017).

Results

In Study 2a, the aim was to explore the relationship between physical activity and psychological wellbeing for the police workforce. I identified three themes using deductive

⁸ I used the reflexive journal throughout my research program, as such, reflections on my assumptions and position as a researcher are presented in Chapter 8 'Reflection'.

thematic analysis and the DRIVE model of work-related stress: 1) effects of physical activity; 2) experience of work demands and resources; 3) mechanisms. I developed a fourth theme from inductive thematic analysis; factors relating to physical activity behavior change. The structure of the focus group results (how they were derived, the main themes and subthemes) are presented in Table 5.2.

Table 5.2 Structure of focus group results

Analysis	Main theme	Sub themes
Deductive analysis – DRIVE model concept ‘psychological wellbeing outcomes’	1. Effects of physical activity	1.1 Physical effects 1.2 Psychological effects
Deductive analysis – DRIVE model concept ‘work demands and resources’	2. Experience of work demands and resources	2.1 Demands 2.2 Support
Deductive analysis – DRIVE model concept ‘perceived job stress’	3. Mechanisms	3.1 Perception of stress 3.2 Feelings of self-determined motivation
Inductive analysis	4. Factors relating to physical activity behavior change	4.1 The influence of others 4.2 The individual 4.3 The environment

Effects of physical activity

My deductive analysis identified that participants perceived a range of effects of physical activity, which related to the DRIVE model concept of ‘psychological wellbeing outcomes’. I categorized this into two subthemes: physical effects and psychological effects.

Physical effects

Participants referred to a range of positive physical effects, such as heart benefits, being more supple, and improved sleep, due to physical activity. For example, Liz, police staff (Force A, Group 2), had increased her physical activity behavior following a diabetes diagnosis, in order “...to increase my strength, and lose weight, but get healthy”. Participants felt that physical activity had to raise their heart rate to be effective for physical health, but also discussed that physical inactivity had negative effects for their physical health. They

reported feeling stiff, lethargic and that they had physically changed shape from sitting down for prolonged periods of time at work. Jackie, police staff (Force A, Group 2) said:

I've only been there [office-based location] 18 months, but I've changed shape. I've done my own research, it's perfectly normal. So, my clothes don't fit and I've put on a bit of weight as well, because I'm sitting on my bottom I've changed shape. You get a stand-up desk if you've got a bad back, how about we get one before we have a bad back.

The physical effects of physical activity were therefore recognized in relation to physical health in the long term. Participants engaged in physical activity to improve their longevity, and over time recognized that physical inactivity led to weight gain and musculoskeletal issues. As such, physical activity related to positive physical health outcomes, and physical inactivity related to negative physical health outcomes. Physical activity has previously been identified as important for police to take care of their health (e.g., Lagestad & van den Tillaar, 2014), and more recently sedentary behavior has been identified as a health risk for police (Brierley et al., 2021).

Psychological effects

My analysis found that participants engaged in physical activity because they perceived different psychological benefits. Diane, Maddie, Ross, and James (Force B, Group 1) described the positive psychological effects of physical activity for them:

Diane (officer): You feel better afterwards [after exercise], definitely. You feel more awake, more alert and you do feel better.

Maddie (staff): Yeah it helps you wind down as well. I used to run, not very far and not very fast, but I did use to run, and it's your thinking time isn't it. It's a way of getting rid of all that sort of stress.

Ross (officer): De-clutter.

Maddie (staff): Yeah, de-clutter.

James (officer): I cycle, it's the same thing, you end up on a country lane, middle of nowhere, just get yourself lost and you don't worry about anything, everything just drifts and you've got no problems at all.

The psychological benefits that participants discussed reflected previous research that reports the 'feel good' effect (Biddle & Mutrie, 2008) and a heightened sense of wellbeing following exercise (Buckworth et al., 2013). Part of the effect described by participants

related to cognitive functioning; they felt more alert and mentally clearer following physical activity, as it had enabled them to get rid of stress, forget troubles, or have a break from work. Therefore, participants were capable of being physically active at work, because they knew the psychological benefits of physical activity. Overall, participants discussed the psychological effects of physical activity in more depth than the physical effects. Schilling et al. (2019) suggested that occupational stress was more closely related to psychological health than physical health in the police, and so exercising to support psychological wellbeing might be important in a workforce operating under stress.

Experience of work demands and resources

Police employees discussed how physical activity influenced their experience at work, and analysis indicated two work characteristics were interrelated with physical activity behavior: demands; support. These related to the DRIVE model concept of ‘work demands and resources’.

Demands

There was a need for police officers to engage in physical activity to meet the physical demands of their job, and as a requirement to pass their job-related fitness test. Joe and Gina, both police officers (Force B, Group 2) explained:

Joe: The fitter you are, the more capable you are, especially when we go into certain situations where we have to restrain people, the physical exertion takes it out of you. Obviously the stronger you are, the fitter you are, the less energy you use and you’ve got more energy afterwards when you’ve taken them into custody to crack on with the work afterwards.

Gina: It’s a good point, because we’re expected to pass a fitness test every year, you’re expected to keep your fitness up and years ago you used to have 2 hours a week, you got given time to train. That’s all gone, but there’s still the expectation that you pass the fitness test or you’re on the naughty step.

Because they were physically active, participants perceived they were more able to meet their work demands, but the requirement to do so could be experienced as a further demand. Whilst police staff do not have the same operational requirements to be physically

fit, physical activity still enabled them to perform their duties. Dave, police staff (Force B, Group 1) said “I find that if I shut down physically, my mind shuts down as well and you don’t perform as well as you can or normally do”.

There were also external demands of working for the police that related to physical activity, as both officers and staff felt that they could not be seen by the public to have any time for themselves, including looking after their wellbeing. The need to put work demands above personal health needs permeated across health behaviors, from exercising to eating.

Jackie and Catrin, both police staff (Force A, Group 2) gave an example:

Jackie: All 300 [of our department] were all invited to do this run, we had an hour off work, it was to raise money for something in London, but we were all given an hour off work to go and run - we were given time to practice. That’s just a small thing which took no effort from a boss. If you can do those small things it will bring people together, such as using lunch hours, using after work time. So you’re not having to give free time.

Catrin: It’s really tricky see when you’re in an organization where you’re government funded. I think people don’t like to be seen giving time, or things out freely because you are being paid by the government. Whereas if you are in a private organization and you’re using the bosses money then that’s not frowned up on. We are very criticised by the public ‘oh we’re paying for those police officers and guess what, they were there sitting in the park having their lunch!’ So we’re under the spotlight for things because we’re heavily scrutinised by members of the public.

Therefore, across focus groups, participants explained that physical activity helped them to fulfil the demands of their jobs. However, the demands of their job also made it challenging to be physically active, and so my analysis indicated an interaction between physical activity and the experience of work demands. That is, there is no opportunity for physical activity at work due to the demands, so an individuals’ physically active behavior is reliant on their own capability (e.g., knowledge, awareness) that being active will support their experience of demands and wellbeing at work.

Support

My analysis identified that where there had been previous physical activity initiatives in the police forces, participants felt supported by the organization, their supervisors, and

each other. Liz, police staff (Force A, Group 2) explained how she felt supported by her supervisor allowing her to use her lunch break to go to the gym:

The workplace benefits greatly from me being healthier and mentally more in tune with my body, and my desire to improve that. The fact that my boss is supporting that, our relationship is better. I work a lot harder, particularly in the afternoon when I come back from the gym, because I'm pumped up ready to go.

She went on to say, "I've got two supervisors and I'll walk over hot coals for them".

Liz also said that this support extended throughout her team, "...there's an entire team that will do anything for those people [supervisors]". This suggests that, not only do supervisors create the social opportunity for physical activity, but a team which feels supported by their supervisor will, in turn, also support their supervisor. This finding is in line with organizational support theory (Eisenberger et al., 1986) and previous research which has found that police who feel valued by their supervisors, and/or the organization have high motivation and engagement at work (Gillet et al., 2013).

Supporting physical activity could also break down barriers between ranks at work, create friendships and contribute to team bonding. Claire, Gina, and Joe (Force B, Group 2), discussed a step-based physical activity challenge that had recently been held in their force:

Claire (staff): You spoke to people who you might not have even spoken to before. For example, the next department might be a nice quiet department and you have a slightly more boisterous department who would get hyped up by it [the steps challenge] and start bantering with the quiet ones next to them 'oh yeah we're gonna beat you', and it got the engagement, it got communication. So it wasn't so much you'd walk down the corridor and say 'hiya', you'd say 'oh seen your score yesterday, you weren't very good!' It's that kind of thing, it broke down barriers.

Gina (officer): Or you'd see someone's pedometer and you'd go 'oh!!'

Joe (officer): On the steps thing a lot of people in *role* thought it was absolutely pointless getting involved. Because we are in a car from a call to the next call. So we're never building up steps, if the job wants to create something that is for everyone they need to take into consideration that maybe your office worker will get more steps in than those just in cars going to calls all the time. Come to some sort of decision.

Gina (officer): I don't know, I got very few done during the day because you're constantly at a desk or on the phone, so I'd think 'oh my god', because my watch beeps if I haven't moved after an hour, so then I'd have to cram in as much as [steps] I can. I found it hard to get em [steps] in.

The exchange also highlights some of the differences between police officers and staff, as the step-based physical activity intervention felt ‘pointless’ to Joe, a police officer. Perceptions of a lack of consistency were identified, as within all focus groups there was debate amongst officers and staff as to which role was more supported to engage in physical activity, creating a feeling that there were different rules for different people at work. In a wellbeing initiative in Force A, all departments were allowed time during work to look after their wellbeing. Amanda, a police officer (Group 1) described this as creating a divide between officers and staff, as typically police officers could not take their wellbeing time, but staff could. She said “...it does cause rifts doesn’t it. If you have one team ‘getting away with it [taking wellbeing time]’. It does cause animosity”.

Overall, there was agreement that police organizations should support employees to be physically active at work, but a similar divided situation was described in Force B, by Dave, Diane, and Ross (Group 1):

Dave (staff): When we say about your individual bosses finding you that hour [to exercise], it’s not common throughout the force, it’s individual management, different types of management.

Diane (officer): I think managers just need to all come together and speak about it, and make some sort of pact that they’re going to allow [time to exercise].

Ross (officer): Yeah its not organizationally entrenched is it, in terms of that. Look at our colleagues in the fire service they train every day.

Therefore, the support of physical activity was not equal in either police force, rather it was down to individual managers as to whether those they supervised could exercise. All focus groups discussed how much time should be allowed for physical activity, for example getting half an hour or an hour during lunch. This related to a need to quantify time, and a police culture that is driven by a hierarchical structure, figures, and performance targets.

Mechanisms

My analysis identified two mechanisms to explain why physical activity was related

to psychological wellbeing and the experience of stress at work, represented in two subthemes: perception of stress; feelings of self-determination. I interpreted that the first subtheme related to the DRIVE model concept of ‘perceived job stress’ and developed the second subtheme from an inductive analysis approach.

Perception of stress

In all focus groups participants emphasized the stress associated with their work and spoke about physical activity as influential in their experience of stress. Jackie, police staff (Force A, Group 2) said physical activity helped to “...feel clearer, you feel perhaps more able to actually face it [demands], to deal with it”. This suggests that physical activity enabled Jackie to reappraise the situation, something also discussed by Martin, Amanda, and Zoey (Force A, Group 1):

Martin (officer): I find that I do my best thinking when I train. Certainly when I’m running. I enjoy that sort of solidarity. The solace of being out on my own, whether I’m going on my bike or I’m running. At one point I even thought I’d take a little notepad out with me, cos I get really good ideas when I’m running, and then by the time I get back its gone.

Amanda (officer): I’m slightly different, I try and forget about everything when I’m out, and then I think better when I get back.

Zoey (staff): But either way it has benefitted you.

For Martin, exercise provided an opportunity to actively think and problem solve, whereas Amanda preferred to suspend her thoughts. Both relate to ways that physical activity can be perceived as an effective way of coping with stress and influence perceptions throughout the stress process.

Feelings of self-determination

In self-determination theory (SDT), it is posited that three basic psychological needs (relatedness, competence, autonomy) are the ‘nutrients’ for individuals to experience wellbeing (Martela & Ryan, 2021). The focus group discussions were found to relate to the basic psychological needs, which are central to motivation. In all focus groups, the loss of team ethos within the police service was described. In particular, the removal of canteens

from police stations was said to have contributed to a lack of communal areas for police officers and staff to interact with each other, and so contributed to a lack of relatedness. Supporting physical activity was seen to provide a social opportunity to reconnect the workforce, and as such, held the potential to fulfil the need of relatedness and improve wellbeing. Ben, a police officer (Force B, Group 2) explained:

From my experience, I helped get the gym in *location* up and running, with running machines and rowing machines. I've felt a massive change in all the shifts, it's started bringing the shifts together as teams as opposed to individuals. Because now they're meeting up before work, and working out as a team, and then on night times they'll go down there and work out together, and it's small little families as opposed to being individuals.

The majority of participants in the focus group agreed, but Kirsty, police staff (Force B, Group 2) had a different experience:

I think you're all talking about team spirit, but sometimes in an office, it can be completely different. In some cases it is a lot harder to be able to get up out of your desk, with people wondering where you are 'when's Kirsty coming back from lunch? She's been 20 minutes', and as soon as you're back in the office you've got to get back to it straight away. It's horrible.... I think everything has got a knock-on effect, because we are all demoralized, we don't want to do anything that's involving work. That's all to do with your wellbeing.

Kirsty was relatively quiet during the focus group, but spoke out on this issue passionately, and so the need to bring colleagues together and support wellbeing was evident through her perceptions regarding team ethos, spirit, and relatedness.

Supported by the use of personas, participants indicated that exercise could build confidence in inactive individuals, but that individuals needed to find a form of physical activity that they enjoyed and had chosen to do themselves. This related to the basic psychological needs of competence and autonomy. For example, Lydia (Force B, Group 2) said that "...learning something new can be key", and:

The first thing that jumped out at me was the importance of talking to Katie [persona], and her coming up with what she can do. So, somebody sitting down with her and asking the right questions, cos she will commit to it more than if she's the one who has decided 'yeah, I think actually I could find 10 minutes before I get to work, I could get there 15 minutes earlier to do something'.

It could therefore be said that, through fulfilling relatedness, competence and autonomy, physical activity can support wellbeing at work.

Factors relating to physical activity behavior change

While conducting deductive analysis using the DRIVE model of work-related stress, I found that there were still themes that had not been captured but could be relevant to answering the research question posed in Study 2b. Prompted by the personas, and drawing on their own experiences, participants had discussed factors for how to change physical activity behavior. From an inductive analysis approach, I developed this into a fourth main theme ‘factors relating to physical activity behavior change’, with three subthemes identified: the influence of others; the individual; the environment.

The influence of others

Participants explained that others would be influential in encouraging individuals who were not already physically active to engage with exercise as a new behavior. Liz and Catrin (Force A, Group 2) gave examples of what had worked:

Liz (staff): She [colleague] was chatting to me, she’s a police officer so she goes to the gym a lot because she wants to stay fit. She said ‘come with me and we’ll go down the gym together, if you go about 2 o’clock there’s not usually that many people there’. So we went and she showed me how to use the machine and she was so supportive, cos I couldn’t run, and she said ‘no, just walk at a pace’ and she talked me through it. We only did it twice, then I was like ‘yeah, I’m going to the gym’, when she wasn’t in. When you are in that gym, other people are so friendly. I’ve had somebody send me a program on exercises I can do. Because they’re fit and healthy, I think they appreciate that I’m making the effort.

Catrin (staff): It’s the same for us, we volunteer our time to help people [in couch-to-5k]. It’s nice when the group is small and manageable, because people do need that 1:1 reassurance a lot of the time. If you get people in a big group they worry about being last on the run, they worry about holding people up. So you need a few volunteers that are happy to give that 1:1 support to someone. You’ve put that person on the right path, you’ve helped them initially, they’re then going to find time in their own lives to fit a run in because they want to go out for a run, or they want to do a keep fit class. I think if you can just invest in that initial period that you’ll have people more willing to do it.

Liz (staff): Couch to 5k is a lovely thing, it really is, but with me I would never have applied for it because I don’t want to stand there in a pair of trainers and a t-shirt in front of these people who I assume are slim and fit. They’re not. But I’m assuming they are.

Across focus groups there were further suggestions that social support could be formally provided through fitness buddies or mentors to increase the physical activity behavior of the inactive personas. Having another individual to reassure them was seen as key for inactive individuals having the social opportunity to be physically active and having the confidence and motivation to overcome barriers to starting physical activity. The role of senior staff was also identified as important to endorse physical activity, because as role models, senior staff could positively, or negatively, influence physical activity at work.

Denise, a police officer (Force A, Group 1), said:

I think the buy-in from above is important as well, not just because you get that driving force to get the funds in and to get the initiative off the ground, but it gets back to time allowed. People being allowed to do it [engage in a physical activity initiative].

This highlights the permission culture within police forces, where employees need to be allowed, or perceive that they are allowed, to engage in a behavior. Therefore, to successfully support physical activity at work, positive influence from senior staff as well as individuals would be needed.

The individual

In all focus groups, it was discussed that while others could influence behaviors at work, there was also individual responsibility for physical activity. Participants acknowledged their own differences - they enjoyed different types of physical activity for different reasons, and so inactive individuals would also have different perspectives. Martin and Zoey (Force A, Group 1) explained:

Martin (officer): I think with having physical activity for a goal, that has to be down to that individual. It has to be the person that wants to do it, whether they want to do it because they want to beat their personal best, or they want to get into a dress or pair of trousers, whatever it might be. The amount of times I have wanted to say to people 'come on', but you can't. And I don't know why that is. Because if I'm sitting down with somebody the last thing I'm going to say to them is 'come on, you need to do a bit more [exercise]'. Because it's probably shunned upon and all of a sudden I'm a bully. But actually you want to try and get people [active], because otherwise it won't happen.

Zoey (staff): I think a lot of it is to try and change people mindset as well. Exercise, it doesn't

have to be a punishment, it is part of a lifestyle, it's to see the bigger picture. You joined the job for 30 years, you can't then think 'well I can do something that I hate doing every week'. You're never going to keep it up. It's got to be something that you can see yourself doing and believe is going to benefit you.

Having fun was an important factor to encouraging people new to exercise, as it would serve to provide automatic motivation to do so. Participants suggested ways to raise awareness of non-traditional forms of exercise that might be more inclusive and fun for all abilities. They perceived that the inactive personas might be put off physical activity as the emphasis was often on the gym or running. The quote also highlights some of the adverse consequences in relation to physical activity at work. As a more senior officer, Martin perceived that he would not be able to push a persona to be active in case he was deemed a 'bully'. On the other hand, the less senior staff in the focus groups perceived that they could not be physically active because of a stigma that work should come before individual needs. That is, they did not feel able to prioritize their own wellbeing whilst at work.

Prompted by the personas, participants acknowledged that not everyone valued physical activity, but often referred to times when doing something for charity had successfully motivated physical activity at work. Denise, a police officer (Force A, Group 1), explained:

I did the half marathon as part of a team. We were doing it cos, one of the lads, his daughter had been diagnosed with cancer. There were 25 of us that ran it. So we had that focus to raise money for the charity that provide real hair wigs for children. So that was a driving force, but it goes back to having a focus and a reason, and whatever happens you're going to do it, cos you're not going to let that person down or let the rest of your team down. So the days where you might feel 'oh no I can't be bothered today', there was always somebody who would say 'come on we'll go out'. Cos we could go out, we did run at the end of the working day. Very rarely during the working day, because of the lack of time, but, people would go out. They'd either run on their own or they'd run as part of a group. That support was something. It's having something that people can do at any level. Because sometimes I think, when somebody is dismissive of it [physical activity], it's not about the fact that they actually don't think it's a good thing, but they doubt their own capability or capacity to be able to do it.

Therefore, while individual motivations and preferences would determine individual behavior, police employees shared core values of helping others that had previously worked

to support physical activity at work. As the police are professional helpers (Brown, 2011), it follows that helping to support a meaningful charity would motivate a physical activity behavior that was otherwise outside of the norm. In this quote Denise also highlighted that less active individuals might have a different perspective to those who were physically active, suggesting that lack of physical capability might be a barrier, not a lack of motivation.

The environment

The environment was identified as a theme that influenced physical activity behavior. This included the facilities that were provided at work, as participants explained that providing the physical opportunity and good facilities for physical activity would encourage employees to use them. For example, there should be gyms with showers and lockers at every police station. In some contexts, this was the case, but it was not consistent across either police force. Participants also suggested small steps that could be taken to increase awareness, and therefore capability, as to how police could be physically active in work. For example, by improving communication about the existing police sports and providing information and advice about integrating physical activity into work. Sian, a police officer (Force B, Group 2), had an additional idea:

We've got spaces in HQ, corners which just have junk in. You go down along the river they've got pieces of exercise equipment, so as you're walking along there you use it. All it is like a little pipe, or a seat and a pedal and you start pedalling. Or there's one for your arms, a step up and step down. It's all random stuff like that, wouldn't cost a huge amount, you put it in a corner somewhere, so you go past, and go 'oh ok then...'

The working environment was also described as not conducive for physical activity, as Richard also a police officer (Force B, Group 2), explained:

I think it's just [lack of] resources everywhere, when I first joined you had 9 or 10 [officers] on a station, now you're lucky if you have 2 or 3, and they're rushing about massive areas now as well. I've seen in the last 2 months a student has come back and they're all happy, jolly, can't wait to go out, then they can't believe what it's like... you give them expectations but they have no idea until they actually go out and see what is going on. Then you see them all drop out of these groups like netball, hockey and things because they just haven't got the time or are stressed and shattered.

Therefore, while participants perceived benefits of physical activity for their experiences of stress at work, the stressful environment was also identified as negatively impacting physical activity behavior and depleting their automatic motivation to engage. Previous research has also reported that work demands and stress prevent police from engaging in sport (Sonnentag & Jelden, 2009).

Preliminary discussion

The objective of the focus groups was to explore the relationship between physical activity and psychological wellbeing in the partner police forces. Four main themes were found using reflexive thematic analysis. First, using deductive analysis and the DRIVE model framework to explain the role of physical activity in police wellbeing, the main themes of: effects of physical activity; experience of work demands and resources; and, mechanisms, were identified. The fourth main theme, factors relating to physical activity behavior change, was developed from inductive analysis. In this preliminary discussion, the focus group themes are used to outline how the Study 2a findings informed the interviews in Study 2b.

The first main theme, effects of physical activity, represented participants' perspectives of positive physical and psychological effects from physical activity. The interaction of physical (e.g., improved health, improved strength) and psychological outcomes (e.g., improved mood, improved cognitive functioning) from physical activity, or the 'mind-body relationship' helps explain why exercise makes individuals feel good (Biddle & Mutrie, 2008). The psychological outcomes of physical activity related to subjective wellbeing, as following exercise participants described a reduction in negative affect and/or an increase in positive affect; two of the dimensions in subjective wellbeing (Diener, 1984). Further, physical activity enabled participants to reduce stress, which improved their cognitive evaluation of their life. That is, physical activity increased their satisfaction, the third dimension of subjective wellbeing.

Physical activity was related to participants' experience of work demands and resources, represented in two subthemes of work demands and support. Participants reported that the effects of physical activity enabled them to fulfil the demands of their roles, but the demands of their roles also presented a barrier to being physically active. Police officers explained that they need physical fitness to perform operational demands (e.g., controlling aggressive suspects), but that they were not consistently supported by the organization to maintain their fitness and did not have the opportunity to do so. When physical activity was supported, participants in Study 2a indicated that they felt supported by the organization, their supervisors and/or each other. According to organizational support theory, this in turn can benefit the organization, as where workers perceive that support is available to effectively fulfil their roles (e.g., through physical activity), there can be an increase in work-related affect, engagement, performance, and desire to remain in work (Rhodes & Eisenberger, 2002).

In addition to the operational demands, my data analysis suggested that physical activity might also alleviate organizational demands (e.g., working with colleagues, time pressure, inadequate resources; Purba & Demou; 2019) for police officers and staff. Participants had improved energy and felt more alert when they were physically active, findings which supported the growing evidence that physical activity improves cognitive functioning and work performance (Ratey & Loehr, 2011). I also found that further external demands (e.g., public criticism) associated with working in the police force limited physical activity. Although physical activity has the potential to improve the experience of work characteristics in police forces, there is a need to understand how the barriers presented by contextual work demands could be addressed to realize this potential (i.e., how the opportunity to engage in physical activity behavior could be afforded to officers and staff).

Two mechanisms were identified to explain why physical activity was related to

psychological wellbeing in the police workforce. Participants explained that physical activity enabled them to reappraise a stressful situation and improved their perception of coping resources. Some participants engaged in problem-solving during physical activity, an analytical approach to coping (problem-focused or approach coping), whereas others would avoid attending to their stressful situation during exercise but feel less distressed by it (emotion-focused or avoidant coping; Anshel, 2000; Lazarus, 2006). Physical activity can fulfil various coping functions, and in doing so has a positive influence on affect (Buckworth et al., 2013) and stress reducing benefits (Anshel, 2000)⁹. Other theoretical mechanisms (e.g., the distraction hypothesis), also suggest that exercise positively influences wellbeing as stressful stimuli are temporarily avoided (i.e., emotion-focused coping). The findings from Study 2a (and Study 1) suggest that ‘perception of stress’ is an appropriate mechanism as it encapsulates the stress process and central tenet of the DRIVE model. That is, appraisals of demands and coping options are encompassed in the mechanism, all a means through which physical activity can improve wellbeing. However, the perception of stress mechanism could not explain all the findings. Participants referred to the relatedness that physical activity at work gave them. They felt physical activity at work improved relationships with supervisors, helped teams reconnect by working out together, enabled new friendships to be made, and removed hierarchical barriers. Further, participants explained that physical activity could enable inactive individuals to learn something new and see their progress (i.e., build competence), and exercise some control over the goal and activity they were pursuing (i.e., develop autonomy). In the analysis process, I identified that this reflected the three basic psychological needs in SDT, and that fulfilling these needs explained why physical activity activated eudemonic wellbeing processes (Ryan & Deci, 2001). To integrate physical activity

⁹ The potential value for physical activity as a coping strategy for the police was introduced in Chapter 2 ‘Literature Review’ and the Chapter 4 Interlude.

into the occupational health literature, Häusser and Mojzisch (2017) proposed that feelings of self-determination were an underlying mechanism explaining the positive effect of physical activity on health and wellbeing; suggestions supported by Study 2a.

Focus group participants gave suggestions for how to support inactive police officers and staff to change their physical activity behavior. Three subthemes were found to represent these factors (the influence of others, the individual, the environment). Of these three subthemes, the influence of others was emphasized and resonated with existing police research that has outlined a need to place greater importance on occupational social relations (Deschênes et al., 2018) and social norms (Krick & Felfe, 2020). The police hierarchy and permission culture were identified as relevant to physical activity behavior within this subtheme and relate to the social opportunity needed for police to engage in physical activity at work. Throughout the police literature, senior management and supervisors are emphasized as important for police wellbeing (e.g., Houdmont et al., 2019a).

In my research, mentoring was a popular suggestion by participants, based on the idea that a mentor (or ‘fitness buddy’) could encourage, signpost, and be a companion for an inactive individual taking the first steps to being more physically active. It was notable that in an occupation where social support is not typically sought (Gill et al., 2018; Jackman et al., 2020) and that has been described as ‘socially isolated’ (Brown, 2011), a lot of the ideas for increasing physical activity behavior from Study 2a centered around ‘others’ and social support, suggesting that this is an area of need of development. In the extant literature, there are examples where social relations have been a positive influence in police forces; a formal mentoring program was found to have benefits for English police officers’ mental health (Gill et al., 2018), and ‘peer-facilitators’ with lived experience of trauma were found to enhance the delivery of a physical activity intervention for emergency services workers in Australia (McKeon et al., 2021). Both Gill and McKeon’s research groups reported that the mentoring

and peer-facilitator roles benefited the mentors as well as the mentees. That is, the individuals providing the social support benefited as well as those receiving the social support.

Therefore, when managed appropriately, the influence of others can be a positive determinant for police wellbeing.

To help explain the contextual factors that I had observed in my Study 2a data (e.g., the suggestions in the ‘factors relating to physical activity behavior’ theme), I explored the literature for models. I recognized that the focus group discussions had reflected the concepts of capability, opportunity, and motivation, which are suggested to interact and influence behavior in the ‘COM-B’ system (see Figure 5.1; Michie et al., 2011)¹⁰. Capability refers to an individual’s psychological and physical capacity to engage in a behavior. Opportunity refers to social and physical factors that sit outside of the individual and make behavior possible. Motivation refers to the automatic and reflective brain processes that energize and direct behavior (Michie et al., 2011). In Study 2a, the subtheme of ‘the influence of others’ aligned to social opportunity, as permission from supervisors and supportive others would be needed to create a social context that facilitated physical activity. The subtheme of ‘the individual’ aligned to motivation and capability. Motivation, as individuals needed to find the physical activity that they enjoyed and set their own goals. Psychological capability, as individuals needed to be engaging in thought processes and know that physical activity at work was beneficial and possible. ‘The environment’ related to physical opportunity as the physical work context (e.g., facilities, lack of time) was influential as to what physical activity at work could look like.

To build on the insight gained from the focus groups, it was important to speak to police officers and staff with low physical activity behavior. The focus group participants in

¹⁰ Alternative behavior change approaches that I might have identified are discussed in Chapter 6 ‘Development of the Exertime intervention’.

Study 2a were mostly interested and/or engaging in physical activity (i.e., they already engaged in physical activity behavior above the WHO recommended guidelines), so a second part to the qualitative enquiry (Study 2b) was conducted to address objective two (i.e., to conduct individual interviews with inactive police officers and staff to establish the barriers and enablers to their physical activity behavior). Further, there was a need to speak to police force workers on an individual basis, as in the focus group discussions it was identified that there were contextual differences between participants in terms of what was possible for physical activity at work. Broadly, officers and staff had different operational demands to contend with, and between teams there were differences in physical and social opportunities for physical activity (e.g., access to gyms, supervisor support of exercise). As the COM-B concepts were reflected in the focus group discussions, it was a suitable framework to inform the second objective of my qualitative enquiry.

Study 2b – Introduction

In Study 2a, focus group participants were provided with personas of inactive police officers and staff to focus their thinking on how physical activity might work for the wellbeing of colleagues less active than themselves. In Study 2b, there was a need to gain an in-depth perspective of inactive (low physical activity) police officers and staff to understand, and better support their physical activity as a determinant of psychological wellbeing. I identified that the Study 2a findings aligned to the COM-B concepts. COM-B is a system used to understand behavior (see Figure 5.1), that has been applied across a wide range of behaviors and contexts (e.g., sexual health in students, Cassidy et al., 2018; sedentary behavior at work, Munir et al., 2018). Within the system, the concepts of capability (physical and psychological), opportunity (physical and social) and motivation (automatic and reflective) are proposed to influence behavior. The relevance of each of the COM-B concepts is dependent on the target behavior and population (Howlett et al., 2019). For example, the

physically active focus group participants suggested that supportive others (social opportunity), work facilities (physical opportunity), personal goals (reflective motivation) and comprehending physical activity at work (psychological capability) determined physical activity behavior, whereas inactive police might deem their physical ability (physical capability) as more relevant.

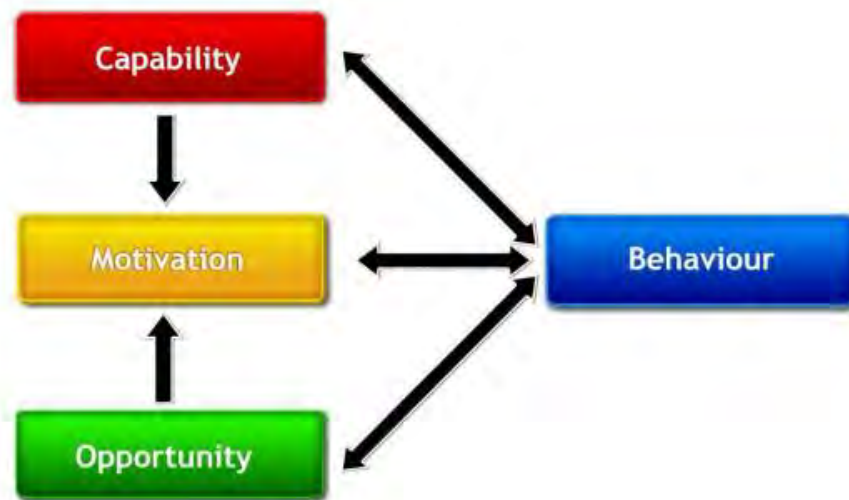


Figure 5.1 The COM-B system for understanding behavior

Understanding a behavior using the COM-B system is the first stage in the behavior change wheel (BCW; Michie et al., 2011). Figure 5.2 displays the BCW, with the COM-B system in the center and inner ring. The BCW is based on behavior change theory¹¹, and offers researchers a systematic approach to move from understanding a behavior to designing an intervention to support it (Salmon et al., 2019). Exactly how researchers move from understanding a problem to developing an intervention has been identified as a gap in research (O’Cathain et al., 2019) as there is little practical guidance for how to do so (Skivington et al., 2021). The BCW provides a tool that fills this gap. Following the first stage in the BCW (i.e., the COM-B assessment), the second stage (middle ring in the BCW; see Figure 5.2) is to link the potential COM-B behavioral targets to an intervention function.

¹¹ A discussion of the development of the BCW can be found in Chapter 6 – Study 3 ‘Development of the Exertime intervention’.

For example, physical capability can be achieved by the function of training (e.g., developing physical skills), or by the function of enablement (e.g., medication; Michie et al., 2011). The third stage (outer ring in the BCW; Figure 5.2) is to select the policy category that will be used to deliver the intervention. For example, training physical skills could be delivered through guidelines, fiscal, regulation, legislation, or service provision.

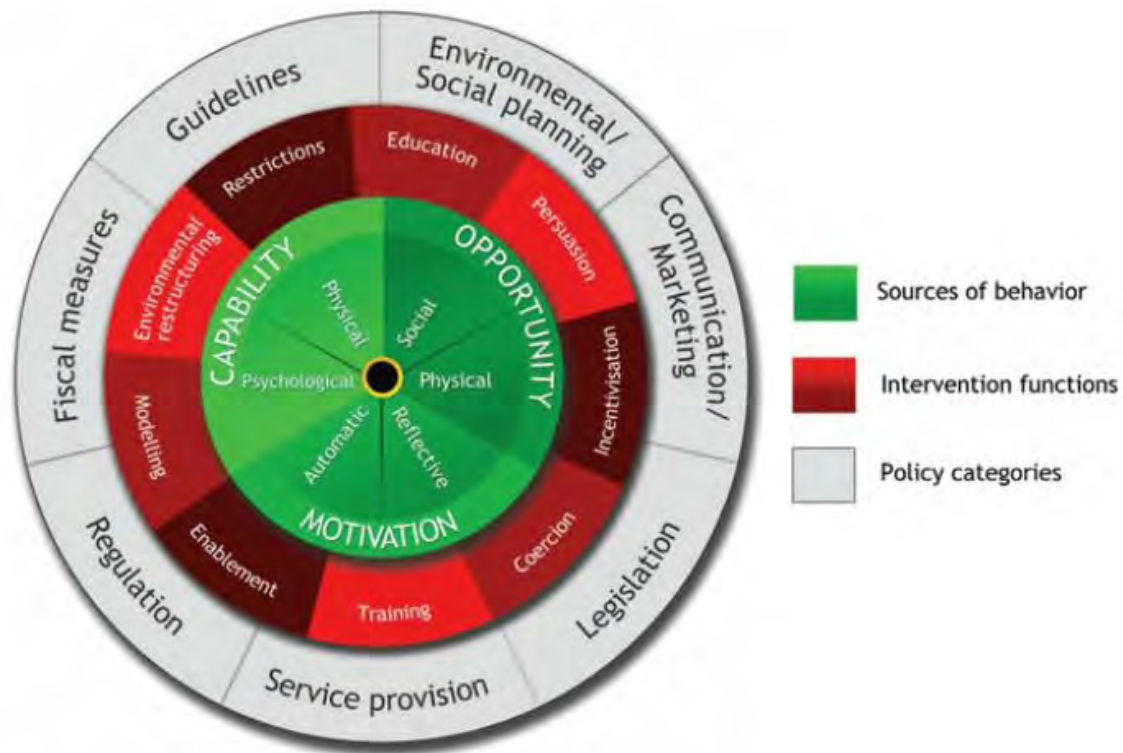


Figure 5.2 The Behavior Change Wheel

Using the COM-B system in Study 2b will enable a context-specific intervention to be developed systematically, by focusing on physical activity behavior as a determinant factor for psychological wellbeing (Study 1 findings), using the understanding gained from the focus groups in Study 2a, the interviews in the present study (2b), and then following the BCW (Study 3). The objective of Study 2b was therefore to conduct individual interviews with inactive police officers and staff to establish the barriers and enablers to their physical activity behavior, informed by COM-B and the findings from Study 1 and 2a.

Method

Design

Interviews were used to gain an in depth understanding of participants' perspectives on how physical activity could be supported in work. Specifically, the perspectives of low physical activity (or 'inactive') police force workers that would, potentially, be the end users of a physical activity intervention. Semi-structured interviews were used to maintain a natural flow of conversation and capture the participants' perspectives, while ensuring that the same broad concepts were explored (Patton, 2015).

Participants

Criterion based sampling was used to reach 'inactive' police employees that met the inclusion criteria of engaging in physical activity below the WHO recommended guidelines. As a 'hard to reach' group, key informant sampling was used whereby steering group members disseminated a participant information sheet (see Appendix 7) to departments in the partner police forces where there was low work-related physical activity. For instance, police community support officers (PSCOs) spend more of their time patrolling on foot than individuals in other roles in the police, and so were not targeted for recruitment.

Ten interviews were conducted (Force A, $N = 6$; Force B, $N = 4$). One interview was conducted as a double interview, as two participants from the same department felt more comfortable speaking about their experiences of physical activity at work together than on their own. Participants ($N = 11$) were aged 26 to 55 years, with six months to 25 years' service in the police (see Table 5.3.).

Table 5.3 Interview participant matrix

	Force A			Force B		
	Role	Department	Gender	Role	Department	Gender
Interview 1	Staff	Control room	Female	Staff	Headquarters	Female
				Staff	Headquarters	Female
Interview 2	Staff	Control room	Female	Staff	Human Resources	Female
Interview 3	Officer	Constable	Female	Officer	Child Protection	Male

Interview 4	Staff	Digital Services	Female	Staff	Control room	Male
Interview 5	Staff	Commissioner	Female			
Interview 6	Officer	Custody	Female			

Materials

A semi-structured interview schedule (Appendix 8) was developed using the COM-B concepts as a guiding framework. Open questions and probes were used to encourage participants to elaborate and/or clarify their responses (Patton, 2015). The interview schedule was piloted with a PCSO (Force B), and it was suggested that an opening section which encouraged participants to discuss their role at work would be an accessible topic to begin speaking about. This would be better suited to the participant group than starting with questions about physical activity, as work was a topic they were more used to discussing. Following the pilot, the interview schedule was amended into three sections: the introduction section focused on establishing an understanding of a ‘typical’ working day and the work environment; the second explored physical activity; and, the third section encouraged a discussion on COM-B concepts in relation to physical activity at work.

Procedure

Prospective participants received an internal email from their department wellbeing representative¹² with a participant information sheet (Appendix 7). Any interested participants were asked to email the researcher, who provided a consent form (Appendix 9) and pre-screening questionnaire (Appendix 10). When the consent form and questionnaire had been completed, participants with ‘low’ physical activity behavior were invited to interview by the researcher. The interviews were arranged for a mutually convenient time between the researcher and participant, and all took place on police property. Interviews lasted between 31 minutes to one hour and one minute in length (M : 43 minutes; SD : 0.39).

¹²The creation of wellbeing groups and department wellbeing representatives was introduced in Chapter 1 ‘Introduction’.

The longer interview was the double interview. All interviews were transcribed verbatim by the researcher.

Analysis

Reflexive thematic analysis was used, using deductive analysis in relation to the COM-B concepts¹³. The six-phase process set out by Braun and Clarke (2022) was followed as outlined in Study 2a¹⁴.

Rigor

To demonstrate rigor, member reflections (Smith & McGannon, 2017) with participants were gathered in two stages: first, after transcription with initial themes (Phase 3); second, once themes had been developed and connected across interviews (Phase 5). The researcher kept a reflexive journal to increase their own awareness and understanding of how analysis developed, discussing themes and explanations with critical friends to enhance critical engagement¹⁵.

Results

In Study 2b, I aimed to establish the barriers and enablers to the physical activity behavior of inactive police officers and staff, informed by COM-B and Study 2a. The barriers and enablers identified in analysis and how they aligned to the COM-B concepts are presented in Table 5.4 and described below.

Physical capability

Enablers

Analysis identified that participants were physically capable of physical activity, and most had previous experience of exercising or taking part in sport. For example, Beth (Force A, Interview 4) used to walk after she had a baby to help with her post-natal anxiety, Kevin

¹³ The rationale for thematic analysis was the same as set out in Study 2a, see page 117.

¹⁴ Further detail on each phase of the analysis process was provided in Study 2a, see page 118.

¹⁵ The rigor processes were the same as those set out in detail in Study 2a, see page 119.

Table 5.4 Barriers and enablers to physical activity at work, aligned to COM-B concepts with initial code labels

COM-B concept	Initial code label	Barrier	Enabler
Physical capability	Ability	Now lack skills or competence	Previous experiences
Psychological capability	Knowledge	Not knowing how to include physical activity into work	Know benefits of physical activity
	Prioritizing	Need stronger mentality to prioritize wellbeing	
	Behavioral regulation	Not aware of how long sat	Self-monitoring sitting time Planning
	Habit	Not in a physical activity habit or routine Work patterns	
Physical opportunity	Facilities	Facilities not consistent across force	Gyms and some sit-stand desks available
	Role demands	Role restrictions Short breaks Lack of time	Could use lunch break
Social opportunity	Supervisor influences	Not common for supervisors to permit/allow time for physical activity Senior leaders not leading by example	Supervisors who value physical activity
	Norms	Stigma if away from desk Sedentary norm Culture of being at your desk meaning you are working	
	Support		Others can encourage physical activity
Automatic motivation	Interest (affect)	Exhausted after work Work stress	Enjoy physical activity
Reflective motivation	Beliefs	Self-confidence to go to gym	Organizational support of physical activity for wellbeing
	Identity	Police force responsibility Cynicism	

(Force B, Interview 4) used to box and play rugby, and Shelley (Force A, Interview 3) used to run. Although they were no longer engaged in these activities, analysis suggested that participants were physically active in terms of movement and energy expenditure when they were at home but were not physically active at work. Childcare was a main reason that Peter (Force B, Interview 3), was physically active at home:

Physical activity to me is going to the gym, your running, your exercise. That's what I understand by physical activity. In terms of my physical activity, I do very little. But I am very physical in other ways because of my family background. I've got young twins, so when I leave here [work] at 5 o'clock I am active until they go to bed at 8 o'clock. I would consider myself not physically active in terms of going to the gym, but physically active in terms of their care.

Barriers

Since no longer being physically active, skills and competence were a barrier to taking part for Rita (Force B, Interview 1b), who said "I haven't cycled for years, whether I could get the balance now... perhaps I ought to try". Therefore, even with previous experience, participants doubted if they still could still complete some physical activities. This was a barrier to participating in group activities, as Abigail (Force B, Interview 2) explained:

I did 'legs bums and tums' I did it for the first time I found it the hardest thing I have ever done, and I was definitely by a mile the most unfit person in there and the most ill-exercised in there. That kind of put me off because I don't want to be the unfittest person in there.

Other participants had health conditions that presented a barrier to some forms of physical activity, for example Abigail (Force B, Interview 2) had asthma, and Freya (Force A, Interview 6), had a foot injury. Gwen (Force A, Interview 1) perceived that physical activity could benefit everyone, but the level and activity might need to be managed according to various conditions and capabilities:

It's knowing which level of physical activity to go to, before getting in a dangerous level for yourself. I'm built for comfort not speed, I'm not a small girl but I'm not obese, but you may get somebody who is on the larger side, where physical activity isn't really beneficial because they

are putting extra strain on things. So for them to just go and run around the building wouldn't make sense, it's not advisable, you are putting extra pressure on your heart and your organs when you could just do a gentle walk to make a cuppa. Even if it is just for a minute or two, get up and move, which I think everyone should be doing a little bit more.

Psychological capability

Enablers

Participants had knowledge of the benefits of physical activity and discussed positive physical effects such as "...heart rate, losing weight", and positive psychological effects "...feel more energetic", "...getting a release from things", "...picks your mood up", and "...clear your mind". When participants provided specific ideas as to how to increase their physical activity behavior at work, I found in analysis that their ideas suggested that behavioral regulation was an enabler. For example, participants suggested planning physical activity into their workday, monitoring their sitting time, setting reminders to move, and making sure that they took breaks. Such strategies reflect the construct of self-regulation which is a central mechanism in social cognitive theory (SCT) and suggests that individuals are capable of altering their behavior (Bandura, 1991). Researchers have found that regulation is predictive of physical activity behavior (Howlett et al., 2019), and have emphasized that a key issue with exercise is the need to repeatedly regulate and maintain the behavior (Beauchamp et al., 2019).

Barriers

Participants knew the benefits of physical activity for health and wellbeing generally, but some did not recognize the relevance of physical activity to their work context (i.e., in terms of reducing work-related stress or improving wellbeing at work). Abigail (Force B, Interview 2) said that physical activity "...is your personal business, you should exercise in your own time. It is not really your works responsibility". Other participants perceived that their work would benefit from them being more physically active but spoke about needing a stronger mentality to

prioritize their wellbeing (including physical activity) whilst at work. Freya (Force A, Interview 6) worked in custody, and explained that she found it difficult to leave. “I struggle with the concept of saying [to myself] ‘no, you [task] can just wait there while I go and have my break’”. This related to a mentality in both police forces whereby work needs came before personal needs. As such, self-care practices (e.g., physical activity) were not in participants’ awareness when they were at work, and participants would often forget to move. Davina (Force A, Interview 2) worked in the control room and said:

I’ve realized ‘oh my god I haven’t gone to the loo for the whole time I have been here’. Sometimes for 6 or 7 hours and I haven’t got up off my chair. The whole time. When I do try and stand up, oh my god it is so painful.

Other participants said that they wanted to include more movement into their work routines but did not know how. Peter (Force B, Interview 3) explained that the habits of police staff were to remain working through lunch breaks, rather than doing physical activity:

It’s easier to sit at your desk as you can carry on with what you are doing. Which I did today, I think 5 of us all sat at our desk eating our food, answering phone calls and cracking on. Which tends to be the norm, which you shouldn’t really do. Once you start going to the gym, I think it then becomes a habit that you will get into. It’s just getting over that hurdle to go.

Participants who worked shifts perceived that it was even more challenging to get into a structured physical activity habit, as the times and changing work patterns meant they could not do it regularly.

Physical opportunity

Enablers

Participants perceived that they had facilities that could enable their physical activity at work. For example, a couple of sit-stand desks were available in the control rooms and custody suite, and gyms were available in some of the police stations. One participant felt “lucky” to have a gym at his police station, as they were not available at all sites across the police force.

Beth (Force A, Interview 4) explained why it was important for her to have the opportunity to participate in physical activity at work:

Having the opportunity to be active in work really suits me, because of the work life balance I suppose. I can do it when I'm in work. It doesn't take any of my time away with the baby because I have already done it then.

Barriers

Not every police station had a gym, and so, conversely, this was also barrier to physical activity at work. Participants' suggestions for increasing their physical activity at work were related to increasing physical opportunity. For example, one participant suggested creating walking route maps so workers could have a short route to follow during their lunch breaks. Further suggestions included instruction cards depicting stretches that could be done at work and consistency in the provision of sit-stand desks. This highlighted that facilities were not equal throughout the force, as some departments already had sit-stand desks.

The demands of working in the police were a barrier to physically being able to move at work. Kevin (Force B, Interview 4) said "...in the control room, if somebody is unconscious and you delay [responding] five minutes because you are doing whatever then that is five minutes an ambulance could have been there. It is scary". The control rooms were mentioned in interviews with individuals from other departments as an area that lacked physical opportunity for movement. For example, Pam (Force B, Interview 1a) described desk-based call handlers as "...attached with a chain" to their desk, and Angie (Force A, Interview 5) said "...police officers out on the beat definitely cannot just take 45 minutes to go and do something [exercise] and people working in the call center can't just up and go". In other roles, high demands meant too short a lunch break for physical activity or lack of resources meant participants would cover for other staff and have no opportunity to move. Freya, a custody sergeant from Force A (Interview

6) explained “...when you are on your own you are just glued. When there is two of you, you can sometimes get in a little break”. The different roles in the police forces therefore presented context-specific barriers for movement, including restrictions, short breaks, and lack of time.

Social opportunity

Enablers

Participants referred to needing the support of others to encourage them into physical activity. Davina (Force A, Interview 2) said “I can imagine someone saying, ‘come on, Davina, let’s do this [activity] today, let’s do that today’, someone pushing me”. One participant, Gwen (Force A, Interview 1), had a medical condition where it was necessary for her to move every hour. She explained that at work her supervisor enabled her to do this “...if I am anywhere near my supervisor, she shouts at me to get up and move”. The support of others at work could therefore enable physical activity.

Barriers

Analysis identified that supervisors and managers had an influential role in behaviors at work, but this presented a barrier as it was not common for supervisors to demonstrate that they valued physical activity. Participants needed their supervisor’s permission to be active at work but did not feel that they approved of it. Pam (Force B, Interview 1a) explained:

I think a lot [of supervisors] need to lead by example. If they are looking to say exercise is an important part of your day then it has to be an accepted part of your day, and we have to feel that the people upstairs [management] for instance are exercising and we are able to do the same”.

To change the culture around physical activity, participants suggested having role models, or senior leaders visibly advocating physical activity, and publicly saying that physical activity at work is ‘ok’. The current feeling was that exercise is not acceptable during work, which created a sedentary norm that Kevin from Force B (Interview 4) referred to as a “stigma” of leaving your

desk. The same was also the case in Force A, as Angie (Interview 5) said “...there is this perception as well that if you have got time to go to the gym when you are in work then you are not busy enough”.

Automatic motivation

Enablers

Participants enjoyed physical activity, and analysis identified that positive affect was an enabler to engaging in various forms of exercise. Abigail (Force B, Interview 2) was particularly passionate about a Zumba class:

My [previous] work provided Zumba, so I used to do that twice a week and she [instructor] was wonderful, she was absolutely spectacular, I loved her. She used to have me in a flood of sweat and I adored her.

Barriers

Although participants reported feeling positive about physical activity, they also reported that feeling tired after, or during, work was a barrier. Shelley, a police officer (Force A, Interview 3) said:

I did enjoy running. During that time when I was running, I was the fittest I was. What happened was I went back to shift work, so I was doing 6 shifts – 2 day, 2 afternoon, 2 night shifts. Obviously working night shifts is really, really difficult. Trying to juggle everything, eating patterns just kind of goes out the window. That is what happened basically, it just trailed off. I just didn't have the energy.

Previous research has highlighted the demands on police as preventing their physical activity (Sonnentag & Jelden, 2009), and the research in Study 2a and 2b has also identified that the demands on police staff prevented their engagement in physical activity. Angie (Force A, Interview 5) explained:

When you have been sat down all day, you're exhausted. I find I go home and I have sat in the car for an hour, I have sat at my desk all day, sat in the car for another hour, you get home and you just feel absolutely exhausted and lethargic. Then you don't want to do anything in the night.

Whereas if you had more of an active day and been out and about for meetings, you have a bit more energy. It kind of just drags you down. It's not healthy to sit and eat food whilst you are working and not have that break anyway. Even just from the way you feel, your eyes are tired.

Pam and Rita from Force B (Interview 1a and 1b) were also office-based and experienced the emotional load of their work as a barrier to physical activity, "...when you're stressed you don't feel like exercising really, you feel like curling up in a ball and then not doing very much".

Reflective motivation

Enablers

Organizational support was an enabler that reinforced the value of physical activity for wellbeing. Beth (Interview 4) described a recent wellbeing initiative in Force A, which enabled police workers to have a wellbeing hour, "...it's just nice to know that you are supported and that they don't think that you are taking the mick, having an hour. That your wellbeing is important". Rita (Interview 1b) also felt that there was organizational support for wellbeing in Force B, "I think they [police force] are doing more than they ever used to as far as exercise is concerned, but the jobs are getting more stressful than they used to so there needs to be something".

Barriers

Beth (Force A, Interview 4) explained the barrier to her using the gym at work "...it's a confidence thing, not being able to use the equipment properly, or looking like an idiot". Beth did not believe she was capable of using the gym, a barrier which relates to internal motivational processes (e.g., competence in SDT and self-efficacy in SCT).

The identity of being a police officer was another barrier to physical activity, as Shelly (Force A, Interview 3) said:

I think when you are in your uniform as a police officer you are a police officer. Then when I leave, I am Shelley again. ...I think if I was to be exercising during work time I would still be thinking about work and what I need to be doing rather than switching off.

Physical activity was not included in the identity of police officer, rather the identity was to always be ‘switched on’ and focused on work. Other participants reiterated this identity, Kevin (Force B, Interview 4) explained that he would always put work first and “...accommodate my life for my job”, and Gwen (Force A, Interview 1) described working in the police force as “...a massive chunk of responsibility on your shoulders”.

Cynicism is another characteristic of the police identity (Violanti et al., 2018b), and Peter (Force B, Interview 3) was cynical of the organizational commitment to employee wellbeing. He suggested he had a lack of belief that the support was genuine, “...why are they doing this, is it to tick the boxes or do they really care about you?” Previous research has also identified negative perceptions that police wellbeing support lacked genuine action (Clements et al., 2021). Therefore, beliefs about individual capabilities and the police identity were a barrier to physical activity at work.

Preliminary discussion

The objective of the semi-structured interviews in Study 2b was to establish the barriers and enablers to the physical activity behavior of inactive police officers and staff. Using reflexive thematic analysis, I employed a deductive analytical approach using the COM-B concepts (see Table 5.4) to identify that psychological capability, social opportunity, automatic motivation and reflective motivation were prominent themes. In this section, the prominent themes from Study 2b are discussed, and reasons offered for why physical capability and physical opportunity might have been less prominent themes. An overall discussion of both Study 2a and Study 2b follows.

In terms of psychological capability, inactive police officers and staff knew that physical activity was beneficial for their wellbeing. Whilst this could be an enabler for physical activity behavior, not all participants saw the importance of physical activity in relation to their work,

which was a barrier. There was also a gap in knowledge for how to integrate physical activity into the workday; participants' ideas for how to do so centered around planning in a time when they could go to the gym or related to interrupting sedentary behavior. Sitting less was discussed by most participants as feasible in the work environment and contributed to psychological wellbeing. Participants suggested that self-monitoring strategies might enable them to be more aware of sitting time and to move more at work. Such strategies are related to regulation processes that, according to SCT, encompass self-efficacy and motivate behavior (Bandura, 1991). Regulatory and self-efficacy processes are one of the mechanisms that researchers have suggested might explain the strength of physical activity habits (Gardner et al., 2020). In Study 2b, participants explained that their current work habits did not include physical activity and the first step of forming a routine that included physical activity was the hardest. Once they were in a habit or routine of physical activity at work, participants perceived it enabled them to continue being active in work, and so forming the habit was the initial barrier. Habit formation techniques have been recommended elsewhere in the literature as a motivational intervention for police staff to reduce their sitting time (Brierley et al., 2021). Habits are a combination of dual processes; some are automatic and not consciously controlled (reflecting the automatic motivation COM-B concept), whereas others are controlled by deliberative, conscious processes (reflecting the psychological capability COM-B concept; Hagger, 2019). Therefore, behavior change interventions targeting habits could consider both capability and motivational influences.

Another psychological capability barrier identified in Study 2b, was that of prioritizing. Participants reported that work was their priority, and they struggled to put their own wellbeing needs before their work duties. This indicates a reasoned deliberative process in choosing to continue working instead of standing or engaging in a form of physical activity. As suggested by

participants, behavioral regulation strategies might enable police force employees to be more aware of their sitting and/or lack of movement. They could then make a reasoned decision to prioritize their wellbeing alongside their work demands and develop physical activity habits within their work routines.

Social opportunity was identified as a prominent theme to increasing physical activity at work as participants gave examples where others could support them to be physically active. Supervisors had an influential role in this. Those who actively reminded staff to move enabled physical activity at work, however, it was not common for supervisors to give permission for staff to move away from their desks or to use work time for physical activity. Another barrier identified from the interviews was that senior leaders did not lead by example and role model the physical activity behaviors they said they supported. Participants reported sedentary social norms where there was a stigma from being away from your desk, as the organizational culture was that being at your desk meant that you were working, whereas time away from your desk meant you were not. The role of organizational culture in sedentary time at work was explored by Such and Mutrie (2017), who identified an interaction of factors impacting physical inactivity in the workplace. Line management was a central domain in creating cultural norms. The influence of this domain might be heightened in a police context, as previous research identified that direct line supervisors have the most impact on the police work environment (Bell et al., 2022). Further, management visibility and organizational support are influential in the take up of police wellbeing (Clements et al., 2021), and sedentary behavior initiatives (Brierley et al., 2021).

It has been suggested that social factors influence physical activity behavior through motivational processes (Li et al., 2014; Vallerand & Losier, 1999). In relation to police physical activity at work, analysis of Study 2b indicated that inactive police officers and staff enjoyed

various forms of exercise, which could enable their automatic motivation for physical activities. However, the barrier for their physical activity at work was feeling stressed and/or exhausted by the demands of work so that they did not have energy for physical activity. This was a barrier despite participants' knowing that physical activity might benefit them and improve their affect. The influence of work demands on police physical activity has received research attention, as the long working hours have been found to prevent LTPA in police (Sonnentag & Jelden, 2009). The current research adds to this knowledge, as the organizational (not operational) demands prevented police staff physical activity too, due to the stress associated with their role. Research in other sedentary groups (e.g., scientific researchers) supports the suggestion that job demands can negatively impact physical activity because they are cognitively fatiguing (van As et al., 2022). Therefore, the barrier to inactive police force workers engaging in physical activity across all roles, is that their automatic motivation is not to exert more energy through exercise.

The constructs that aligned to reflective motivation can explain why physical capability and physical opportunity were not found to be prominent themes in Study 2b. Participants explained that they did not feel confident in their ability to go to the gym and use equipment correctly. This suggests that the barrier was not that participants could not physically do the activity (reflecting the physical capability COM-B concept), but that beliefs about their ability limited their engagement (reflecting the reflective motivation COM-B concept). Beliefs about capabilities relate to self-efficacy in SCT, and the basic psychological need of competence in SDT; both have been found to be key drivers for physical activity behavior (Beauchamp et al., 2019 and Teixeira et al., 2012 respectively). Because of these key drivers, my interpretation of the Study 2b data was that although participants frequently suggested that they needed facilities (e.g., gyms and sit-stand desks) to increase their physical activity at work (reflecting the physical

opportunity COM-B concept), the physical opportunity was not the most prominent barrier. There are two implications from this. First, that where there are facilities available but not being used, it is because inactive police force workers lack the self-efficacy or competence to use them, indicating that beliefs and reflective motivation processes are the barrier. This implication is reinforced by another barrier that was identified. The police identity (i.e., the responsibility associated with the occupation, the perceived need for permission to be active, prevailing social norms to always focus on work, and the cynicism of support) prevented facilities from being used. It might be pertinent to focus attention on addressing these beliefs to facilitate increased physical activity as this can influence how the existing facilities are perceived, in line with social cognitive theories (e.g., SCT). Second, there is a contextual caveat in that the provision of gyms and sit-stand desks was not consistent across departments in either police force. Some departments *do* need facilities that can be used within the role-specific restrictions and demands. This highlights the need for contextual understanding of the specific environments and departments in the police force to better support physical activity and wellbeing.

There were some limitations to Study 2b. The majority of interview participants were female, nine out of 11, which might have influenced the findings. For example, lacking self-confidence to go to the gym might be more of a barrier for females in a typically male oriented workforce. The decision not to use the theoretical domains framework (TDF; Cane et al., 2012) to inform the interviews could be seen as another limitation. In the TDF, behavior change theoretical concepts are synthesized into 14 domains that link between the COM-B concepts and the BCW. The TDF enables researchers to maintain a comprehensive coverage of the causal determinants on behavior in subsequent intervention design and has been developed into a version for assessing physical activity behavior (DPAQ; Taylor et al., 2013). However, a decision

was made to not use it in the interview guides for Study 2b because the predetermined list might have limited findings in this research context. In the development of the DPAQ, a ‘social/professional role/identity’ domain was removed as it did not fit with physical activity behavior. It might, and in Study 2b was found to, fit with physical activity behavior in policing. Furthermore, looking at the TDF overlap with COM-B concepts, the majority of TDF domains relate to psychological capability and reflective motivation (Atkins et al., 2017). Therefore, these domains are more likely to be reflected in the findings, and subsequent interventions.

Overall Study 2 discussion

The objective of Study 2a was to conduct focus groups to explore why physical activity was linked to psychological wellbeing for the police workforce. Focus groups were analyzed using deductive analysis underpinned by the DRIVE model of work-related stress, and findings gave insight into the role of physical activity in stress at wellbeing at work. Analysis identified that physical activity had physical and psychological effects (outcomes) and influenced the experience of work demands and resources through two mechanisms: the perception of stress; and, feelings of self-determined motivation. Inductive analysis identified factors relating to physical activity behavior change, which I found reflected the COM-B concepts. The COM-B concepts were then used to inform the interviews in Study 2b, which had an objective to establish the barriers and enablers to the physical activity behavior of inactive police officers and staff. Analysis identified that all COM-B concepts were influential in physical activity behavior, but psychological capability, social opportunity, automatic motivation and reflective motivation were found to be the most prominent.

Conceptual implications

The research conducted and presented across Study’s 2a and 2b adds new knowledge to

understanding of the role of physical activity in police stress and psychological wellbeing, an area overlooked by previous research. The two mechanisms identified in Study 2a (perception of job stress and feelings of self-determined motivation) explain this role. To elaborate, through the perception of stress, physical activity was influential in enabling police force workers to reappraise stressors and possible coping options, thereby supporting wellbeing. Through feelings of self-determined motivation, physical activity provided a means for colleagues to come together, and/or progress towards a self-selected goal, thereby supporting wellbeing. The identification of the perception of stress mechanism was informed by the DRIVE model of work-related stress, in which work characteristics are proposed to negatively influence wellbeing if an individual perceives that they are stressful. This research supports that physical activity benefitted workplace wellbeing because it influenced the same cognitive appraisals. For example, during exercise some participants engaged in problem solving, while others temporarily avoided the stressful situation. In these examples, the situation had not changed, but it was perceived as less stressful, which reduced the negative influence of the situation for wellbeing. This is in line with Lazarus' conceptualization and physical activity research which leans on cognitive explanations for the benefits of physical activity to psychological wellbeing (e.g., distraction, see Wiese et al., 2018), and supports the contention that physical activity behavior is an individual characteristic that should be included in work-related stress research (Häusser & Mojzisch, 2017).

Research has only recently theoretically integrated physical activity into a model of work-related stress (pamDC; Häusser & Mojzisch, 2017). In the pamDC, explanatory mechanisms of self-regulation and feelings of self-determined motivation were proposed to mediate between the influence of job demands and job control on LTPA (respectively) and health

and wellbeing. The findings from Study 2 support the idea that feelings of self-determination are a mechanism by which physical activity can influence psychological wellbeing. For example, although self-regulation was identified in this research, it was in relation to the strategies inactive police officers and staff suggested needed to be supported to increase their physical activity at work (Study 2b). In the pamDC, the focus is on how work characteristics impact physical activity. The research in Study 2a and 2b can contribute to extending the model, by suggesting that the feelings of self-determination mechanism also explains why physical activity behavior impacts the experience of work characteristics (work demands and resources).

Practical implications

Conducting the study in two parts provided the opportunity to demonstrate transferability of findings (Tracy, 2010). That is, whether they were consistent or might differ between physically active (Study 2a) and inactive (Study 2b) police officers and staff. Some findings from the focus groups transferred to the interview findings. All participants knew that there were physical and psychological effects of physical activity, including that it was beneficial for their wellbeing. In addition, all participants perceived that lack of movement (physical inactivity) was detrimental to their wellbeing. An implication from this research is that supporting physical activity and reducing sedentary behavior are a means by which police wellbeing could be improved. It has been recognized that there is a need for police officers to be physically active to meet the operational demands of their roles (e.g., Marins et al., 2019), but my findings in Study 2 suggest that there is also a need for police staff (and officers) to be physically active to meet the organizational demands they face. Although the health outcomes of physical activity are well established, less is currently known about the health outcomes of sitting (Bull et al., 2020). Future research should explore how sitting less and moving more can support wellbeing at work.

Another similarity between Study 2a and 2b was the importance of social opportunity for wellbeing; all participants noted the influential role supervisors played in this regard. When participants were permitted time for physical activity, they felt supported by their supervisors and the organization. Yet, the support was not consistent throughout the police force and contributed to feelings of inequality. The implication is that if it is not possible to consistently support physical activity in the same way throughout the force (i.e., not all police force workers have lunch breaks to go to the gym), all employees still need to feel they are supported. Developing mentoring programs could be a way to do so, in which physically active police officers and staff could provide guidance to support their less active colleagues to increase their physical activity behavior. Mentoring in the police has previously been found to reduce anxiety for mentees, increase meaning in work for mentors, and increase colleague interactions to positively impact police wellbeing (Gill et al., 2018). In addition, supervisors could demonstrate the importance and feasibility of physical activity in their specific work context, through being physically active themselves and being aware of their staffs' physical activity. Research suggests that such leadership behaviors in the police can improve staff lifestyle behaviors and wellbeing (Santa Maria et al., 2019).

There were some differences between the findings derived from the focus groups and interviews. Specifically, in relation to psychological capability, the interview participants did not all perceive that physical activity was related to their experience of stress or wellbeing at work (despite knowing that it was related to their wellbeing). An initial implication from this is that there is a need to explain the relevance and potential benefits of physical activity for workplace health and wellbeing throughout the police force. Focus group participants compared physical activity in the police force as less organizationally entrenched than it is in the fire and rescue

service (FRS). The Home Office (2017b) produced a fitness best practice guide for the FRS, which included recommendations for managing fitness, culture, and communications, and emphasized the importance of education about physical activity for health and welfare. A similar strategy might benefit the police force in educating employees about wellbeing and enabling physical activity at work to be visibly and consistently supported.

Strengths, limitations, and future directions

A strength of this research is that both studies were theoretically informed. Using the DRIVE model to inform Study 2a enabled the stress process to be reflected in the research findings, where previous qualitative research with police populations gives insight into separate parts of the process (i.e., stressors and/or demands, Jackman et al., 2021; mental health outcomes, Demou et al., 2020). Using the COM-B system in Study 2b enabled the factors known to influence behavior change to be captured in establishing how to support police physical activity at work. Further, the research will inform the systematic development of a physical activity intervention using the BCW in a subsequent study (Chapter 6).

Another strength in this research is the method in both studies. In Study 2a, personas were used to explore ideas and perspectives on physical activity behavior. The use of such visual data collection methods has been encouraged, as they can contribute to understanding in participatory and empathic ways (McGannon et al., 2019). In Study 2b, a unique and ‘hard to reach’ group of participants were accessed, as inactive police officers and staff gave up their time to discuss physical activity and wellbeing at work. The prominent COM-B concepts identified in this research should be explored further, for instance, the types of social support that might be most relevant for increasing physical activity and wellbeing.

There were also limitations to these studies. The research has offered an initial

exploration and understanding of physical activity in relation to police stress and psychological wellbeing at work. The research was conducted from a critical realist approach and so focused on the causal processes. However, a phenomenological approach might gain richer insight into the idiographic experiences of physical activity, stress, and wellbeing in the police. Future research could build on this study contribution to add depth to the understanding. For example, in relation to the finding that physical activity can support police staff in meeting the organizational demands of their role, it could be beneficial to unpick which demands specifically.

Using deductive analysis with predetermined categories (i.e., DRIVE model and COM-B concepts) might have constrained results. To mitigate against this potential constraint, inductive analysis was also used in the Study 2a method, and a rigorous process was followed in both Study 2a and Study 2b. The rigorous process included a using reflexive journal, critical friends, and gathering member reflections (Smith & McGannon, 2017) to raise awareness of researcher preconceptions and possible alternative perspectives. However, not many participants responded to the member reflections, and so some of the opportunity to generate further insight from participants was missed. This reflects the realities of working with an occupational group that have little time or resources.

A range of police force workers participated in this research, but other individuals from other departments within the same police forces might have had different experiences and perspectives. The notion of collecting data until no new findings are identified (data saturation) has been criticized (O'Reilly & Parker, 2013), because in striving for saturation researchers focus on sample size rather than data content (Low, 2019). Instead, it is suggested that qualitative research has achieved an adequate sample when three questions are answered:

1. Does your data address core explanatory questions? Yes. Two mechanisms (perceptions

of stress and feelings of self-determined motivation) were found to explain why physical activity was linked to psychological wellbeing in the police (Study 2a core question). The COM-B concepts of psychological capability, social opportunity, automatic motivation and reflective motivation were found to have prominent barriers and enablers to the physical activity behavior of inactive police officers and staff (Study 2b core question);

2. Have deviant cases been explored? Yes. The interviews in Study 2b accessed a hard-to-reach group and inactive individuals in the police force, who would not typically engage in research about physical activity;
3. Does the data generate generalizable categories that are contextualized in the broader social context? Yes. A range of police roles, rank and experience were captured in the focus group data, with more detail of context surrounding physical activity and psychological wellbeing for individuals captured in the interviews. The interviews substantiated focus group findings from another perspective in the police context, as did the steering group discussions in Study 3 (Chapter 6).

Conclusion

This research has provided insight into the role of physical activity for police psychological wellbeing. In Study 2a, physically active police officers and staff were found to perceive that physical activity was an important factor for their wellbeing, and that it positively influenced their experience of work demands and resources. This was explained through two mechanisms of the perception of stress and feelings of self-determined motivation. In Study 2b, inactive police officers and staff suggested barriers and enablers for their physical activity at work. By using the COM-B system it was identified that supporting psychological capability, social opportunity and motivation could facilitate physical activity behavior at work. The

findings have important implications for wellbeing support in the police forces, and for how to increase physical activity behavior. Broadly, for wellbeing, police forces might benefit from educating the workforce about stress and wellbeing at work and increasing social support. Specifically, physical activity could be included into a strategy, with recommendations to develop mentoring programs to support inactive individuals, and for supervisors and leaders to visibly demonstrate that they value their own and their staffs' physical activity and psychological wellbeing. The next step in this research is to use the findings and BCW to develop a physical activity intervention in the partner police forces.

Chapter 6

Study 3: Development of the Exertime intervention

Introduction

In this chapter, I set out the process of developing an intervention to increase the physical activity of police workers in a control room context. The intervention was informed by Study 1, 2a and 2b, and follows the Behavior Change Wheel (BCW) process for intervention development (Michie et al., 2014). Consistent with the co-design approach of the thesis, I engaged with end-users (i.e., those in the control room department) to systematically develop the intervention. In relation to the Double Diamond (Design Council, 2019) framework, this involved progressing through the ‘Define’, ‘Develop’ and ‘Deliver’ phases (see Figure 3.2)¹⁶. To address the aim of developing a physical activity intervention that was context specific, I set four objectives:

1. To review the extant literature to inform a physical activity intervention (Double Diamond Step 4; see Figure 3.2);
2. To use the BCW to co-design a theory-based intervention that was context specific (Double Diamond Steps 4, 5, 6; see Figure 3.2);
3. To observe workers and discover more of the specific context (Double Diamond Step 5; see Figure 3.2);
4. To define the protocol for the intervention (Double Diamond Step 7; see Figure 3.2).

Study 3 – Introduction

To support physical activity behavior, researchers rely on theoretical frameworks to understand, explain, and intervene with physical activity behavior (Rhodes et al., 2019). In Study 2b, I found that there were some specific barriers and enablers that were unique to the work context of each participant. For example, inactive police employees working in the control rooms and custody suites perceived that physical activity was not feasible in their work environment, as

¹⁶ In Chapter 3 ‘Methodological Approach’, I set out the steps in my research against the Double Diamond framework, and BCW.

they needed to constantly be at their desk to receive emergency calls or supervise detained individuals. For police force workers in these contexts, decreasing sedentary behavior was suggested to be more feasible than increasing physical activity behavior. Therefore, in this section, I will review the theories that are used by researchers to inform physical activity and sedentary behavior interventions.

Theories in workplace physical activity interventions

Rhodes et al. (2019) categorized four main areas of theory-driven approaches to change physical activity behavior: social cognitive approaches; dual process approaches; humanistic approaches; and, socioecological/systems approaches. I will next introduce focal theories from the four main approaches and review each approach.

Social Cognitive approaches

Social Cognitive Theory. The basic assumptions of social cognitive theory (SCT; Bandura, 1977, 1991) are that behavior is driven by cognitions, is purposeful, and under the control of the individual. Within SCT, perceived self-efficacy is a core determinant that is theorized to influence behavior directly, and indirectly through outcome expectations, socio-structural factors, and goals (Bandura, 2004). Self-efficacy describes an individuals' belief in their ability to successfully engage in a specific behavior. This belief also influences the other determinants in SCT (Bandura, 2004). For example, someone with high self-efficacy is more likely to persist in a behavior despite perceived barriers (socio-structural factors), whereas someone with low self-efficacy might give up, or expect their efforts to bring poor outcomes. In a systematic review and meta-analysis, Young et al. (2014) found that SCT explained 31% of the variance in physical activity behavior, and that self-efficacy and goals were most likely to be associated with the individual engaging in physical activity. In terms of understanding physical

activity behavior, SCT provides evidence for consistent effects of self-efficacy, self-regulatory mechanisms, and a testable theoretical framework (Beauchamp et al., 2019). There is also evidence that higher self-efficacy is associated with lower sedentary behavior (Rollo et al., 2016), and most social cognitive theories include some representation of the construct (Bandura, 2004; Young et al., 2014).

Theory of Planned Behavior. The theory of planned behavior (TPB; Ajzen, 1991) was expanded from the theory of reasoned action (TRA; Fishbein & Ajzen, 1975) to explain and predict behavior in specific contexts. In both the TRA and the TPB, intention, or the readiness and desire to perform a behavior, is the most important predictor of behavior. Both theories posit that intentions are informed by attitude (i.e., affective evaluations of whether the behavior is enjoyable, and instrumental evaluations of whether the behavior is beneficial) and subjective norms (e.g., perceived social pressures). The TPB built on the TRA by including perceived behavioral control, a construct that refers to the degree to which people believe they can perform the behavior and has been compared to self-efficacy (Hagger et al., 2002). The TPB has been widely applied to health behaviors; Kim et al. (2019) found that 91% of the physical activity interventions they reviewed were underpinned by the TPB. Systematic reviews report medium effects of perceived behavioral control on exercise, medium effects of attitude on exercise, and large effects of intention on exercise (e.g., Symons Downs & Hausenblas, 2005). The TPB constructs have also been found to predict 23% of sedentary behavior, with the largest effect from intention on sitting (Howlett et al., 2020).

Despite its widespread use, consistent limitations of the TPB are reported in the literature. Firstly, there is the intention-behavior gap, whereby individuals who have a strong intention to engage in a particular behavior, do not implement that behavior. It has been suggested that

additional constructs, such as self-regulation, habit, and interaction with the environment, could be added to account for the gap in explained behavior (Rhodes & Yao, 2015). Secondly, the effect of subjective norms on intention is not statistically significant, and researchers have recommended it could be removed from the TPB (Rhodes & Nigg, 2011). The lack of support for the subjective norm variable in physical activity behavior is surprising to researchers, as humans have an innate need to socialize and norms have a strong link with other health behaviors (Kim et al., 2019). In the TPB there are two types of subjective norms. Injunctive norms, which relate to an individual's motivation to comply with their perception of whether others approve of a behavior, and descriptive norms, which relate to their normative beliefs of whether others engage in a behavior themselves (Ajzen, 2002). To explain the subjective norm findings, it has been suggested that measuring descriptive norms in relation to specific relevant others (i.e., rather than 'others' in general) provides more promising results than injunctive norms for physical activity behavior (Kim et al., 2019). For example, believing that supervisors engaged in physical activity at work might be more relevant than believing that an unspecified individual thought that physical activity at work was beneficial. Alternatively, it has also been suggested that reconceptualizing the subjective norms variable to reflect social support (i.e., the perception of assistance to perform a behavior), might be more relevant to physical activity than norms (i.e., the perception of pressure to perform the behavior; Rhodes et al., 2002). That is, believing that a supervisor would help to increase physical activity might be more relevant than believing they wanted to see an increase in physical activity at work.

Social cognitive theories and models have been the dominant approach in physical activity research, and all predict similar magnitude in physical activity behavior at the individual level (Rhodes et al., 2019). All social cognitive theories emphasize the thought processes in

behavior and assume that behavior is the result of rational decision-making. This is intuitive to the definition of exercise as planned, structured and repetitive (Caspersen et al., 1985; Rhodes et al., 2019). Exercise is a subset of physical activity however, and less is known about the predictors of behaviors that are not necessarily planned (e.g., sedentary behavior; Phipps et al., 2022). The non-conscious processes (e.g., habits, automatic associations) in physical activity are not explained or accounted for by social cognitive approaches. These non-conscious processes might be stronger for predicting less intense activities (e.g., sedentary behavior) than intense physical activities (Rebar et al., 2016). Further, social cognitive approaches do not account for the complexity of behavior which is highly dependent on context (Rutter et al., 2020), so researchers are beginning to look at other approaches. Therefore, while social cognitive approaches might inform some of the individual-level components that my intervention could target (e.g., self-efficacy beliefs, perceived barriers), there are additional influences on physical activity and/or sedentary behavior to consider (e.g., habits, the external context).

Dual process approaches

Affective-Reflective Theory. Dual-process approaches consider two types of influence on individual behavioral determinants: reflective processes which are deliberative; and, automatic processes which are non-conscious (Rhodes et al., 2019). In 2018, Brand and Ekkekakis introduced the Affective-Reflective theory (ART) of physical activity and exercise, which involves a Type-1 and Type-2 process. According to ART, the Type-1 automatic associations process is activated when an individual notices an exercise-related stimulus (e.g., is told to exercise). Next, an affective valuation (i.e., feeling of pleasure or displeasure) is triggered. Individuals default to their automatic activation, and the Type-2 reflective evaluation process only follows if the individual is willing and able to engage in cognitive processing (e.g., they

have self-control resources available; Brand & Ekkekakis, 2018). The Type-2 process involves constructs such as self-efficacy beliefs, past experiences, and cost-benefit analysis, and so can incorporate social cognitive theory. The ART differs from other dual-process theories (e.g., Strack & Deutsch, 2004) as the hedonic (affective) perspective is incorporated in the Type-1 process (Brand & Ekkekakis, 2021). Thus, the ART could explain inactivity as well as activity. For example, an individual might have intended to go for a run, but at the time it came to it (the exercise-related stimulus), if their automatic valuation to stay sitting at home was stronger than their automatic valuation to run, the intention to run would not lead to running (behavior; Brand & Ekkekakis, 2018). Previous research has found that dual process approaches can explain sedentary (e.g., Conroy et al., 2013) and physical activity behavior; if repeated frequently in the same context each behavior can shift from being controlled by reflective planning processes to being automatically triggered (Strobach et al., 2020). However, this is less likely for vigorous physical activity behaviors (Rebar et al., 2016).

In the context of physical activity research, the ART, and dual process approaches overall, are relatively new, and further studies are needed to develop them (Brand & Ekkekakis, 2021). Rhodes et al. (2019) suggested that there are terminology issues (e.g., ‘implicit’, ‘non-conscious’, ‘habit’, ‘automatic’ and ‘impulsive’ are all used interchangeably) and measurement issues (e.g., how to accurately measure non-conscious processes) to overcome, but the dual process approaches offer promise for improved understanding of physical activity behavior. Biddle (2021) explained that the COM-B system also reflects a dual process view, as the motivation domain has both an automatic motivation and a reflective motivation component. Both processes are needed to progress understanding of physical activity and sedentary behavior so that it can be understood in context (Biddle, 2021). Using the COM-B system to develop my

intervention would, therefore, enable coverage of social cognitive and dual process approaches.

Humanistic approaches

Self-Determination Theory. Humanistic approaches hold the view that behavior is driven (motivated) by innate needs, such as the three basic psychological needs of autonomy, competence, and relatedness in Self-Determination Theory (SDT)¹⁷. There is wide support for SDT in explaining physical activity behavior, and for its utility in interventions (e.g., guiding interventions to support the three psychological needs; offering participants meaningful choices for physical activity can support their autonomy; see Quested et al., 2021). In their systematic review across various population samples and settings, Teixeira et al. (2012) found that, of the basic psychological needs, perceived competence most consistently predicted physical activity. However, it has been suggested that sedentary behavior might rely more strongly on non-conscious processes than motivation (Biddle, 2021), as while sitting, people do not think about sitting (Gardner et al., 2019). Motivation for sedentary behavior might therefore relate to what the individual is doing at the time (e.g., using their smartphone) as well as sitting itself (Fennell et al., 2021). In terms of my research, the implication from humanistic approaches is that I need to understand what motivates physical activity and/or sedentary behavior in context, and support autonomy, competence and/or relatedness to produce long term behavior change.

Socioecological and systems approaches

Bronfenbrenner (1979). The approaches introduced thus far emphasize that physical activity and sedentary behavior are self-determined by the individual (i.e., how an individual thinks influences their behavior). As such, they can represent a linear view of cause and effect, without acknowledging the interaction between the individual and the wider system they are part

¹⁷ In Chapter 2 ‘Literature Review, I introduced the basic psychological needs in SDT as an approach to eudemonic wellbeing generally, and briefly in the Chapter 4 Interlude.

of (Rutter et al., 2020). The wider system is acknowledged in systems thinking, which includes environmental, government and policy influences (Lox et al., 2006). Systems thinking and socioecological models build upon Bronfenbrenner's (1977) ecological theory, in which he proposed a number of overlapping ecosystems. Starting with the individual at the center, the ecosystems progress from the immediate environment to gradually wider settings (i.e., from current physical settings to social structures, government policies, societal values, and the cultural context). As such, socioecological models describe the context and assets that exist within the ecosystems, and systems approaches offer a way of exploring these assets in context. A contribution of systems approaches is in recognizing the importance of context and the multiple determinants of behavior that operate in different contexts (Owen et al., 2011).

Systems approaches focus on the population level and have been instrumental in understanding the role of the built environment in relation to active living (Sallis et al., 2006) and sedentary behavior (Owen et al., 2011). Typically, socioecological models and systems approaches are paired with behavioral theories to include the individual factors within the system (Salmon et al., 2020). However, the contribution of the environment above the social cognitive variables is small, and any variable could be argued to fit anywhere, which presents a lot of choice for how to influence an increase in physical activity behavior (Rhodes et al., 2019). To develop my intervention, I needed an approach that could guide my consideration of the individual (i.e., drawing on cognitive, automatic, and motivational processes) and contextual (i.e., drawing on systems) influences on physical activity and/or sedentary behavior.

COM-B and BCW

The COM-B system (see Figure 5.1) and BCW (see Figure 5.2)¹⁸ build towards a systems

¹⁸ COM-B and the BCW were introduced as a systematic process to intervention development in Chapter 5.

approach, as the environmental and individual influences are brought together in a framework that can be used at the individual and/or community level (Biddle, 2021). The COM-B and BCW were developed in response to the difficulty researchers faced in selecting between the multiple theories of behavior change. Initially, Michie et al. (2005) conducted an expert consensus exercise to integrate 33 prominent theories of behavior change into an overarching theoretical framework, the theoretical domains framework (TDF). Twelve domains were identified in their TDF, which has since been revised to 14 domains following a validation exercise (Cane et al. 2012). Each domain contained constructs from behavior change theories, for example the behavioral regulation domain includes self-monitoring, habit, and action planning constructs. The TDF enabled comprehensive identification of the influences on behavior, but was undertheorized (i.e., was not underpinned by a model with testable relationships) and initially underused (i.e., did not have the level of detail to guide intervention design; Michie et al., 2011). To maintain the comprehensive theoretical coverage and address these limitations, Michie et al. (2011) developed the COM-B and BCW from a systematic synthesis of previous behavior change frameworks. The TDF can be integrated within the BCW as an optional step, but as it can constrain intervention design (McGowan et al., 2020), and is challenging for individuals not from a psychology background to understand (Phillips et al., 2015), it was not well aligned to the Double Diamond framework guiding my research and I did not include this step in intervention development.

In addition to the COM-B system, TDF and BCW, it is important to note further advancements associated with the BCW approach, such as the behavior change techniques (BCT) taxonomy (Michie et al., 2013), which has enabled the standardized description of intervention content. BCTs are the active components of behavior change interventions that

were, prior to the BCT taxonomy, inconsistently described by researchers (e.g., ‘self-monitoring’ and ‘daily diary’ might have been used to describe the same behavior change component). The BCT taxonomy now facilitates comparison of content across interventions and settings so that researchers can identify which are most effective in changing specific behaviors (Biddle, 2021). Another development from the BCW approach is the ongoing mapping project that links BCTs with their mechanisms of action (MoA; Carey et al., 2018). Recognizing that BCTs were often selected by researchers because of the theoretical construct they target, without necessarily identifying the underpinning mechanism (i.e., the MoA), Carey et al. (2018) created a matrix tool to map BCTs and their MoAs. Developing this tool and testing MoAs is a priority for health behavior change research to identify the causal pathways that can explain why interventions work, not just that they work (Byrne, 2020). For instance, understanding that the problem solving BCT works because it targets behavioral regulation mechanisms.

The BCW approach is extensively used (e.g., Munir et al., 2018; Salmon et al., 2019) and, in addition to the wide theoretical coverage, a particular strength in relation to physical activity and sedentary behavior is that it is behavior and context specific (Biddle, 2021). Physical activity and sedentary behavior take on various types (e.g., light physical activity, muscle training exercise, occupational sitting, sedentary screen time), and understanding the specific behavior is central to COM-B and the BCW. In a prospective use of COM-B, Howlett et al. (2019) found that COM-B had strong predictive validity of physical activity behavior, with habits (capability), subjective norms (opportunity) and exercise self-identity (motivation) the key drivers. For sedentary behavior, COM-B also had strong predictive validity, with behavioral regulation (capability), subjective norms (opportunity), intentions, emotions, and perceived behavioral control (all motivation) the key drivers (Howlett et al., 2020). Although the findings

indicate that there are different predictors for physical activity and sedentary behavior, subjective norms were significant for both. This further evidences the limitation of theories which do not account for an individuals' interaction with their (social) environment (e.g., TPB), and indicates that they should be considered in my intervention design.

The BCW can be seen as a framework with comprehensive coverage of the constructs outlined in social cognitive, dual process, humanistic and socioecological approaches (see Biddle, 2021). However, the BCW is focused on planning and designing interventions. So, for interventions at initial conception (i.e., identifying there is a problem requiring intervention) or in need of refining and planning for a full evaluation (i.e., testing for feasibility, making changes to the intervention), other processes might be better suited (O'Cathain et al., 2019).

Processes to inform intervention development

O'Cathain et al. (2019) conducted a systematic review of processes that have been used to develop health interventions, resulting in a taxonomy of approaches. Theory and evidence-based processes (e.g., those using the BCW, MRC guidance or the theories reviewed above) are rigorous and produce interventions which have a reasonable chance of being effective. Yet, they can be limited as the people who will be using the intervention (e.g., target population or end-user) are not formally involved in the process (Janols & Lindgren, 2017). I will briefly introduce how some of the processes in O'Cathain et al.'s (2019) taxonomy can inform my intervention development in this section.

In partnership processes (e.g., co-design approaches) and target population-centered processes (e.g., user-centered approaches) interventions are based on the views and needs of the people that will be using them. Both are participatory approaches and can produce interventions that are more relevant to the end-users than if they are not involved (O'Cathain et al., 2019). For

example, Munir et al. (2018) used a participatory approach to develop their workplace sitting intervention, which was effective in the short, medium, and long-term (Edwardson et al., 2018). Working to create active classrooms, Köykkä et al. (2019) included teachers in the development and delivery of their intervention, recognizing that *how* an intervention is delivered can be as important as *what* is delivered (Hardcastle et al., 2017). It should be noted that Munir et al. (2018) used COM-B and the BCW alongside their participatory approach, and Köykkä et al. (2019) used SCT (among other relevant theories). As such, they are examples of a combination process (O’Cathain et al., 2019), which I intended to use to design my intervention (i.e., a co-design approach in combination with a theory-based approach). A strength of combination processes is that the benefits of different approaches are brought together, although the utility for other researchers to learn from combined approaches can be limited if it has not been described in sufficient detail (O’Cathain et al., 2019). To ensure consistent and sufficient detail in their intervention reporting, researchers are guided to use Hoffmann et al.’s (2014) template for intervention description and replication (TIDieR) checklist, which I will use to describe my intervention protocol.

From another process identified in the taxonomy, it is important to pay attention to the external validity of interventions (implementation based approach; O’Cathain et al., 2019). For instance, to encourage health researchers to consider intervention efficacy beyond statistical significance, Glasgow et al. (1999) introduced five evaluation dimensions in their reach, efficacy, adoption, implementation, and maintenance (RE-AIM) framework. The RE-AIM framework can be used as a progression guide (from pilot to full trial), and strength of the framework is the consideration of application to real-world settings. Michie et al. (2014) have also encouraged BCW users to consider the real-world application of interventions through their affordability,

practicability, effectiveness, acceptability, side-effects, and equity (APEASE) criteria. My intervention development will be guided by the APEASE criteria.

Rationale for COM-B system and the BCW

I have introduced a number of theories and processes that could be used to develop a physical activity and/or sedentary behavior intervention. All theoretical explanations and processes have merit, and therefore a framework with comprehensive theoretical coverage and combined approach to intervention development can enable me to take forward the strengths identified. In relation to my research program, the COM-B concepts have helped to understand sedentary behavior in the police (cf. Brierley et al., 2021), and were identified as relevant to physical activity in the police in Study 2a and 2b. COM-B and the BCW have also been used in combination with partnership approaches to intervention development (e.g., Munir et al., 2018; Salmon et al., 2019). They might be particularly well suited to doing so, as the COM-B concepts simplify complex information so it can be communicated to non-academic audiences (Michie et al., 2014). Therefore, using COM-B and the BCW are an appropriate method to *design* a physical activity intervention as they are iterative within my research (i.e., Study 2a and 2b) and can be used in combination with my co-design approach (i.e., Double Diamond framework). Further, using COM-B and the BCW with my co-design approach will ensure that the resultant intervention remains context specific (e.g., acceptable, feasible) to end-users and is likely to help to overcome limitations of the BCW (i.e., where target populations are not involved; Janols & Lindgren, 2017).

Method

To co-design a context specific physical activity intervention with the partner police forces, the BCW intervention guide was followed (objective 2), within the Double Diamond

framework (see Figure 3.2). Following on from previous studies (quantitative exploration in Study 1 and qualitative enquiry in Study 2a and 2b), the ‘problem’ that the intervention was being designed to ‘solve’ was low physical activity in the police workforce.

BCW Stage 1 – Understanding the behavior

In a co-design approach to intervention development, my role as the researcher was to understand what was effective in the extant evidence base of workplace physical activity and sedentary behavior interventions. The COM-B analysis (Study 2b) provided initial contextual understanding of the behaviors, so I next conducted a review of the intervention literature (objective 1).

BCW Stage 2 – Identify intervention options

Using the Stage 1 findings (data from Study 2a; COM-B analysis from Study 2b; literature review from Stage 1, Study 3), I selected intervention functions and policy categories for interventions in specific departments in the partner police forces. This informed four intervention options that were discussed with the steering group to contextualize the findings and select a department and intervention option that would be developed further with that specific department. This stage completed the ‘Define’ phase and first Double Diamond (see Figure 3.2).

Second iteration of BCW Stages 1 and 2

Once an intervention option and department had been selected with the steering group, I engaged in a second iteration of the BCW Stage 1 and Stage 2, to better understand the behavioral influences in that context. Specifically, I shadowed shifts within the department in both partner police forces, to observe the environment and collaborate with the individuals working there to learn about the acceptability and feasibility of intervention options so that the end-user needs were met (objective 3).

In the next steering group meeting, I reported back what I understood about the context specific behavior and, in light of the findings, discussed intervention options again. To guide decision making, the APEASE criteria were used. At this stage, I moved into the ‘Develop’ phase in the second Double Diamond.

BCW Stage 3 – Identify content (BCTs) and implementation options

Guided by the data from previous Stages, and the BCT taxonomy, I identified the BCTs that would be in the intervention and mapped them against the MoAs to clearly maintain, and test, the link to theory. The content (BCTs) and mode of delivery (implementation options) were discussed with the steering group. I then attended a training session with the supervisors in the specific department to discuss the intervention and gain further input from them.

The supervisor training session began the final ‘Deliver’ phase in the second Double Diamond. The supervisor comments informed the final intervention. This took me back to the ‘Develop’ phase in the second Double Diamond to integrate their ideas into the intervention materials. The final intervention was defined using the TIDieR checklist (objective 4).

Results

BCW Stage 1 – A review of the workplace intervention literature

The aim of Study 3 was to develop a physical activity intervention that was context specific, and the first objective was to review the extant intervention literature. Researchers frequently report that interventions which try to increase physical activity and reduce sedentary behavior simultaneously are not effective (e.g., Howlett et al., 2020; Swartz et al., 2014). So, in my literature review I will first look at physical activity workplace interventions, then, sedentary behavior workplace interventions, focusing on those that have used the BCW. I then give an overview of the intervention research that has been conducted in police forces specifically. In

this section, I review physical activity and sedentary behavior interventions together, and more broadly than those using the BCW, in order to focus on the context. I conclude the review of workplace intervention literature with a summary of findings.

Physical activity

Researchers have reported that theory-informed workplace physical activity interventions have small but positive effects on physical activity behavior (e.g., Abraham & Graham-Rowe, 2009; Taylor et al., 2012). It has been suggested that interventions focused on walking, counting steps (Abraham & Graham-Rowe, 2009), or using supervised exercise sessions (Lock et al., 2020) are most effective. In relation to individual BCTs, self-monitoring with goal setting has been frequently reported as an effective intervention component in workplace physical activity interventions (Abraham & Graham-Rowe, 2009; Lock et al., 2020). However, in their systematic review of workplace physical activity interventions, Taylor et al. (2012) found that barrier identification and relapse prevention were the BCTs with the largest effect size. The heterogeneity in workplace intervention studies presents a challenge for researchers to draw conclusions over what an effective intervention looks like (Lock et al., 2020). For example, Abdin et al. (2018) found that office exercise, yoga and walking interventions improved wellbeing, and concluded that any type of physical activity intervention was better than no intervention. This highlights the importance of developing an intervention for a specific context.

Seppälä et al. (2018) used the COM-B system and BCW to retrospectively analyze the content of physical activity promotion policies in the workplace context. They found that psychological capability, physical opportunity, and social opportunity were frequently supported by the existing policies, whereas physical capability was neglected. The most frequently used BCTs were information about health consequences, instructions on how to perform a behavior,

restructuring the physical environment, and social support. The authors identified that this resulted in an overreliance on providing information to change behavior, limiting the effect of the policies. In addition, they suggested that the effect of social support was limited to encouragement and counselling delivered through healthcare professionals only, which might not be effective. For example, to maximize social support in being received as intended, the content (what type of support is delivered) and process (how the support is delivered) are important (Rafaeli & Gleason, 2009). Cutrona and Russell (1990) categorized five types, or dimensions of support: emotional support (e.g., providing care or sympathy); tangible support (e.g., material or behavioral help); esteem support (e.g., encouraging someone); informational support (e.g., giving advice or information); and, social integration (e.g., companionship support), which Fisher (1997) suggested could be delivered from a directive (directed by the support provider) or nondirective (directed by the recipient) perspective. It might be that colleagues are a more effective source of nondirective, tangible or companionship support than healthcare professionals, and so considering different processes and social support providers other than healthcare professionals might be more effective (Seppälä et al., 2018). The overall implication from Seppälä et al.'s (2018) research is to consider the gaps in physical activity provision and support the neglected aspects (i.e., social environment) further to increase efficacy.

Sedentary behavior

Brierley et al. (2019) conducted a systematic review to identify the effective BCTs in workplace sedentary behavior interventions. There were significant reductions in sedentary behavior in 24 out of 29 studies, with the BCTs of social comparison, problem solving, demonstration of behavior, goal setting, behavior substitution and habit reversal frequently utilized in studies effecting behavior change. The interventions mostly targeted changing the

physical environment (e.g., active workstations) with an educational (e.g., behavior support strategies) and social element (e.g., team champions). Brierley et al.'s (2019) findings reflected those in Shrestha et al.'s (2018) review, in which it was found that workplace sit-stand desks were effective in reducing sedentary behavior in the first year of use only. The efficacy improved when they were used in combination with other behavior change strategies (e.g., information and counselling). Buckingham et al. (2019) combined physical activity with sedentary behavior in their systematic review of mobile health interventions in the workplace. They found that the most frequently observed BCTs were self-monitoring, feedback, goal setting and social comparison. Prompts and cues were commonly used to target sedentary behavior, which Stephenson et al. (2017) also found of the workplace interventions included in their systematic review.

What can be concluded from the effective BCTs used in workplace sedentary behavior interventions, is that occupational sitting should be considered a habitual behavior, and the most effective interventions target habits alongside the social context of occupational sitting (e.g., shared workplace social norms and social support; Brierley et al., 2019). Gardner et al. (2016) have also reiterated the need to combine physical and social environment modifications alongside individual behavior change strategies (e.g., habit regulation). Another conclusion to improve the existing workplace sedentary behavior intervention evidence base was the need to strengthen intervention reporting using the TIDieR checklist (Brierley et al., 2019).

Interventions in the police context

There is a growing body of research which has conducted physical activity and sedentary behavior interventions in police populations. Boyce et al. (2014) conducted a weight loss competition in police officers, which was effective in reducing body weight. Participants took part in teams, and the competitive nature of the intervention was suggested to be effective, as

police culture is team-oriented and officers are competitive. Boyce et al. (2014) detailed the competition rewards (e.g., certificates, trophy, financial prizes) in their paper, but not the physical activities that participants engaged in. In separate studies, Crawley et al. (2016) fully explained the procedures in their exercise program in a police academy, and reported significant improvements in physical fitness, while Jeter et al. (2013) detailed the sequences in their yoga intervention in a police academy and reported significant improvements in reduced stress. Although promising, both interventions were with cadets, so the feasibility of conducting the same interventions in the context of qualified police officers/staff might differ (i.e., trainees found it difficult to participate in yoga after academy training; Jeter et al., 2013). Rossomanno et al. (2012) did conduct a structured exercise program over six months with police officers and found health benefits (i.e., weight loss, and improvements in muscular strength and fitness). However, the behaviors were not maintained at 18 months follow-up, and the researchers found that a lack of time and motivation were barriers to adherence to the program. To achieve longer term success, Rossomanno et al. (2012) suggested that physical activity should be embedded into the work routines of police officers.

There are limited examples of police physical activity interventions that have been informed by theory; doing so could improve the understanding of the causal mechanisms for the reported effects and increase the likelihood of long-term physical activity behavior change (Lock et al., 2020). Although not a behavior change theory, Anshel and Kang (2008) aligned their fitness regimen to motivational interviewing (MI; Miller & Rollnick, 1991). MI is a person-centered approach to behavior change, which can be explained by SDT (see Markland et al., 2005). In MI, individuals are encouraged to activate their own motivation, resources, and decisions regarding change, although the setting or support provider might determine the focus

of the change (e.g., physical activity; Miller & Rollnick, 2013). MI can reliably produce improvements in physical activity (O'Halloran et al., 2014), and the MI techniques used in physical activity counselling interventions can be mapped onto the BCT taxonomy (Gagnon et al., 2018). In Anshel and Kang's (2008) study, police officers worked with a performance coach to identify their negative health habits (e.g., lack of exercise, poor nutrition) and develop plans to change these habits over 10 weeks. Despite reporting improved physical fitness following the intervention, there was a high dropout rate which was suggested to be due to the relationship with the performance coach. Anshel and Kang (2008) summarized that MI is a promising area for police research but should be considered in the whole organizational context to facilitate the longer-term process of behavior change. For example, positioning supervisors as the providers of MI instead of an external coach might better help to embed new behaviors.

Previous physical activity interventions have focused on police officers, but Pedersen and colleagues conducted sedentary behavior interventions with office-based police staff. Their extant evidence base has all utilized Exertime, an e-health software program which prompts users to stand and engage in a short bout of physical activity (typically lasting one to two minutes) every 45 minutes. The prompt can be ignored, but only for 15 minutes, at which point Exertime takes over the workers' computer screen to 'force' them into exercise and make it more difficult to continue with the existing sedentary habit (a passive prompt). Pedersen et al. (2014) found that Exertime users had increased calorie expenditure after a 12-week intervention compared to controls, and Mainsbridge et al. (2014) found a reduction in blood pressure in their Exertime intervention group compared to controls. Although there was no follow-up in either study, Cooley et al. (2014) conducted a qualitative follow-up and participants reported an increase in motivation and communication with colleagues because of the Exertime intervention.

They also reported that there was a need for organizational support to give participants confidence to change their sedentary habits. There has been some consideration of psychosocial variables with Exertime research in the police, as Mainsbridge et al. (2020) found that perceived job stress decreased at a three-month follow-up. Exertime-based research in the police has retrospectively been coded using the BCT taxonomy (Stephenson et al., 2017), however has not yet been theoretically informed. Researchers have offered suggestions for why Exertime is effective: it reconceptualized the stigma that workplace physical activity had to take place at lunchtime into one that included short-burst exercises (Pedersen et al., 2014); and, the passive prompt engaged participants in the decision-making processes (Mainsbridge et al., 2014).

To promote physical activity across the whole of a police force (i.e., to all officers and staff), researchers have begun to develop mobile health technologies (e.g., interventions delivered through mobile phone apps). Across a 100-day physical activity challenge, where participants competed in teams to record the most movement, Oliver et al. (2021) found physical activity increased, and perceived job stress, job satisfaction, coping strategy use and engagement at work improved for police officers and staff. Post-intervention qualitative interviews gave insight into the impact of the team related aspect, as participants explained that the intervention built comradery throughout the police force. Also using a phone app, Buckingham et al. (2020) delivered health and wellbeing information, deployed wellbeing champions and taster physical activity sessions with sports clubs throughout a police force. Using objective physical activity measures (i.e., a pedometer) they found a significant increase in daily step count from the intervention, and, that the greatest increase on physical activity behavior was amongst the less physically active officers and staff. However, there were no statistically significant changes on secondary outcomes (e.g., perceived stress) except for mental health related quality of life.

Buckingham et al.'s (2020) study represents a step forward in police physical activity intervention research, as their intervention was coded with the BCT taxonomy. Yet their research design could not determine which of the BCTs was effective in behavior change. Again, qualitative interviews gave some insight into what participants perceived was effective, and suggested that the individual app features (e.g., goal setting, self-monitoring) were preferred to the social components (e.g., social comparison, competitions, support), which is contradictory to other police research (e.g., Boyce et al., 2014; Oliver et al., 2021). The qualitative interviews in Buckingham et al.'s (2020) study also highlighted contextual factors (e.g., pressure of work, organizational culture, lack of supervisor engagement) as barriers to intervention engagement.

Summary of workplace intervention literature

The results of my review of workplace intervention literature have indicated that self-monitoring with goal setting is an effective BCT for physical activity (e.g., Lock et al., 2020) and sedentary (e.g., Brierley et al., 2019) behavior change. Specific to the police, there is evidence to support the efficacy of physical activity (e.g., Boyce et al., 2014) and sedentary behavior (Mainsbridge et al., 2014) interventions. However, there were limited instances where interventions were reported in sufficient detail (e.g., Rossomanno et al., 2012) or underpinned by theory (e.g., Crawley et al., 2016). There are gaps in the literature as to what works to change police physical activity behavior, and why. What can be taken from the extant evidence, is that interventions conducted with the police need to address barriers to participation, such as lack of time (Rossomanno et al., 2012). Further, that team support aspects (Boyce et al., 2014; Oliver et al., 2021), being involved in decision-making (Anshel & Kang, 2008; Mainsbridge et al., 2014) and embedding the activity into work practices (Anshel & Kang, 2008; Rossomanno et al., 2012) might all be important to the feasibility and efficacy of the intervention. The importance of

support and autonomy were also identified in Study 1, Study 2a and Study 2b in the context of the partner police forces in my research program.

BCW Stage 2 – Identify intervention options

Using the Stage 1 findings (data from Study 2a and 2b; COM-B analysis from Study 2b; literature review from Stage 1, Study 3), I linked four contexts for physical activity intervention to intervention functions and policy categories, providing examples for intervention options (see Table 6.1). To elaborate, the participants in Study 2b provided the context of four possible departments or teams where workers experienced low physical activity at work and so could be the end-users of my intervention. In the Study 2b COM-B analysis, I suggested that psychological capability, social opportunity, automatic motivation, and reflective motivation were the COM-B concepts that could be further supported to increase physical activity behavior. Following on from this, the matrix of links between COM-B concepts, intervention functions and policy categories in the BCW guide (Michie et al., 2014) led me to select options as to how each COM-B concept could be influenced. The example intervention options or ideas that resulted were informed by this process, what worked for physically active police officers and staff in the Study 2a data (e.g., the influence of others) and what had been identified as effective in the Study 3 Stage 1 workplace intervention literature review (e.g., create a reward system).

Next, to decide which context to develop the intervention with, I met with the steering group. In the Chapter 4 Interlude I introduced four considerations in the ‘Define’ phase in the Double Diamond that guided the steering group decision to focus on physical activity as the driver for wellbeing. The four considerations were again discussed to select the department to ‘Develop’ an intervention with, in the next Double Diamond phase (see Figure 3.2):

- Feasibility was discussed in terms of shift patterns. Some of the intervention

Table 6.1 Four specific contexts for physical activity interventions and options for intervention

Team and rationale	Example of data from Study 2b	COM-B concept	Intervention function	Policy category	Example intervention option / idea
Constable – officers based at stations in sedentary role	We [team] walked into town on Friday lunchtime and he [colleague] said ‘we should be doing this more often just to get away from the computer’’. (Shelley, Force A Interview 3)	Social opportunity	Enablement, Modelling	Comms/marketing, Environmental/social planning, Guidelines, Regulation, Service provision	Restructure environment to increase social support for physical activity Collectively establish rules
Control room – high demand, restrictive role	Sometimes for 6 or 7 hours and I haven’t got up off my chair (Davina, Force A Interview 2)	Psychological capability	Education, Enablement, Environmental restructuring, Modelling, Training	Comms/marketing, Environmental/social planning, Guidelines, Regulation, Service provision	Educate about the ways to be physically active Enable movement in environment
Human Resources – sedentary role	I love exercise though, I don’t understand why I can’t seem to motivate myself to get back into it and get back into the routine (Abigail, Force B Interview 2)	Automatic motivation	Enablement, Environmental restructuring, Incentivisation, Training	Comms/marketing, Environmental/social planning, Guidelines, Service provision	Create a reward system Modelling to induce automatic behaviors
Custody – isolated environment (small team), restrictive role	The motivation to do more [physical activity], probably would come in getting me fit and just fitting it in [work] basically (Freya, Force A, Interview 6)	Reflective motivation	Education, Incentivisation, Modelling	Comms/Marketing, Guidelines, Regulation, Service provision	Communications to create more positive beliefs Establish a workplace service to form personal plans

options (e.g., enablement and social support) were perceived as more challenging for teams with colleagues working on different shift patterns;

- All ideas were low cost;
- There was support for all ideas (see Table 6.1), as all could potentially add value to the relevant department, but greatest support was for developing an intervention with the department with the least physical activity at work (i.e., the department that would, as suggested by Study 1 findings, and Buckingham et al.'s 2020 findings, benefit most);
- In terms of portability and size, environmental restructuring (e.g., e-health software) was perceived to have potential to influence a whole department rather than individualized enablement.

The control room was selected as the context to develop the physical activity intervention with, because staff have a sedentary role with limited opportunity for movement and it is a high demand and high stress environment. In the control room, staff perform one of two roles; call handlers take 999 emergency calls and 101 non-emergency calls, and dispatchers monitor operations and liaise with police officers attending incidents. Control room operators are usually the first point of contact for distressed members of the public and must remain emotionally neutral while they coordinate complex information between the public and police officers (Lumsden & Black, 2018). Steering group members reported that, in their respective forces, the control room was the area with the highest sickness absence, citing musculoskeletal issues and mental ill-health as the two main reasons for sickness. Previous research on police control rooms has found that high demands, low control, lack of managerial support and constant change causes a high stress environment that leads to poor physical health, poor mental health, and increased

substance use (Galbraith et al., 2021). Despite this, the control room remains an under researched area in policing (Galbraith et al., 2021; Lumsden & Black, 2018).

Second iteration of BCW Stages 1 and 2

Once the control room was agreed as the context for the intervention, I needed to discover more about that context and collaborate with those working there to develop one of the intervention options (see Table 6.1) further. Control room staff work on a shift pattern of six shifts on (two morning shifts, two days shifts, two night shifts) followed by four rest days. To observe any differences in capability, opportunity, or motivation for physical activity behavior between shift times, I shadowed one morning (7am – 5pm), one day (1pm – 9pm) and one night shift (9pm – 7am) in the control room in each of the partner police forces. As well as differences in shift times, I also observed differences (and consistencies) between the control rooms in Force A and Force B (e.g., observing that Force A was more performance oriented than Force B). My findings are summarized in Table 6.2. Overall, control room workers did not leave their desks over each shift (eight – 10 hours in length), except for one 36-minute break, to go to the toilet or to make a cup of tea. Individuals told me that they noticed they felt stiff at the end of a shift, and that there were different opportunities for movement between roles and times of day or night. Generally, call handlers had more opportunity for movement than dispatchers, and there was more opportunity for movement during a night shift than during the morning or day (although motivation was lower). I observed that behavior was driven by demand (i.e., calls queueing or incidents in progress), and so support would be needed for individuals to develop self-regulation for physical activity behavior at work. Social norms (i.e., needing supervisors' permission, not wanting to stand out, not moving from desks) were also found to drive behavior (see Table 6.2). These observations suggested that behavioral regulation and social influence mechanisms might

Table 6.2 Findings from shadowing shifts in partner police force control rooms

Observation	Both forces	Force A or Force B differences
Role differences	<p>Call handler – have three screens (typically use two), can set status to ‘unavailable’ if have permission to leave desk;</p> <p>Dispatch – have four screens to monitor, work as a pair (‘buddy’) to cover areas and need to be constantly available;</p> <p>Supervisors – work on a six-month rotation, have to evidence they have made positive change in work to get a promotion, do not answer calls and can walk around the control room.</p>	Force A is a bigger force, control room shared with some fire and ambulance services.
Control room staff wellbeing	Staff are encouraged to take a small break when they take a distressing call, but this does not happen often in practice due to demand.	Force A had a welfare room for staff to take some time out, although the room has been re-purposed. Wellbeing is discussed in team meetings but is performance oriented.
Opportunities for movement	<p>Time of shift – morning and day shifts have few breaks between calls or tasks. There is downtime in night shifts, staff update systems but also chat, go on their mobile phones, or crochet;</p> <p>Sit-stand desks – a couple of desks in each force control room had functionality to stand while working but were seldom used – most staff think these give the best opportunity for movement and did not know what else could be done.</p>	Force A had some break flexibility for smokers, they can choose four x nine-minute breaks instead of one 36-minute break, and some have additional smoking breaks
Drivers of behavior	<p>Demand – calls queueing or incidents in progress drive staff behaviors and the mood in the control room, which can change to a stressful environment quickly depending on the nature of calls. No awareness of own needs (including needing to move);</p> <p>Social norms – staff work on shifts together, support each other and chat between calls to create a team environment. “The ones who work hard are the ones who are sat down”, the only reasons to not be sat down are to be doing a tea round for the team. Supervisor permission is needed to do this, and to leave your desk (including to go to the toilet).</p>	<p>Force A is performance oriented – performance manager collates team statistics which creates some competition between teams, but there is also support between teams (i.e., unwritten rule where a shift comes in early to relieve the previous);</p> <p>In Force B ‘performance’ was not mentioned. As a smaller force staff are more self-conscious of ‘standing out’ and not behaving as per a sedentary social norm.</p>
Staff thoughts on a physical activity intervention	<p>Staff think there are no opportunities for movement in work. Staff who are physically active outside of work do not perceive that they need to be active whilst at work as well;</p> <p>Supervisors thought that “anything for physical activity is better than nothing”, or that it was worth “giving it a go”.</p>	Force B was more positive for the physical activity intervention than Force A (supervisors had concerns physical activity would distract from performance).

be influential for behavior in the control room.

I reported my observations of the control room context back to the steering group and discussed intervention options using the APEASE criteria. It was agreed that enablement (increasing means/reducing barriers to physical activity), modelling (providing an example), training and education intervention functions could all be influenced through service provision. Specifically, e-health software could be used to deliver a service that would prompt a change in the sedentary habits of control room workers, as:

- Acceptability – staff are used to monitoring screens and responding to prompts, so e-health software is acceptable (some bespoke amendments might be needed for the control room context) to bring movement into workers' awareness. In addition, with information and demonstrations of exercises that can be done in the vicinity of the desk included in the software, the barrier of inactive staff not knowing what to do to embed movement into work could be overcome;
- Practicality – given the constraints of the environment staff needed to be able to move in the vicinity of their desk. Due to shift patterns and the restrictions of one 36-minute break, physical activity at work was not practical (i.e., staff were not regularly free on a Wednesday at 5pm to take an exercise class and could not engage in a 30-minute exercise class as well as eat a meal during their break). Interrupting sedentary behavior with short bursts of activity that could be completed at their desk was more feasible;
- Effectiveness – developing habits where workers regularly engage in short active microbreaks has been effective in reducing blood pressure (Mainsbridge et al., 2014), increasing calorie expenditure (Pedersen et al., 2014) and reducing

perceived job stress in the Tasmanian police (Mainsbridge et al., 2020). The prompts and shorter activities were also considered to be suitable to the low physical activity group, where other interventions (e.g., competition, Boyce et al., 2014; exercise program, Crawley et al., 2016) might be off-putting to inactive control room workers. It has also been suggested that embedding habits into police work routines is needed for sustainable change (Rossomanno et al., 2012);

- Affordability – affordable e-health software would be selected in Stage 3;
- Safety – to ensure safety of critical control room operations, the e-health software would be checked with IT departments and control room supervisors;
- Equity – e-health software could be delivered to all workstations in the control rooms (and potentially to other departments).

BCW Stage 3 – Identify content (behavior change techniques) and implementation options

To select the e-health software that could meet the APEASE criteria in the control room context, six e-health programs were sourced. I downloaded trials of the programs and met with representatives from two of the software providers to understand their functionality further. I demonstrated the programs to the steering group. Of the six programs, the steering group preferred Exertime, as it was simple to use and there was scope to amend the software so that it was bespoke for the control room (i.e., remove the passive prompt). The bespoke amendments for the control room included filming supervisors completing the Exertime exercises (and additional exercises) in the control room, to fulfil the modelling intervention function and socially influence behavior change.

To gain further input from the control room supervisors, I attended one of their training days in each partner police force and delivered a session about Exertime. The supervisor training

sessions lasted 30 minutes (see PowerPoint slides in Appendix 11). This comprised: 10 minutes reporting my research program findings from Study 1, 2a and 2b; five minutes introducing Exertime; and, 15 minutes discussion canvassing supervisors' feedback to improve the intervention, so it was suitable for the control room context. In Force B, most supervisors were positive about the Exertime intervention. They said that physical activity needed to be enjoyable to be sustainable and suggested that making some of the exercises into competitions might make them more fun. They recognized their role and influence as supervisors in supporting staff (e.g., encouraging staff participation, creating a good experience, educating staff) and explained that individual staff needed (preferred) different types of support. They volunteered to be filmed taking part in the Exertime exercises to demonstrate their support and suggested introducing the exercises to staff in force training days so that they could practice the exercises, building their self-belief and confidence to participate. In Force A, supervisors had concerns that staff would use the e-health software to take an excess of breaks which could negatively impact performance. They also raised concerns that the software prompts might cover up another important app on computer screens, and/or that staff would claim their work was putting them at risks of ill-health if they received information about the health consequences of sedentary behavior and then could not engage with the prompts¹⁹. The feedback from both supervisor training sessions was integrated into the final intervention, which I next describe a protocol for.

Intervention protocol

The aim was to pilot the Exertime intervention (delivered beyond the thesis; see Figure 3.2) and assess the feasibility of progressing to a full trial (see Hallingberg et al., 2018). The pilot of the Exertime intervention would address three research questions:

¹⁹ The reasons for the concerns in Force A are discussed in the 'practical implications' sections of my discussion in this chapter.

1. What are the perceptions of feasibility and acceptability of the Exertime intervention in the police control room?
2. Does the Exertime intervention influence sedentary behavior (primary outcome), stress and psychological wellbeing (secondary outcomes)?
3. What is the value of behavioral regulation and social influence mechanisms in the police control room?

Participants. Participants will be recruited according to the following inclusion criteria:

1) they work in the control rooms of the partner police forces; 2) they complete a physical activity readiness questionnaire (PAR-Q; see Appendix 15).

Design. Exertime is a three-group randomized control trial design, consisting of: a control group; an Exertime group; and, a Social Exertime group. Using computer generated software, participants will be randomly allocated as a shift to one of the intervention groups (i.e., all participants in the same shift are randomly allocated to the same intervention group). Control groups will receive an education session on the importance of interrupting sedentary behavior (see Appendix 12). The Exertime intervention group receive the same education session, as well as the Exertime intervention. The Exertime intervention comprises the Exertime e-health software, video demonstrations of exercises (Appendix 13) and Exertime instructions (Appendix 14). The Social Exertime group receive the same education session as the control group and Exertime intervention group, and the same Exertime intervention as the Exertime intervention group. In addition, they receive nondirective social support delivered by their supervisors.

The Exertime intervention was developed following the BCW guide. The COM-B

concepts, intervention functions, MoA, BCTs and mode of delivery can be seen in Table 6.3²⁰.

The key MoAs that are targeted in the Exertime intervention are behavioral regulation, social influences and social norms (which findings from Study 2b, and my control room observations indicated drove behavior in the control room). Using Carey et al.'s (2018) tool, these MoAs were mapped onto BCTs in the Exertime intervention (see Table 6.3). Additional MoAs are also present in the Exertime intervention following suggestions in the supervisor training sessions (e.g., getting staff to practice the Exertime exercises in their training sessions is linked to the beliefs about capabilities MoA). Further insight into the operationalization of each of the BCTs in the Exertime intervention is provided in Table 6.4.

The social support in the Social Exertime group was designed in line with MI to provide supervisors with guidance on *how* the social support aspects of the intervention should be delivered, as well as *what* should be delivered (Hardcastle et al., 2017). Supervisors in the Social Exertime intervention group co-developed examples of nondirective support statements to exchange with their staff, to support (socially influence) their engagement with the intervention. The intervention design was focused on nondirective support to reflect the different types of support that supervisors had explained staff needed in the supervisors training session. For example, in week one, supervisors ask their staff "how can I best support you to engage in Exertime?" This statement targets the social support (unspecified) BCT and the MI technique to support change or persistence (Hardcastle et al., 2017). As it targets a social support BCT it is linked to the social influence MoA (see Carey et al.'s 2018 tool). The complete list of supervisors' supportive statements is in Appendix 16, with each statement mapped against the

²⁰ The Exertime intervention was developed before the Covid-19 pandemic. Amendments that could be made to the delivery of the Exertime intervention in light of the Covid-19 pandemic are considered later in this Chapter (e.g., amendments to mode of delivery, removal of some BCTs – see 'Strengths, limitations and future directions').

Table 6.3 Mapping COM-B concepts against intervention functions, MoA, BCTs and mode of delivery

COM-B concept	Intervention Function	MoA	BCT	Mode of delivery
Psychological Capability	Education, Enablement, Modelling, Training	Behavioral regulation	1.1 Goal setting (behavior) 1.2 Problem solving 1.4 Action planning 1.8 Behavioral contract 2.3 Self-monitoring of behavior 8.3 Habit formation	Face to face, individual Face to face, individual Face to face, individual Face to face, group Face to face, group Distance, individual
		Memory, attention and decision processes	1.9 Commitment 7.1 Prompts / cues	Face to face, group Distance, individual
		Knowledge	4.1 Instruction on how to perform behavior 5.1 Information about health consequences	Face to face, group Face to face, group
Social Opportunity	Enablement, Modelling	Social influences	3.1 Social support (unspecified)	Face to face, individual
		Norms and Subjective Norms	6.3 Information about others' approval	Face to face, individual
Reflective Motivation	Education, Modelling	Goals	1.5 Review behavior goal(s)	Face to face, individual
		Beliefs about capabilities	6.1 Demonstration of behavior 8.1 Behavioral practice/rehearsal 15.1 Verbal persuasion about capability	Face to face, group Face to face, group Face to face, individual
		Self-image	13.1 Identification of self as role model	Face to face, group

BCT, MI technique and MoA that it is linked to.

Intervention schedule. The Exertime intervention schedule involves four phases:

- Set-up phase (0-4 weeks). All staff working in the police control rooms will receive the education session during their staff training sessions. To participate, staff will be asked to complete consent forms and a PAR-Q (see Appendix 15) following the education session. Registers will be taken at the training sessions to monitor recruitment. After four weeks (once all shifts have had their training session and been at work for one shift set to allow time to volunteer to participate), shifts will be randomly allocated to an intervention group. The supervisors in the Social Exertime group will be emailed instructions and information to deliver the social support aspects;
- Baseline (week 5). On the first shift that participants can use Exertime, I will give demonstrations on how to use the software and collect data on primary and secondary outcomes (i.e., ensure self-report survey measures have been completed, take blood pressure data readings; see ‘outcomes’). Retention will be monitored over the 12-week intervention period;
- End (week 17). On the last shift that participants can use Exertime, I will repeat another data collection and recruit for end-user interviews to assess perceptions of feasibility and acceptability;
- 6-month follow-up. I will repeat another data collection on primary and secondary outcomes to determine any longer-term impacts of the Exertime intervention.

Table 6.4 BCTs mapped against their definition, intervention group, how it is operationalized and when it is delivered in Exertime

Label	Definition in BCT Taxonomy	Group	Example of operationalization in Exertime	When delivered
<i>Goals and planning</i>				
1.1 Goal setting (behavior)	Set or agree a goal defined in terms of the behavior to be achieved	3	Supervisors will ask their staff to identify a specific goal in terms of Exertime e.g., record 5 Exertime activities per shift	Intervention - Start
1.2 Problem solving	Analyze, or prompt the person to analyze, factors influencing the behavior and generate or select strategies that include overcoming barriers and/or increasing facilitators	3	Supervisors will prompt their staff who are not engaging well with Exertime to generate strategies that could increase their engagement	Intervention - Mid
1.4 Action planning	Prompt detailed planning of performance of the behavior (must include at least one of context, frequency, duration and intensity)	3	Supervisors will ask their staff how they plan to continue to perform Exertime behaviors at the end of the intervention	Intervention - End
1.5 Review behavior goal(s)	Review behavior goal(s) jointly with the person and consider modifying goal(s) or behavior change strategy in light of achievement. This may lead to re-setting the same goal, a small change in that goal or setting a new goal instead of (or in addition to) the first, or no change	3	Supervisors will discuss progress with staff in relation to Exertime behaviors	Intervention – Mid, End
1.8 Behavioral contract	Create a written specification of the behavior to be performed, and witnessed by another	3	A contract is drawn up between the supervisor and their shift staff, during a team meeting so all witness the whole team committing to Exertime	Intervention - Start
1.9 Commitment	Ask the person to affirm or reaffirm statements indicating commitment to change the behavior	3	Supervisors will revisit the behavioral contract with their staff (individually and in meetings using the words ‘high priority’) to continue with Exertime behaviors	Intervention - Weekly
<i>Feedback and monitoring</i>				
2.3 Self-monitoring of behavior	Establish a method for the person to monitor and record their behavior	2,3*	Staff are encouraged to view their feedback graphs in the Exertime software	Training session
<i>Social support</i>				
3.1 Social support (unspecified)	Advise on, arrange or provide social support or non-contingent praise or reward for the behavior	3	Supervisors were given a list of supportive messages that could be portrayed to staff	Intervention - Weekly
<i>Shaping knowledge</i>				
4.1 Instruction on how to perform the behavior	Advise or agree how to perform the behavior	1,2,3	The researcher advises staff which exercises can be used to record naturally occurring activities, e.g., going to the loo	Training session

<i>Natural consequences</i>				
5.1 Information about health consequences	Provide information (e.g., written, verbal, visual) about health consequences of performing the behavior	1,2,3	The researcher delivers content regarding the impact of sedentary behavior on general health and wellbeing	Training session
<i>Comparison of behavior</i>				
6.1 Demonstration of the behavior	Provide an observable sample of the performance of the behavior directly in person or indirectly (e.g., via film, pictures, for the person to aspire to or imitate), includes 'Modelling'	1,2,3	Video demonstrations accompany each exercise within the Exertime software	Intervention
6.3 Information about others approval	Provide information about what other people think about the behavior. The information clarifies whether others will like, approve or disapprove of what the person is doing or will do	1,2,3*	The researcher highlighted that supervisors are supportive of the intervention and have participated in the content of the Exertime software	Training session
<i>Associations</i>				
7.1 Prompts/cues	Introduce or define environmental or social stimulus with the purpose of prompting or cueing the behavior. The prompt or cue would normally occur at the time or place of performance.	2,3	The Exertime intervention prompts staff to stand and engage in a short-burst exercise every hour	Intervention
<i>Repetition and substitution</i>				
8.1 Behavioral practice/rehearsal	Prompt practice or rehearsal of the performance of the behavior one or more times in a context or at a time when the performance might not be necessary, in order to increase habit or skill	1,2,3	The researcher leads staff in completing four of the Exertime exercises	Training session
8.3 Habit formation	Prompt rehearsal and repetition of the behavior in the same context repeatedly so that the context elicits the behavior	2,3	The Exertime exercises prompt repetition of the same physical activities within the vicinity of work desks	Intervention
<i>Identity</i>				
13.1 Identification of self as role model	Inform that one's own behavior may be an example to others	1,2,3*	Researcher informs supervisors that they are role models to their staff and their behaviors	Supervisor training session
<i>Self-belief</i>				
15.1 Verbal persuasion about capability	Tell the person that they can successfully perform the behavior, arguing against self-doubts and asserting that they can and will succeed	3	Supervisors tell their staff that they can successfully decrease their sedentary time, despite the demands of their roles	Intervention - mid

Groups: 1 = Control, 2 – Intervention, 3 = Social * = Can be reinforced in the social group

Outcomes.

Sedentary behavior (primary outcome). The Occupational Sitting and Physical Activity Questionnaire (OSPAQ; Chau et al., 2012) will be used to measure sedentary behavior at work. The OSPAQ has demonstrated excellent test-retest reliability and moderate validity for establishing time spent sitting or standing at work (Chau et al., 2012). Over four questions, participants indicate the hours and days they have worked in the past week, and describe the activities (i.e., sitting, standing, walking, and heavy labor or physically demanding tasks) they have engaged in, as a percentage. For example, in response to the question: “How would you describe your typical workday in that last seven days?” an office worker might respond: “95% sitting, 2% standing, 3% walking, 0% heavy labor or physically demanding tasks”.

Physical activity. Physical activity is to be measured using the single item physical activity questionnaire (Milton et al., 2013). Reliability, concurrent validity (Milton et al., 2013) and criterion validity (Wanner et al., 2014) have all been demonstrated. Participants provide a number of days in response to the question: “In the past week, on how many days have you done a total of 30 minutes or more for physical activity, which was enough to improve your breathing rate?”

Psychological wellbeing. The Warwick-Edinburgh Mental Wellbeing Scale (WEMWBS; Tennant et al., 2007) will be used to measure wellbeing. Tennant et al. (2007) demonstrated test-retest reliability and internal consistency for this measure, in which positively worded items are used to measure hedonic and eudemonic aspects of mental health. Over 14 questions, participants are asked to indicate their experience over the past week by circling a number between one (*none of the time*) and five (*all of the time*). For example: “I’ve been feeling optimistic about the future”.

Perceived job stress. A single item question will be used to measure perceived job

stress. Kinman and Jones (2005) demonstrated construct validity, and Houdmont et al. (2019b) found that the global single item measure tapped into a common and stable set of referents. Participants respond on a scale of one (*not at all stressful*) to five (*extremely stressful*) to the question: “How stressful do you find your job?”

Perceived job satisfaction. A single item question will be used to measure perceived job satisfaction. It is commonly used (e.g., O’Connell et al., 2015), and high reliability, concurrent and construct validity have been demonstrated (Dolbier et al., 2005). Participants respond on a scale of one (*extremely dissatisfied*) to seven (*extremely satisfied*) to the question: “Taking everything into consideration, how do you feel about your job as a whole?”

Habits. Sitting habits will be measured using the Self-Report Behavioral Automaticity Index (SRBAI; Verplanken & Orbell, 2003). Convergent and predictive validity have been reported with full habit scales (Gardner et al., 2012). Over four questions, participants respond on a scale of one (*completely uncertain*) to 11 (*completely certain*) as to how true a behavior is. For example: “Sitting at work is something I do without thinking”.

Behavioral regulation. To measure self-regulation for sitting in the workplace, Hadgraft et al.’s (2017) scale will be used. Their scale was adapted from physical activity literature as there were no existing measures specific to workplace sitting. Internal consistency and test-retest reliability of the measure has been demonstrated (Dunstan et al., 2013). Over four questions, participants respond on a scale of one (*never*) to five (*very often*) as to how often they have used various strategies to regulate their behavior. For example: “In the past 12 weeks I have recorded my sitting or standing at work”.

Perceived support. To measure perceived support from supervisors, Caplan et al.’s (1975) scale will be used. Internal consistency and predictive validity has been reported in previous studies (e.g., Rooney & Gottlieb, 2007). Over four questions, with subscales for key support providers, participants respond on a scale from one (*not at all*) to four (*very much*) as

to how much support they perceive would be provided by the key support providers, if needed. For example: “If needed, how easy is it to discuss your problems at work with your supervisor?”

Received support. The Social Support Inventory (SSI) nondirective subscale will be used to measure received support (see Fisher, 1997; Harber et al., 2005). The SSI nondirective subscale has internal consistency at four, eight and 12 weeks (Gabriele et al., 2011), and has been used in the workplace context (Johnson et al., 2018). Over four questions, participants respond on a scale from one (*not at all typical*) to five (*very typical*) as to how typical each statement is of the support received from their supervisor in the past 12 weeks. For example, if they would: “show an interest in how you are doing”.

Descriptive social norms. To measure descriptive social norms for sitting in the workplace, Priebe and Spink’s (2011) three items measuring physical activity will be adapted. Only highly specific items for sitting social norms are available (e.g., Priebe & Spink, 2015), and highly specific items for norms have reduced predictive validity (Ball et al., 2010). Participants respond on a scale of one (*not at all*) to seven (*very often*) about how often they think their co-workers engage in a behavior. For example: “How often do you think your co-workers try to stand up from their desk?”

Blood pressure. Blood pressure readings will be taken as an indicator of physiological health functioning in line with clinical practice guidelines (Whelton & Carey, 2018).

Exertime usage data. Each time a participant engages with an Exertime exercise, the type of exercise, amount of time they spent on the exercise, calorie output, and time and date of the exercise is recorded by the e-health software program. This data will be downloaded at the end of the 12-week intervention to monitor adherence.

End-user interviews. In line with previous research into the acceptability and feasibility of workplace sitting interventions (e.g., Hadgraft et al., 2016), semi-structured

interviews will be conducted to gain participants' reflections on the acceptability and feasibility of a full trial of Exertime in the police control rooms. Questions will relate to perceived impacts of the Exertime intervention, engagement, and barriers and enablers to participation. For example: "Can you describe a time when you were not able to engage with an Exertime prompt?"

Analysis. Qualitative end-user interviews will be analyzed using reflexive thematic analysis (Braun & Clarke, 2022) to explore the acceptability and feasibility of the Exertime intervention (research question one). Quantitative data will be analyzed using a one-way repeated measures multivariate analysis of variance (RM-MANOVA) on baseline, end, and six-month follow-up measures to test for any impact of the Exertime intervention on primary (sedentary behavior) and secondary outcomes (other variables as detailed in 'measures'; research question two). Post-hoc analyses will be used to determine significant differences between the intervention groups and the value of behavioral regulation (i.e., Exertime intervention group) and social influence (i.e., Social Exertime intervention group) mechanisms (research question three). The TIDieR checklist for the Exertime intervention is provided in Appendix 17.

Discussion

In Study 3, I developed a context specific physical activity intervention with police force control room workers using a co-design framework (Double Diamond) and the BCW. First, I conducted a review of workplace physical activity and sedentary behavior intervention literature to inform the intervention (objective 1). From this review I found that goal setting and self-monitoring were effective techniques to change physical activity and sedentary behavior in occupational settings (e.g., Brierley et al., 2019), but had not been tested in police populations. Physical activity and sedentary behavior interventions with the police had not been clearly reported or informed by theory but indicated that support and

autonomy might be important factors to the efficacy of interventions (Anshel & Kang, 2008; Boyce et al., 2014). To continue developing my intervention so that it was theory-based and context specific, I followed the BCW guide (objective 2). Following guidance from the steering group, agreement was reached to focus on the control room context for the intervention, as staff were sedentary in their roles and experienced high stress and low wellbeing in that environment (Galbraith et al., 2021). To discover more of the control room context and engage with police officers and staff working there, I shadowed shifts in both partner police forces (objective 3). I observed that high demands (i.e., volume, frequency, nature of emergency calls) and social norms (i.e., standing up is perceived as not working hard) drove the sedentary behavior in the control rooms. In addition, I observed that supervisors held a lot of influence over whether staff felt able to stand up or leave their desks (i.e., permission culture). Working with the steering group and control room supervisors, a protocol for a pilot of the Exertime intervention was developed and defined using the TIDieR checklist (see Appendix 17; objective 4). In the intervention, Exertime e-health software will be used to prompt short-bursts of physical activity by targeting behavioral regulation and social influence mechanisms (Carey et al., 2018).

Conceptual implications

The Exertime intervention was systematically designed using the BCW within a co-design (Double Diamond) framework. A key strength of the BCW approach is that it is behavior and context specific (Biddle, 2021). However, to develop the Exertime intervention additional steps were needed (e.g., I went through a second iteration of Stage 1 and Stage 2) to ensure it met the needs of control room workers. Specifically, there were three steps taken in addition to those in the BCW guide. Firstly, a literature review was conducted in addition to the COM-B analysis (Study 2b) to understand the behavior (Stage 1). In the BCW guide, researchers are signposted to the BCTs that are commonly used for each intervention

function, but additional research was required to determine which BCTs were commonly used and/or effective for the specific context (i.e., police populations) and behavior (i.e., physical activity and sedentary behavior). Secondly, I engaged in a second iteration of BCW Stage 1 and Stage 2, informed with intervention options from the first iteration (see Table 6.1), to observe and understand further how and if they might work in the context of the control room. In the restrictive control room environment (e.g., where staff need to respond to calls quickly and/or constantly monitor incidents), I observed that an intervention would need to be driven by supervisors if their staff were to engage. Thirdly, there was another iteration of intervention development within the BCW Stage 3. Whereby once the Exertime software had been selected, I delivered part of the intervention (e.g., education in the supervisor training session) to the supervisors to gain their feedback and include their ideas in the intervention protocol. The conceptual implication is that flexibility is needed in the BCW stages to place greater emphasis on the target population (e.g., in co-design; Janols & Lindgren, 2017) so that the specific behavior and context remain the focus throughout intervention development (i.e., not just in the behavioral analysis in Stage 1).

In Study 3, I used the BCW in combination with a co-design approach and have explained how this was done at all stages in the intervention development. Specifically, in the behavioral analysis (Study 2b), in the steering group meeting selecting intervention options (first iteration of Stage 2 in Study 3), in shadowing shifts (second iteration of Stage 1 and Stage 2 in Study 3), and in selecting the e-health software and delivering supervisor training sessions (Stage 3 in Study 3). Slattery et al. (2020) stated that better reporting of the activities involved in co-design research were required to advance knowledge, and Study 3 contributes to the knowledge base with the detail on how users were incorporated in the design process. In Stage 3 of Study 3 I described a pilot of the Exertime intervention that will be conducted to assess the feasibility of progressing to a full trial. At this point, there was no guidance in the

BCW approach to refine an intervention or design a pilot study to test the feasibility of it (O’Cathain et al., 2019). The implication is that the BCW offers a comprehensive guide to developing theoretically informed interventions but is best used in conjunction with other approaches (e.g., co-design or evaluation frameworks) to be implemented in the context for which it was designed.

Practical implications

To adopt a co-design approach to develop the Exertime intervention, I engaged with the steering group, end-users (control room staff), their supervisors and the team managers in the control rooms. In the supervisor training sessions described in Stage 3 (and see Appendix 11), Force B supervisors were enthusiastic about the intervention, offering ideas to contribute to the development of the intervention, whereas in Force A concerns were voiced about the Exertime intervention. This was because team managers, who are the rank above supervisors in the hierarchy and organizational structure of the police force, attended the training session in Force A, instead of supervisors. Team managers have the responsibility of their team meeting targets (i.e., performance concern), whereas supervisors are looking to gain promotion. To do so they must demonstrate that they have created a change that positively impacted their team (i.e., as Exertime might). The concerns of Force A team managers were alleviated following reassurance from the steering group that the Exertime intervention was supported by senior management. The implication is the importance of engaging the right people and having support throughout the organization (e.g., engage senior leaders as well as end-users; Johnson et al., 2018).

In Study 3, I gained insight into the control room context. As identified in Study 1, physical activity behavior was one variable that significantly moderated (improved) the relationships between perception of demands, perception of job stress and psychological wellbeing in the partner police forces. The perception of reward, control and support were

also identified as significant moderators that improved these relationships (see Study 1). From my observations of the control room in Stage 3 of Study 3, I found that staff perceived low control (i.e., they were not autonomous as the demand of calls, open incidents, and supervisor permission drove behavior) and low support from their supervisors (although they were supported by their colleagues). Low control and low managerial support were also identified by Galbraith et al. (2021) as stressors in police control rooms. Therefore, to further support psychological wellbeing in the control rooms, interventions that build staff autonomy could be developed (Galbraith et al., 2021). In SDT, the value of providing a culture that promotes autonomy is emphasized as being central to supporting wellbeing (Deci & Ryan, 2012). One possibility to do so, that might also improve staff perceptions of manager/supervisor support, would be MI training for supervisors so that they could work with their staff to create a collaborative, autonomous culture in control rooms. Researchers have suggested that MI is a suitable tool to support police officer mental health (e.g., Steinkopf et al., 2015), and although not directly examined in police populations, Forseberg et al. (2011) demonstrated that prison staff could be successfully trained to deliver MI.

Strengths, limitations, and future directions

In Study 3 I developed a physical activity intervention for the police force control room, using a systematic theory-based and co-design approach. Following the BCW enabled me to combine the context specific behavioral determinants with the BCTs in the Exertime intervention, while also maintaining a link to the underpinning theoretical processes (MoAs). All of these aspects are needed to advance health behavior change research (Byrne, 2020). Previous research which has conducted physical activity interventions in the police has not been informed by theory or reported with sufficient detail to enable replication or understanding of the intervention content. Study 3 has therefore advanced knowledge by providing a clear intervention description using the TIDieR checklist (see Appendix 17) and

informing of the behavioral regulation and social influence mechanisms that drove physical activity behavior in the control room context.

Using a co-design approach and reporting on observations of the control room, Study 3 has added new knowledge about this under researched area in policing (Galbraith et al., 2021). The Exertime intervention that was developed was iteratively designed to meet the needs of the control room workers. Increasing physical activity was not feasible in the intervention context, but reducing sedentary behavior was an acceptable means by which to potentially reduce stress and improve psychological wellbeing. Study 3 was the first study to consider physical activity and sedentary behavior in the police control room from a stress and wellbeing perspective, where previous police research has more broadly focused on cardiovascular fitness and/or police officers (e.g., Rossomanno et al., 2012).

Although a key strength of Study 3 is in the systematic method used, there are some limitations worthy of brief consideration. The BCW enabled a comprehensive theoretical coverage of possible behavioral determinants to be considered in the Exertime intervention, and the final mechanisms identified were identified using Carey et al.'s MoA tool. However, the MoA tool is still being developed and so the links between the BCTs and their theoretical mechanisms could be clearer in the intervention. For example, the habit formation BCT has three potential MoAs (behavioral regulation, behavioral cueing, motivation; Carey et al., 2018), and so more underpinning processes are tested in the Exertime intervention than the key target mechanisms of behavioral regulation and social influence. In addition, some of the BCTs in the Exertime intervention (e.g., reviewing behavior goals) were included as part of the social support to be delivered by supervisors. Therefore, in the Exertime intervention the reviewing behavior goal(s) BCT is included as part of a social influence mechanism, but previous literature and the MoA tool have delivered it differently. Another MoA (goals) was therefore included (see Table 6.3). For researchers aiming to identify the MoAs in their

interventions, there is a gap between the BCTs and MoAs. The MoA tool does not identify which of the COM-B concepts the MoAs relate to and linking MoAs in an intervention is not a step in the BCW guide. To overcome this limitation the TDF is needed, or alternatively, researchers have used the BCW with other theories to identify potential MoAs. For example, Köykkä et al. (2019) used the BCW alongside self-regulation and habit formation theories to inform of the MoAs and guide their subsequent selection of BCTs in an intervention to reduce sitting time in classrooms.

A three-group randomized control trial design was described to pilot the Exertime intervention. The design includes a control group which is a strength and does not feature in all police interventions (e.g., Jeter et al., 2013). However, in the Exertime intervention all intervention groups receive the same education session. As such, even the control group receive some information about the importance of moving at work for their health and wellbeing, which is possible (although not probable) to change behavior in itself (Pedersen et al., 2014).

End-user interviews and recruitment and retention information data will be collected to assess the feasibility and acceptability of the Exertime intervention. These are the most frequently used indicators for progression criteria (Mellor et al., 2021), but the pilot study does not have a strict progression criterion. That is, it was not agreed with the steering group what measures would be used to determine whether the Exertime intervention would go to full trial following the pilot. For example, qualitative findings (e.g., that staff felt supported) might be more influential than quantitative outcomes (e.g., how many minutes of physical activity they completed; Hallingberg et al., 2018). Another potential limitation surrounds the measure of fidelity, and how I will assess how well the Exertime intervention was delivered as intended (Toomey et al., 2020). The Exertime software collects usage data, and the end-user interviews will also provide data on perceived engagement with the software and social

support elements. Further measures (e.g., the MI Treatment Integrity code; Moyers et al., 2010) could also have been used to assess how effectively the supervisors in the Social Exertime group delivered their MI aligned supportive elements. Fidelity is a key area for improvement in health behavior change interventions (Toomey et al., 2020) and insufficiently considered in workplace mental health literature (Fikretoglu et al., 2022).

Impact of Covid-19 on the Exertime pilot

Unfortunately, despite the best efforts of myself, my supervisors, and the steering group, due to the Covid-19 pandemic a pilot of the Exertime intervention could not yet be delivered (see Figure 1.1), as the police control rooms adapted to emergency operational functioning at this time. A future direction is to pilot the intervention described. The Exertime intervention could be delivered within pandemic restrictions (i.e., workers maintaining social distancing of two meters, without myself physically visiting the control room), but the following amendments would have to be made to delivery:

- Table 6.3 indicates that some of the BCTs would be delivered through face to face, group modes of delivery. Rather than face to face, these aspects would be amended for online delivery. For example, the education session (instruction on how to perform a behavior, information about health consequences BCTs) would be pre-recorded for staff to watch online in their own time, instead of physically at staff training sessions which were no longer taking place;
- The behavioral contract, commitment, and behavioral practice/rehearsal BCTs would not be included in the intervention (see Table 6.4). Team meetings did not take place under social distancing, and so it was not feasible for the whole shift of workers in the Social Exertime group to collectively draw up and commit to engaging with Exertime. Further, the behavioral practice/rehearsal

was due to take place at staff training sessions and so staff would not be able to complete the Exertime exercises in advance of seeing them in the software;

- The blood pressure outcome measure would not be taken if I could not physically attend the control room. This would be a limitation of the study as it would be relying on self-report data;
- If some staff were working from home, Exertime could still be installed on their work laptops remotely, however these individuals would only be in the Exertime intervention group (i.e., they could not participate in the Social Exertime group).

In the context of the pandemic, the value of social influence mechanisms with social distancing might be diluted. To mitigate against an outbreak of Covid-19 amongst control room staff, both partner police forces split their workers so that half of them operated from a temporary ‘resilience site’, while the other half stayed working in their usual control room. The change in physical and social environment and further proximity from colleagues and supervisors might distance control room staff from workplace-based norms (Kniffin et al., 2021). With social distancing and the suspension of team meetings there is also a wider discussion around how staff are supported without these meetings or training sessions that are normally a source of support. In a systematic review, Labrague (2021) found that maintaining social support was an important factor for protecting the mental health of health care workers, and that promoting social connectedness online was a potential way to do so.

There is scope for future research to develop the Exertime intervention further. For example, introducing new exercises at four – six weeks, including behavioral commitment and team-building activities were all recommended by Boyce et al. (2014) as factors to increase the efficacy of a weight loss program in the police. End-user interviews following the pilot of the Exertime intervention will give insight as to what BCTs were effective and

how the intervention could be improved. To support psychological wellbeing in control rooms, future research could also focus on interventions that facilitate supervisor support and autonomy. Although these elements feature in the Exertime intervention, how they could be developed more broadly (i.e., not just in relation to reducing sedentary behavior) to support staff in managing the stress of their jobs warrants further exploration. E-health software and mobile phone apps have been suggested as an easily accessible platform to support health behavior change in the police, by informing users of existing support and encouraging them to make healthy choices (Swanston et al., 2021). In the context of the Covid-19 pandemic, developing resources that facilitate this support online might be beneficial.

Conclusion

In Study 3, I have developed a context-specific physical activity intervention. Police staff and officers working in the control rooms have a highly stressful, demanding, and sedentary role which is associated with negative psychological wellbeing (Galbraith et al., 2021). To support the psychological wellbeing of police working in the control rooms, I used the BCW to systematically develop a theory-based physical activity intervention in this context. In combination with a co-design approach (Double Diamond framework), I identified that a sedentary behavior intervention was more acceptable and feasible than a physical activity intervention in the control room context. When observing the control room, I found that supervisors have an influential role in staff behavior. I also found that Exertime, an e-health software program which had previously been effective in reducing sedentary behavior in police populations (e.g., Pedersen et al., 2014), was feasible for use in the control room with some amendments. To encourage regular short-burst physical activities, the Exertime intervention was developed to target behavioral regulation mechanisms by raising staff awareness of how long they have been sitting, and to target social influence mechanisms by supervisors supporting their staff's engagement with Exertime. Study 3 has provided a

detailed description of the development of the Exertime intervention and the next step in the research is to deliver a pilot of the intervention.

Chapter 7

General Discussion

Introduction

Through the research presented in this thesis, I aimed to explore stress and wellbeing in two British police forces. To address this aim, in Chapter 2 I set three objectives:

1. To assess the factors associated with stress and wellbeing in the partner police forces;
2. To gain deeper insight into a key driver for wellbeing, from the perspective of the workforce;
3. To develop a theory-based intervention that would target the driver identified in objective 2 and provide a detailed description of the intervention.

To meet these objectives, the Double Diamond (Design Council, 2019) framework was used to systematically engage with the partner police forces throughout the research program in a co-design approach. In Chapter 3, I set out seven steps in my thesis, which were mapped across the Double Diamond and four empirical studies (Chapters 4, 5, 6; see Figure 3.2). Specifically, in Chapter 4, I met objective 1, by providing a cross-sectional evaluation of stress and psychological wellbeing in the partner police forces (Study 1). I found that physical activity was a key driver for wellbeing (Chapter 4 Interlude). Chapter 4 represented the first two phases of the Double Diamond, ‘Discover’ and ‘Define’ (thesis steps 1 and 2). In Chapter 5, I met objective 2, by conducting two qualitative studies (2a and 2b) to gain insight into police physical activity behavior. This represented another iteration of the ‘Discover’ phase in the Double Diamond (thesis step 3). In a second iteration of the ‘Define’ phase in the Double Diamond (Chapter 6 Introduction), I defined the challenge of developing a physical activity intervention to support wellbeing in the partner police forces. This completed the first diamond (thesis step 4). Through developing the Exertime intervention in Chapter 6, I met objective 3, which represented the third (‘Develop’) and fourth (‘Deliver’) phases in the second diamond of the Double Diamond (thesis steps 5, 6, 7). Despite the original plan to

‘Deliver’ the Exertime intervention and evaluate it as a pilot study within my thesis, this was not possible due to the Covid-19 pandemic (see Figure 1.1). Before the pandemic, the development of my intervention had already comprised a partial iteration of the intervention delivery, as I conducted supervisor training sessions (thesis step 6). The feedback from the training sessions led me back to ‘Develop’ aspects of the intervention (thesis step 7). Piloting the intervention is therefore presented as a step beyond my thesis in Figure 3.2.

Within the current Chapter, I provide a general discussion of my research. I begin by consolidating the findings reported in Chapters 4, 5 and 6. Next, I provide the theoretical and conceptual implications from the findings of the thesis, before outlining the practical implications. I then explain how the findings holistically contribute to knowledge. Finally, I present the strengths, limitations of my work and outline future research directions within the area of study.

Explanation of findings

Chapter 4 – Exploration of stress and wellbeing

In Chapter 4, using a quantitative approach underpinned by the DRIVE model (Mark & Smith, 2008), I assessed the factors associated with stress and psychological wellbeing in the partner police forces (thesis objective 1). I found that work and individual characteristics had direct, indirect and moderation relationships with stress and psychological wellbeing. Of the work characteristics, work demands had negative direct relationships (e.g., when perceived work demands increased, perception of job stress increased and wellbeing outcomes deteriorated), and work resources had positive direct relationships (e.g., when perceived work resources increased, perception of job stress decreased and psychological wellbeing outcomes improved). Further, work resources were significant moderators; perceiving higher levels of reward, control or support at work improved the negative relationships between work demands, perceived job stress and wellbeing outcomes. However,

perceiving higher (better) supervisor relations did not always improve the negative relationships. The individual characteristics of life stress, life satisfaction and physical activity behavior also had direct and moderation relationships with stress and psychological wellbeing. I identified an underlying pattern that medium physical activity behavior (i.e., meeting the WHO guidelines) was a significant moderator and reduced the negative associations between work demands and stress. That is, physical activity behavior was, potentially, a protective factor for a police force worker's psychological wellbeing. I also supported the DRIVE model mediation relationship in Study 1 and found that work demands (except for change consultations) were indirectly related to psychological wellbeing outcomes through perceived job stress. This supported the notion that perceived job stress was an explanatory mechanism of work-related stress, and the role of appraisals in work-related stress and wellbeing.

In the Chapter 4 Interlude I gave insight into steering group discussions of the Study 1 findings, in which physical activity behavior was selected as the key driver for psychological wellbeing to take forward in the rest of the research. Other variables that were identified as drivers for work-related stress and psychological wellbeing could have been taken forward²¹. For example, the rest of the research could have focused on appraisals and how to change perceptions of stress, or how to increase perception of work resources²². The rationale for focusing on physical activity was that it could support a preventative, proactive approach to work-related stress in the partner police forces. In reviewing the relevant literature in the Chapter 4 Interlude, I identified several mechanisms that might explain why physical activity was linked to stress and psychological wellbeing (e.g., detachment and recovery, Sonnentag, 2018; fulfilling eudemonic processes, Kimiecsek, 2016; a coping strategy, Anshel, 2000). The

²¹ In the Chapter 4 Interlude I introduced five drivers that were identified from Study 1 findings.

²² In Chapter 8 'Reflection', I reflect on the decision to focus on physical activity behavior further.

next step was to explore physical activity from the perspective of those working in the partner police forces.

Chapter 5 – Qualitative insights

In Chapter 5, I conducted two qualitative studies to gain deeper insight into physical activity as a driver for psychological wellbeing (thesis objective 2). In Study 2a, I led a series of focus groups to explore the relationship between physical activity and psychological wellbeing for the workforce. In my deductive reflexive thematic analysis, informed by the DRIVE model concepts, I found three themes: the effects of physical activity; experiences of work demands and resources; and, mechanisms. Through these themes I represented the positive effects of physical activity, the negative effects of low physical activity or sedentary behavior at work and gave insight into some of the work characteristics identified in Study 1 (i.e., perceived work demands, perceived support). In the ‘mechanisms’ theme I identified two subthemes to explain why physical activity was linked to psychological wellbeing. The ‘perception of stress’ mechanism reflected the explanatory process put forward in the DRIVE model, and the ‘feelings of self-determination’ mechanism reflected eudemonic wellbeing processes. Through reflexive analysis, I identified that there were themes in my focus groups that had not been captured by my deductive thematic analysis. From inductive reflexive thematic analysis, I then found a fourth theme, ‘factors relating to physical activity behavior change’, which represented factors specific to the police context. In a reflexive process, I explored the literature and identified that the COM-B system (Michie et al., 2011) could be used to help explain the contextual factors that I had observed throughout my focus group data. For example, participants referred to the influence of others as a factor to change physical activity behavior, which related to the COM-B concept of social opportunity. Alternative behavior change frameworks that I might have identified in these themes included

the socioecological approach²³. I chose to focus on COM-B as a framework, as this allowed for context specificity and sat at the center of a systematic approach to intervention development (i.e., the BCW; Michie et al., 2011). This enabled me to fulfil my research program objectives.

In Study 2b, I conducted a series of semi-structured interviews with inactive police officers and staff to establish the barriers and enablers to their physical activity behavior. I focused on inactive individuals because in Study 1, I found significant differences in stress and psychological wellbeing between individuals with low and medium, and low and high physical activity behavior. Using deductive reflexive thematic analysis, guided by the COM-B concepts, in Study 2b I found that psychological capability, social opportunity, automatic motivation and reflective motivation were prominent themes in police physical activity behavior at work. Barriers included participants' not feeling able to prioritize their own wellbeing amongst work demands, so there was variation between roles (and contexts) as to what form of physical activity might be feasible. An enabler to physical activity behavior was the support of others, supervisors especially. The next step in my research was to develop a physical activity intervention that was context-specific with the partner police forces.

Chapter 6 – Development of Exertime

In Chapter 6, using the BCW, I co-designed a physical activity intervention with the partner police forces, and set out a detailed description of the intervention (following the TIDieR checklist, Hoffmann et al., 2014; thesis objective 3). I began by reviewing the physical activity and sedentary behavior literature and found limited examples of interventions that had been conducted in police populations and were underpinned by theory, and/or, were described in sufficient detail. What could be identified from the extant literature

²³ In Chapter 6 'Development of the Exertime intervention', I reviewed the key theoretical approaches in physical activity and sedentary behavior.

was the importance of team support aspects (reflecting Study 1, Study 2a, Study 2b findings), involving participants in decision making (reflecting autonomy in Study 2a), and embedding physical activity into work (reflecting habits and psychological capability in Study 2b). These factors were therefore included within my intervention (see Table 6.3).

Guided by the steering group, and Study 2a and 2b findings, the control rooms were selected as the context for the intervention, because they were a high demand, high stress environment with limited opportunity for movement. To understand more of the control room context, I shadowed shifts in both partner police forces. I found that behavior was driven by high demand and social norms, and that staff perceived a need to decrease their sedentary behavior, which was more feasible than increasing physical activity behavior at work. Using the APEASE criteria (Michie et al., 2014), I worked with the steering group to adapt Exertime, an existing e-health software program, into an intervention for the control rooms. The intervention would target behavioral regulation (e.g., habit formation) mechanisms by prompting control room workers to engage in short-burst exercises throughout their shifts, and social influence (e.g., social support) mechanisms through supervisors encouraging staff engagement with the software. To further develop the Exertime intervention, I delivered training sessions to supervisors and integrated their suggestions into the intervention (e.g., giving staff opportunities to practice Exertime exercises in their training days). I concluded Chapter 6 with a protocol for a pilot of the Exertime intervention (including a completed TIDieR checklist; see Appendix 17).

Theoretical and conceptual implications

Through the findings outlined above, a number of theoretical and conceptual implications can be made. In this section, I provide implications for work-related stress, wellbeing, and then social influence.

Work-related stress

My research supports a multidimensional approach to work-related stress. Study 1 was informed by the DRIVE model because it enabled systematic integration of multiple factors into the study of work-related stress. I found that individual characteristics had significant direct and moderation relationships with perceived job stress and psychological wellbeing outcomes. My qualitative findings from Study 2a, 2b, and 3 supported the inclusion of individual characteristics in work-related stress, as participants gave insight into the relationship between physical activity and their experiences at work. Another strength of the DRIVE model, which I set out in Chapter 2, was the inclusion of appraisals through the mediating mechanism of perceived job stress. In Study 1, I supported this mechanism and found that work demands were related to psychological wellbeing indirectly through the perception of job stress. However, there was no proposed mechanism in the DRIVE model to explain why individual characteristics were related to psychological wellbeing outcomes. In Study 2a, I found that perception of stress was one mechanism by which physical activity could be explained to influence psychological wellbeing (and that feelings of self-determination was another mechanism). My findings impact on how individual characteristics feature in work-related stress models; at present the processes by which they influence wellbeing are not accounted for (e.g., in the JDR; see Schaufeli & Taris, 2014). To fully integrate individual characteristics within work-related stress models, there is a need to also understand (and represent) the underlying mechanisms for their influence, as well as that of work characteristics. For example, in the DRIVE model, an additional pathway could be proposed. It could propose that the relationship between individual characteristics and psychological wellbeing outcomes is mediated by perceived job stress, or, it could propose another mechanism that explains the relationship (e.g., feelings of self-determination; Study 2a).

Prior to my research, there was little empirical evidence considering the potential impact of physical activity within the stress process at work, rather the focus of previous studies has been on the impact of work-related stress on physical activity (Häusser & Mojzich, 2017). My research has begun to address this gap in knowledge and supports a bidirectional relationship which has been evidenced in the generalized stress literature (Gerber & Pühse, 2009). In my research, physical activity behavior was protective against the negative effects of work-related stress (individual characteristic perspective), but work-related stress negatively affected physical activity behavior (outcome perspective; Study 2a). The outcome perspective has been dominant in occupational research (e.g., Häusser & Mojzich, 2017) and in research generally (see Stults-Kolehmainen & Sinha, 2014). Yet, conceptualizing physical activity as an outcome is contrary to the perspective that is taken when physical activity is targeted as a stress management intervention, and the significant reduction in stress that can result (e.g., Clark et al., 2014). When physical activity is included in theoretical models that could explain these effects, physical activity itself is rarely the focus, rather it is an example of a type of behavior within the model, such as a coping behavior (e.g., Anshel, 2000) and so the specific understanding of physical activity can be overlooked. By framing physical activity as an individual characteristic in work-related stress, rather than an outcome, the underpinning processes can be explored and theoretically integrated. Häusser and Mojzich, (2017) have made a step forward in this regard, depicting physical activity as a mediator in their pamDC, but the reciprocal pathway (individual characteristic perspective) has yet to receive attention; researchers have been urged to explore this pathway (Sonntag, 2018).

My research supports the utility of the DRIVE model as a framework to represent the reality of work-related stress (Smith, 2021), enabling nomothetic measurement of transactional work-related stress. Work characteristics central to stress across occupations

(e.g., demands, control, support; Häusser et al., 2010) were also significant in police stress (Study 1). However, there was a need for context-specific understanding in addition. In Study 2a, I first used deductive reflexive thematic analysis, informed by the DRIVE model concepts to represent my findings in three main themes, but I identified a fourth theme from an inductive analysis approach to represent factors specific to the police. Further contextual understanding was also needed in Study 3. This led me to shadow shifts to learn more about the control room environment and capture some of the social interactions that might influence the Exertime intervention (Janols & Lindgren, 2017). The overall implication for work-related stress models is to account for the organizational context as well as commonly influential variables, so that salient factors are not omitted (Kinman et al., 2016). The COM-B system and BCW are context-specific frameworks for behavior change, and could, potentially, provide an example for how a standardized yet specific approach to work-related stress could be achieved. Specifically, a theoretically informed model that starts with an assessment of COM-B concepts to explore in context could then be used to develop intervention options and types of delivery (if desired).

Wellbeing

In Chapter 2, I explained that the DRIVE model encompassed both subjective and eudemonic wellbeing. Subjective wellbeing could be assessed as wellbeing outcomes (e.g., Williams et al., 2017), and eudemonic wellbeing could be inferred in the perceived job stress process. In Study 1 and 2a, I supported the contention that perception of stress was a mechanism by which work demands, and physical activity behavior were associated with psychological wellbeing outcomes respectively. I also identified another mechanism (feelings of self-determination) in Study 2a, which represented the eudemonic wellbeing process that focus group participants were describing more fully. Researchers agree that both subjective and eudemonic perspectives are needed to comprehensively assess workplace wellbeing

(Bartels et al., 2019). The DRIVE model does cover both perspectives, however, the implication from my research is that eudemonic wellbeing needs to be more specifically represented. For example, through an additional feelings of self-determined motivation mechanism. Doing so could encourage researchers and practitioners to consider how to support eudemonic processes in interventions (e.g., by fostering employees' basic psychological needs), as well as how to manage stress and improve wellbeing outcomes.

Social influences

In all studies presented in this thesis, I have highlighted social influences. In Study 1, support and supervisor relations were directly associated with reduced stress and improved psychological wellbeing. In the moderation relationships, perceiving support from colleagues improved the direct associations, but perceiving high supervisor relations did not improve all the relationships between perceived work demands and psychological wellbeing. In previous DRIVE model research (e.g., Galvin, 2016) and work-related stress research generally (e.g., Häusser et al., 2010), inconsistent findings for social support as a moderator have been reported. Where there is evidence for significant moderation relationships, perceiving social support from supervisors and colleagues protects against (buffers) the negative effects of stress, as Baka (2020) found in research with the Polish police. However, research tends to assess perceptions of support from colleagues and supervisors within one variable (e.g., Baka, 2020; Hansson et al., 2017). In Study 1, I assessed support (from colleagues) and supervisors (supervisor relations) separately, which might explain the difference. The implication for research and theoretical models in which concepts are combined is that the nuances of variables and divergent relationships can be missed. In Study 2a and 2b I gained further insight, using qualitative methods to find out that although supervisor support could be positive for wellbeing, it was not consistently so. Officers and staff perceived that their supervisors (unlike their colleagues) were able to facilitate their physical activity behavior at

work, but did not, because work demands were prioritized before worker wellbeing. My qualitative findings may go some way to helping explain the mixed findings for social support and supervisor relations in Study 1. Social support is a complex construct, with different perspectives, providers, processes, and content that leads to a large variety in how it is applied and measured (see Gottlieb & Bergen, 2010), and ultimately, to how well support is perceived and received. If not considered carefully social support can be ineffective (Rafaeli & Gleason, 2009). In Study 3, I identified that social support (unspecified) is a frequently used BCT in physical activity (Seppälä et al., 2018) and sedentary behavior (Brierley et al., 2019) change, but it is often reported without sufficient detail on process or content. Researchers need to provide conceptualizations and operationalizations of the social support they are targeting to develop understanding and maximize the benefit for long-term health outcomes (Hogan et al., 2002).

Social opportunity was found to be a prominent determinant of behavior in Study 2b. In this COM-B domain, supervisor permission and sedentary norms were found to be a barrier to physical activity at work, and social support was found to enable physical activity at work. In Study 3, I explained that research which does not differentiate between injunctive and descriptive norms can find a diluted influence of social norms in physical activity behavior (Kim et al., 2019), to the extent that researchers have suggested social support could replace norms in theoretical models (e.g., in the TPB; Rhodes et al., 2002). Yet, in Study 3 I observed that norms influenced the lack of physical activity behavior in the control room. This is in line with other research which, informed by COM-B, has also found a strong influence of norms on physical activity and sedentary behavior (e.g., Brierley et al., 2019; Howlett et al., 2020). Together with my findings, the theoretical implication is that the influence of norms on physical activity and/or sedentary behavior might be driven by the context. To elaborate, in the control room setting descriptive norms are evident and relevant

others can be seen sitting. However, in research which is conducted out of context (e.g., Rhodes et al., 2002), participants are asked about relevant others exercise behaviors which might not be so clearly known.

Practical implications

In this section, I reflect on the practical implications of my research for workplace wellbeing, physical activity as a mechanism to support psychological wellbeing at work, and the implications for police forces specifically.

Workplace wellbeing

Across my thesis, the DRIVE model, WPQ, COM-B and BCW were effective frameworks that enabled me to assess psychological wellbeing (Study 1) and develop an intervention based on that assessment (Study 2a, 2b, and 3). Similarly, organizations can use quantitative surveys to assess where their organization is in terms of stress (e.g., using the HSE Indicator Tool) and wellbeing (e.g., using the WPQ). These surveys provide organizations with important information on the drivers of stress and wellbeing which can be monitored over time (Johnson et al., 2018). However, the assessment is limited by the factors that are considered, for instance some population-specific factors might also need to be measured (Williams & Smith, 2018). Following my research, physical activity could be important to assess for police organizations. After assessing stress and wellbeing, the next step and *how* organizations then use the survey information can be difficult (Bartels et al., 2019). Mostly, a tailored approach is taken, whereby researchers and/or organizations contact survey respondents to discuss the results and inform subsequent wellbeing interventions or actions (e.g., Williams & Smith, 2018). Organizations which take this approach usually have discussions that focus on the workplace factors that influence psychological wellbeing, but there is no simple guidance for what follow-up actions are desirable (Johnson et al., 2018). COM-B and the BCW could be options to support this next stage of developing interventions,

as they can be well understood by external organizations (Michie et al., 2014). For example, following the survey, a target behavior (e.g., driver for stress or wellbeing) could be agreed upon and the BCW followed to develop an intervention to change that behavior. For this to work practically, a clear understanding of the target behavior is needed, and, as I found in Study 3, another framework is also needed for a pilot study to be conducted and evaluated. Evaluation is an important part of occupational stress and wellbeing interventions that is often overlooked (Biron & Karanika-Murray, 2014). Through the development of the WPQ and other tools, assessment of psychological wellbeing has been simplified for organizations. The same attention is now needed for the next steps (i.e., how that information is used in developing interventions, follow-up actions and evaluations).

Physical activity as a mechanism to support wellbeing at work

In Study 1, 2a, and 2b, I found that physical activity was a means by which to support psychological wellbeing at work. Informed by the DRIVE model, I identified in Study 2a that physical activity supported subjective wellbeing (i.e., effects of physical activity theme) and eudemonic wellbeing (i.e., perception of stress and feelings of self-determined motivation sub-themes). Both wellbeing perspectives should be supported by comprehensive workplace wellbeing interventions (Bartels et al., 2019), and can be realized by workplace physical activity (Sakuraya et al., 2020). I found that engaging in medium physical activity behavior was associated with psychological wellbeing benefits, compared to low physical activity behavior (Study 1), so organizations could focus on supporting employees to meet the WHO guidelines. To do so, a range of physical activity interventions should be provided, as individuals preferred different activities (Study 2a and 2b). To translate the benefits of physical activity for psychological wellbeing into an occupational context, researchers call for clarification on the most effective duration, frequencies, and intensity (e.g., Bischoff et al., 2019). From my research, equally, if not more important, considerations are what physical

activity is feasible in the organizational context and why would it support wellbeing.

Police-specific implications

Following my research program, police forces should support physical activity behavior. My Study 1 findings indicated that meeting the WHO physical activity guidelines was associated with reduced stress and improved wellbeing. The implication for police forces is that lower-level physical activities should be supported as well as police sport participation, which has previously been the focus within police organizations. While police sport has important physical, professional, psychological, and social benefits (see Lindberg et al., 2017 for a case description of the Swedish Police Sport Association), police organizations should also aim to support physical activity and reduce sedentary behavior in ways that are not contingent on physical skill ability (e.g., increase step count; Buckingham et al., 2020; take movement microbreaks; Mainsbridge et al., 2020). Doing so can alleviate operational and organizational demands (Study 2a and 2b) and enable workers across the diversity of the police force to feel supported in their physical activity behavior. To ensure that physical activity is organizationally entrenched and supported throughout the workforce, like in the fire and rescue service, policy could be developed. Policy could include education about physical activity and wellbeing at work (Study 2b and 3), support for dedicated workplace physical activity advice (Study 2a and 2b), a leadership behavioral contract (Study 2a, 2b, and 3) and a communication strategy (Study 1). Such a policy could empower all levels of the police organizational hierarchy to support their wellbeing and/or their staff's wellbeing and physical activity without fear (i.e., Force A team managers did not initially support Study 3). Within the dedicated workplace advice, context specific interventions could be developed to support sedentary departments in the police force within their role restrictions (Study 3). One particular intervention that could be explored, is a mentoring and fitness buddies scheme (Study 2a and 2b) as this would also build support – another variable associated with police

psychological wellbeing (Study 1).

Throughout the findings in my research (Study 2a, 2b, and 3), and other police research (e.g., Bell et al., 2022; Houdmont et al., 2019a) the influence that supervisors have in stress and wellbeing has been emphasized. Supervisors were aware of their influence on staff behavior (Study 3). The supervisor – staff relationship is complex; supervisors can be loved by their staff (Study 2a), but for staff who perceived that they got on well with their supervisor (high levels of supervisor relations) there was a significant negative relationship between overcommitment and negative mood (compared to staff with medium and low supervisor relations; Study 1). To maintain a favorable relationship, staff might perceive that they are unable to ‘switch off’ from work. Molines et al. (2022) reported that there can be a ‘dark side’ of positive leadership relations in the police, whereby a supervisor who inspires and motivates their staff too much can adversely affect their wellbeing and generate emotional exhaustion. To manage the relationships appropriately, supervisors could receive specific training (see Study 1), and understand their staffs’ needs to adapt their support accordingly (Molines et al., 2022). In line with transactional stress theory, the same leadership approach will not be perceived the same by all (Perrewé & Zellars, 1999), and so individualized considerations need to be recognized.

There are practical implications for police control rooms (Study 2a, 2b, and 3) specifically. In Study 3, I found that high demands (e.g., call volume) and social norms (e.g., supervisor permissions) drove the environment. The environment was performance oriented, with low staff autonomy, wellbeing, and opportunity for movement. Other research has also found these factors to be sources of stress in police control rooms (Galbraith et al., 2021), and in call centers generally (Bakker et al., 2003). To modify the job characteristics which negatively influence psychological wellbeing (i.e., low control, performance pressures), job redesign interventions have been effective in call centers (see Holman & Axtell, 2016), and

recommended for police control rooms (Galbraith et al., 2021). Participative job redesign interventions are a form of job crafting (see Chapter 2) and have successful outcomes as employees drive which alterations are made to work characteristics (e.g., new tasks to increase job control; changes to feedback from supervisors; Holman & Axtell, 2016). Such interventions are challenging to deliver in call center environments due to high turnover, hierarchical structure, and low employee participation, but can be done (Axtell & Holman, 2018). The implication from my research is that securing senior management support is key for participatory interventions to progress. My research focused on a particular behavior that was associated with psychological wellbeing, arguably a smaller change than job redesign, and was met with performance concerns from team managers in Force A (Study 3). Organizational changes need to be made in increments (Willis et al., 2016), and so a recommendation for police control rooms is to continue researching stress and wellbeing and make small changes based on staff wellbeing needs. A longer-term strategy could be to begin a participatory job redesign intervention, once staff are less cautious and more empowered to actively participate (Axtell & Holman, 2018).

Contribution to knowledge

My research program is one of the first to consider physical activity in the police from a stress and wellbeing perspective. In this section, I outline the new knowledge that my research has provided. First, on physical activity in the police, as it relates to stress and psychological wellbeing. Then, on conducting co-design research in police populations.

Physical activity in the police

In Study 1, 2a, and 2b I found that physical activity was associated with reduced perceptions of stress and improved psychological wellbeing across the police workforce. The Study 2a and 2b findings support previous research which has focused on police officers and found that physical activity is important to fulfil the operational demands of their role (e.g.,

Lagestad & van den Tillaar, 2014). My research builds on this, with new knowledge that physical activity should be considered more broadly within, and across, police forces to support psychological wellbeing. A broader consideration should extend the view of physical activity as any movement (Caspersen et al., 1985), so that not just exercise, but also small bouts of activity, and even interrupting sedentary behaviors is recognized as beneficial (Study 2a, 2b, and 3). This is in line with the WHO guidelines (see Bull et al., 2020). A broader consideration should also extend the view beyond police officers to police staff and all roles in policing, as physical activity also enabled typically sedentary workers (e.g., staff) to meet the organizational demands of their roles (Study 2a). My qualitative findings in Study 2a add new knowledge that explains why physical activity supported police psychological wellbeing. The positive physical, psychological, and social effects of physical activity behavior were because being active influenced stress appraisals (e.g., reappraisal of stressful situation) and fulfilled basic psychological needs (e.g., developed relatedness and brought colleagues together). With this new knowledge, police forces have the beginnings of an evidence base to include physical activity within their occupational stress and wellbeing support throughout the workforce.

Another original contribution from my research was the finding of a significant difference between stress and wellbeing relationships for police force workers with low and medium physical activity behavior (Study 1). Gaining the perspective of inactive police officers and staff in Study 2b provided further understanding of the barriers and enablers to their physical activity behavior – which future research can now use to inform subsequent support. Guided by the COM-B concepts, I identified factors which were unique to the police context. For instance, the police identity was a barrier to physical activity because the responsibility of work was put before personal needs. Research from other contexts has found that identity does not fit with physical activity behavior (e.g., Taylor et al., 2013). There was

also a cynicism that organizational support was genuine, which was another barrier that has been found to engaging with police wellbeing support generally (e.g., Clements et al., 2021; Violanti et al., 2018b). On the other hand, supervisor support and management visibility could enable physical activity behavior change, these influences might be heightened in a police context due to the limited margin for error (Burtscher et al., 2018) and hierarchical organizational structure (Molines et al., 2022). Previous police research mostly finds that supervisors are perceived negatively by their staff (e.g., Bell et al., 2022). I did find negative supervisor influences in my research (Study 1, 2a, and 2b), but also some positives (Study 1 and 2b) which, if managed correctly, could bring about positive change for police wellbeing (Study 3). I have therefore generated new knowledge regarding police physical activity behavior, which could be applied to wellbeing support more generally, as police organizations are looking to create positive change around wellbeing (Phythian et al., 2021).

There is a paucity of physical activity interventions which have been conducted in police populations that are underpinned by theory (Buckingham et al., 2020). In Study 3, I began to address that gap in knowledge, using the BCW to co-design the Exertime intervention with the control rooms. I clearly identified the behavioral regulation and social influence mechanisms theorized to support behavior change in the control room (following Study 2b). To develop interventions that have an increased likelihood of effecting sustained change, the mechanisms by which they work must be identified (Carey et al., 2018). From my research, supporting police to be aware of their own self-care practices (i.e., regulating behavior to prioritize their wellbeing alongside their work demands), and supervisors encouraging them to do so (i.e., social influence to make use of wellbeing initiatives) could interrupt sedentary behavior and improve psychological wellbeing in the police control rooms (Study 2b and 3). Studies which make MoAs and BCTs explicit are needed to advance health behavior change research (Byrne, 2020), and further research can now build on the initial

understanding provided by my research.

Co-design research

I have made a contribution to knowledge by detailing the co-design approach across my research program (Study 1, 2a, 2b, and 3; see Figure 3.2); an area which has received increased interest in sport, exercise and health (Smith et al., 2022), but is not often reported in depth (Slattery et al., 2020). The insight I have given into key decisions made with the steering group make a unique contribution to understanding how such research partnerships work. Specifically, in the Chapter 4 Interlude (moving from Study 1 to Study 2a) and in Chapter 6 (progressing through the BCW Stages in Study 3), the decisions to focus on physical activity behavior and the control room context were informed by four Double Diamond considerations (feasibility, cost, passion for the idea, portability / size). The steering group were a vital mechanism in collaborative working. As a conduit between myself and the wider workforce, having regular communications ensured that the research was supported by senior management and that the target population could be accessed, so that the research captured their needs. The importance of speaking to the target population was evident in Study 2b, as I found that inactive police force workers did not all recognize the importance of physical activity to their experiences at work, whereas active police force workers in Study 2a did. Education was therefore included in the intervention developed in Study 3 (see Table 6.3). In Study 3, I clearly set out the BCW stages taken to develop the Exertime intervention, going through Stage 1, Stage 2, then a second iteration of Stage 1 and 2, before progressing to Stage 3. A criticism of the BCW has been that the target population is not emphasized within the framework (Janols & Lindgren, 2017). My research contributes to knowledge of how to engage the target population; by regular communications with a steering group and, if using the BCW, by applying sequential flexibility (i.e., going through iterations of the BCW stages) to better reflect collaborative working.

Strengths, limitations, and future research directions

As with any research, there are strengths, limitations, and recommendations for future research, which I will set out in this section. The future research directions section is organized into two sub-sections: wellbeing at work and conducting research with the police.

Strengths

Throughout my thesis I have undertaken a rigorous and systematic approach to address the aim of exploring stress and wellbeing in the partner police forces. It is theoretically and conceptually underpinned with contemporary frameworks. In Chapter 2, I critically reviewed the literature and identified the DRIVE model as a key advancement to inform the study of work-related stress and wellbeing. In Chapter 4, I systematically assessed all 12 DRIVE model relationships (where previous research has focused on direct and mediation relationships, e.g., Nelson & Smith, 2016). In Chapter 5, I first conducted deductive reflexive analysis (Study 2a), informed by the DRIVE model concepts, to explore the relationship between physical activity and psychological wellbeing in the workforce. I found that the COM-B concepts could explain the data, so used those concepts to inform Study 2b and 3. In Chapter 6, following Study 1, 2a and 2b findings, I developed the Exertime intervention using the BCW, carefully identifying the MoAs and BCTs that could influence behavior change. By critically considering the data trends at each stage of my thesis I have also demonstrated an iterative process in my research.

I have used multiple methods in my thesis. This enabled me to provide a comprehensive understanding of the processes and social structures which contributed to stress and wellbeing in the police workforce (see McEvoy & Richards, 2006). In my quantitative findings (Study 1), I identified a pattern whereby medium physical activity behavior was associated with reduced stress and improved wellbeing, which was corroborated and elaborated on in my qualitative studies (Study 2a, 2b, and 3). The pilot of

the Exertime intervention will build on the understanding further, with quantitative and qualitative methods.

The clear communication of my co-design approach informed by the Double Diamond framework is another strength of the research, as better reporting of the co-design activities and processes is needed to advance the field (Slattery et al., 2020). Collaboratively working with the partner police forces enabled me to pay close attention to the context and combine this understanding with theoretical frameworks (e.g., DRIVE model, BCW) to make evidence-based recommendations.

My research has high ecological validity. It was conducted in a real-world context and the findings contribute to understanding and improving real-world problems. The real-world setting of my research program was demonstrated no more clearly than the fact that it was conducted during a once in a lifetime global pandemic. I was able to adapt my research to the changing context and suggested amendments to the Exertime pilot in Study 3 so that it can now be piloted in pandemic restrictions. The potential of the Exertime intervention, and the implications of Study 1, 2a, 2b, and 3 findings contribute to the development of police wellbeing resources and fulfillment of the Police Covenant (see Chapter 1).

Considering physical activity from a stress and wellbeing perspective makes an original contribution which has impact across the whole of the police workforce. Following Study 1, the partner police forces have empirical evidence that physical activity is a significant factor to the psychological wellbeing of their workforce. From Study 2a and 2b, the partner police forces have an understanding of how physical activity can be supported in their organizations. Following Study 3, they have e-health software to support the wellbeing of control room workers – an overlooked area of policing (Galbraith et al., 2021). My research findings, as they relate to work-related stress and psychological wellbeing, have the potential to generalize to other police forces and occupational groups operating under

significant pressure and stress.

Limitations

Despite the contribution I have made to knowledge on *how* to conduct co-design research (i.e., using Double Diamond framework and a steering group), and the strength in my description of this, there is a limitation in that the co-design approach was not assessed. Slattery et al. (2020) acknowledged the difficulty of evaluating the real-world impact of co-design approaches, but the fundamental question of whether approaches that engage end-users (approaches which involve intensive collaboration) are more effective than those that do not, is a critical gap in knowledge that cannot be answered by my research (see ‘future research directions’).

In Chapter 4, I conducted a cross-sectional assessment of stress and psychological wellbeing in the partner police forces. Whilst this informed of the variables associated with stress and wellbeing, it was limited as it could not inform of the cause and effect of relationships. For example, did physical activity cause an improvement in wellbeing, or did increased wellbeing (e.g., individuals feeling more autonomous) cause individuals to engage in more physical activity behavior? Although my subsequent qualitative studies (2a and 2b) suggested that the relationships might be bidirectional, only longitudinal research designs can answer questions surrounding how the relationships identified change over time. Longitudinal research (e.g., intervention studies) is needed to inform DRIVE model research specifically (Margrove & Smith, 2022) and understanding of the relationships between hedonia/eudemonia and health behaviors generally (Kimiecik, 2016). Further research could build on my research with longitudinal designs to inform of the causality in the relationships identified.

Physical activity is an umbrella term (Caspersen et al., 1985). By iteratively following the data in my thesis, I have findings that relate to physical activity, exercise, sport, physical

inactivity, and sedentary behavior. The IPAQ measure was used in Study 1 to capture physical activity broadly (across domains), but Study 2a, 2b, and 3 findings suggested that sedentary behavior was more relevant in the control room context. There was therefore a move away from physical activity towards sedentary behavior within my thesis. Movement behaviors are interdependent (e.g., interruptions in sedentary behavior are often replaced with light physical activity) and can be viewed on a continuum (Biddle, 2021). Due to the iterative nature of my research, sedentary behavior was not considered until Study 2a, and physical activity was less of a focus by Study 3. An avenue for future research to explore is how the different terms under the physical activity umbrella relate to psychological wellbeing in the police.

Future research directions

Wellbeing at work

The DRIVE model was an appropriate framework for exploring stress and psychological wellbeing in Study 1 and enabled the multidimensions of work-related stress to be assessed. I inferred eudemonic processes from the DRIVE model but recommend that an avenue for future research is to make this more explicit. In Study 2a, I found that feelings of self-determination were a mechanism to make the eudemonic processes more explicit. Without specific representation of eudemonic wellbeing there is limited opportunity for researchers and/or organizations to understand the processes, measure them, and then to make informed recommendations to develop eudemonic wellbeing at work. With the current DRIVE model (as with stress models generally), the focus is on stress management; whereas employee engagement surveys focus on motivation and flow (concepts aligned to eudemonic wellbeing, see Chapter 2 and Margrove & Smith, 2022). To further synthesize stress and wellbeing within the DRIVE model, Margrove and Smith have proposed a development to include emotional engagement (among other additional concept headings). However, there is a balance between making the DRIVE model too complex, so that it is unlikely to be used,

and too simplistic, so that it is no longer holistic or conceptually accurate. Including just a single concept to represent eudemonic wellbeing in the DRIVE model might achieve this balance. Outside of the DRIVE model, researchers have now developed a eudemonic wellbeing scale (Bartels et al., 2019). This could, perhaps, be used to validate a single eudemonic wellbeing at work item to be included in the WPQ (as well as the DRIVE model). Alternatively, eudemonic wellbeing could be captured by assessing the meaning of work demands, and the extent to which they are appraised positively (challenge) or negatively (hindrance), as Lockey et al. (2022) did with in the police.

A second area to develop is the integration of physical activity into theoretical models of work-related stress. This could build upon the DRIVE model (e.g., using a combined effects approach; Smith, 2021) or the pamDC. To integrate physical activity further into either model, the underpinning mechanisms need to receive empirical attention. There was no mechanism predicted for the influence of individual characteristics (and so physical activity) in work-related stress in the DRIVE model, but I found that perception of stress and feelings of self-determination were mechanisms that explained why physical activity was associated with psychological wellbeing from my participants' perspective (Study 2a). Häusser and Mojzich (2017) also suggested that SDT was a mechanism that mediated relationships between job control and physical activity, so this could be explored with other occupational groups. Researchers should conduct longitudinal research to answer questions about the causal mechanisms underpinning physical activity, work-related stress, and wellbeing relationships (e.g., fulfilling psychological needs, Häusser & Mojzich, 2017; recovery processes, Sonnentag, 2018; strengthening resources, Gerber & Pühse, 2009).

Conducting research with the police

Policing remains a stressful occupation which warrants continued research attention and support. National developments (e.g., Oscar Kilo, the National Police Wellbeing Service

[NPWS], and the Police Covenant; see Chapter 1) indicate that understanding and support of police wellbeing is growing. Throughout my research program I aimed to explore stress and wellbeing, from an initial assessment (Study 1) to a pilot study (Study 3) in partner police forces. For researchers and practitioners with similar aims to conduct stress and/or wellbeing intervention research with the police, I recommend that context, theoretical underpinning, and progression criteria are key considerations. Policing is an occupational group with unique demands (e.g., Duran et al., 2018), organizational, cultural, and structural issues, all of which are contextual variables that influence interventions and so need to be considered in research (see Biron & Karanika-Murray, 2014). Conceptually accurate theoretical underpinning is needed to understand what factors to potentially target, and to explain their causal effects (Byrne, 2020). For example, targeting physical activity because it reduces perceptions of stress. At present, there are research recommendations for interventions that could support police wellbeing (e.g., Clements et al., 2021), but there is a shortage of research which progresses from recommendation to a pilot or a full trial. Applying progression criteria, for example traffic light systems, to indicate which recommendations should be realized (Hallingberg et al., 2018) might support researchers to reach the intervention stage and build the evidence base.

Co-design can be an effective approach to achieving contextual understanding through end-user engagement, however, it can lack guidance as to how to incorporate theory (Hurley et al., 2021). The scope of the research, roles, and interactions should be agreed at the outset. For example, in my research the regularity of meetings was agreed with the steering group at the start, and we outlined how the target population (contextual) and researcher (theoretical) contributions would be combined. Evaluation criteria should also be agreed at the start of a co-design venture to evaluate the efficacy of the intervention as well as the approach itself. This will build on wider knowledge as to whether co-design processes are

more effective than non-collaborative processes (Slattery et al., 2020), and enable future researchers to replicate successful methods. LaMontagne et al. (2021) co-designed a mental health literacy and leadership development intervention with the Australian police, but despite the collaborative approach its' efficacy was limited as the planned activities were additional to officer workloads and not well attended. This reiterates the need to have senior management buy-in to develop organizational wellbeing support that is integrated with police work, rather than *in addition to it* (LaMontagne et al., 2021). Committing necessary resources is an essential aspect of engaging senior leaders in wellbeing support (Johnson et al., 2018), and of facilitating effective co-design (Hurley et al., 2021). Co-design research is resource intensive (Slattery et al., 2020) and so researchers and organizations need to be aware of this and include it in their scoping discussions.

To support organizational and/or individual behavior change in the police workforce, researchers could consider using the BCW, because it is an easily understandable, theoretical, and context-specific model to develop interventions. The potential drivers that I identified in Study 1 could also be considered for future interventions. For example, changing work practices to increase perceptions of control, support, rewards (significant work resources; Study 1) or reduce perceptions of demands, change consultations, overcommitment (significant work demands; Study 1 and see Chapter 4 Interlude). Other health behaviors important in policing might also be the focus (e.g., healthy eating; Gibson et al., 2018, and sleep; Hartley et al., 2014).

I have identified that limited physical activity interventions have been conducted with the police. Of the interventions which have been conducted, very few have been informed by theory, and so there is scope for more effective interventions to be realized. Given the potential benefits to physical health (e.g., Lear et al., 2017), psychological wellbeing (Zhang & Chen, 2019) and reduced stress (Gerber & Pühse, 2009), physical activity in the police

warrants further exploration. Piloting the Exertime protocol (Study 3) is one avenue for future research, but other research should develop and deliver physical activity interventions for other contexts in the police force. With a larger evidence base, physical activity guidance and policy could then be incorporated into the NPWS.

Conclusion

In this chapter I have provided an overview of the aim and objectives in my thesis and explained the findings from four empirical studies that I conducted to address the aim and objectives. I have contributed to the existing knowledge base through: a) finding that physical activity behavior had a significant positive association with reduced work-related stress and improved psychological wellbeing in the partner police forces; b) providing an explanation for why physical activity behavior positively influenced stress and psychological wellbeing in the police; c) exploring the barriers and enablers for police officers and staff with low physical activity behavior; and, d) detailing a co-design and theory-informed approach to intervention development. Also in this chapter, I have provided practical implications to support police force workers with their psychological wellbeing. Specifically, suggesting leadership training for supervisors and recommendations to support physical activity behavior. Not having previous experience of working in the police force myself²⁴, the co-design approach was essential to understanding the context for these recommendations. The systematic, rigorous, and iterative approach I have adopted throughout my thesis is a key strength in my research, although I acknowledge a limitation that co-design processes were not assessed. I take this as a learning point to address in future research. I have made further recommendations for researching wellbeing at work generally, and for conducting research in the police specifically in this chapter. The final step is to reflect on my experiences and research journey.

²⁴ In Chapter 8 'Reflection, I give insight in my researcher positionality.

Chapter 8

Reflection

Introduction

In the final chapter in this thesis, I reflect on my research journey. Having conducted the research in a part-time capacity, with two external police organizations during a global pandemic, I was presented with unique opportunities and challenges over the course of my program of research. Consequently, there are a number of implications which can provide learning points to support other PhD researchers, their supervisors, and the external organizations they are working with. I begin the chapter by giving the reader insight into who I now am as a reflexive researcher, explaining my use of a reflexive journal and my position as a researcher, before suggesting the learning points that can be taken from my experiences. Then, to set out the learning points systematically, I align them to the research process, as they relate to: (a) planning the research approach; (b) developing research questions; (c) collecting data; and, (d) understanding the findings. I conclude the chapter, and thesis, with a summary.

Reflexive researcher

A reflexive researcher questions their own position, assumptions, and values within the research process (Finlay & Gough, 2003). In this section, I explain my use of a reflexive journal throughout the research program and give insight into who I am to account for my position within the thesis.

Reflexive journal

At the beginning of my PhD, I was advised to keep a record of my meetings and activities, as when it came to writing up my thesis I would not be able to remember everything about what I did, or why. My initial reflections took on this format - making notes in relation to a study to help with decision making (e.g., how I would make sense of the large number of statistical analyses I ran in Study 1). My reflections developed over the qualitative studies 2a and 2b as I introduced my thoughts and feelings. For example, how I felt an

interview (or focus group) had gone, how I'd acted as an interviewer (or focus group facilitator), what I could have done better. Acknowledging the role I was having in my research was a step for me in gaining self-awareness, and I began to reflect in a more in-depth manner. During the Covid-19 pandemic this developed into a daily practice, where I kept reflections in a paper journal as I preferred being able to reach for something tangible to offload and manage my thoughts and feelings quickly, rather than opening another word document. Now, I have paper journal for thoughts and feelings (personal and academic), as well as electronic journal that relates to the research process (academic) that can be more easily searched and therefore drawn upon to guide me in future situations.

Whilst in the write-up stages of my thesis, I was invited to present the findings from the research program to the partner police forces. I realized that, although my reflexive practice had featured the stages of reflection in Gibbs (1988) model, it could have been more effectively structured to enhance my learning. I therefore used Gibbs six-stage model to inform the presentation. Specifically, I described what happened in the research, what I thought and felt about it, what had been good, what could have gone better, what else I could have done to make it so, and then an action plan to support me in similar future research situations. Reflexivity is never final (Braun & Clarke, 2022), so I will continue to develop my reflexive practice by using Gibbs' model.

Researcher positionality

As cliché as it might sound, I began on this research program because I wanted to help people. I had no experience of the police service but recognized that they were an organization in need of support. Physical activity, specifically running, had helped my family deal with mental health challenges and I wanted others to be able to realize the same benefits, so research in this area with the police appealed to me.

I began on the PhD program as a 25-year-old. I distinctly remember being interviewed

by my director of studies (DoS) and a steering group member from Force A and being asked what I thought the biggest challenge would be conducting this research. I answered that it might be getting police officers to take me seriously. As a young girl with no experience of working in the police, what would I know about their wellbeing? How could I possibly help them? Why should they listen to me or give any of their time to talk to me? I have therefore always been conscious how I would be perceived as an outside researcher to the police, although I am an inside researcher to the value of physical activity for wellbeing (from personal experience; Braun & Clarke, 2022). I therefore held assumptions that physical activity was beneficial for wellbeing, however this was balanced against also understanding (from experience) that physical activity cannot solve everything. Over the course of the research program, I have also become an inside researcher to work-related stress. At the start of my journey, I understood the basics of work-related stress and wellbeing concepts from my undergraduate Psychology degree and postgraduate Sports Psychology degree. As I developed professionally (i.e., took on more demanding workloads), I realized the benefits of gaining experiential knowledge of the work-related stress context. The first learning point for me, is that it was ok not to know all about my research topic at the outset, as long as I had an awareness of that and approached my research accordingly. In the next section, I set out the learning points from my PhD journey.

Learning points

In this section, I have drawn upon reflections across my research journey and the implications that they might have to support other PhD researchers conducting ecologically valid research, their supervisors, and the external organizations they work with. To present the learning points systematically, they are aligned to the research process (see Table 8.1).

Table 8.1 Summary of the learning points from my research journey, for future researchers, supervisors, and external organizations.

Research process stage:	Learning points for:		
	PhD researchers	Supervisors	External organizations
Planning			
Part-time PhD	Be self-aware and look after your wellbeing	Support students' holistic development in areas additional to PhD	-
Co-design	Send monthly updates to supervisors and external organizations so that all stakeholders can see progress	Manage expectations and set up a steering group with senior management representation	Communicate the scope and role of the researcher to colleagues that are involved as the research progresses
Developing research questions	Talk about your research to non-academic audiences to develop questions that need answering	Hold pre-meetings with students to build their confidence working with the external organization	Try to integrate the researcher into the organization where possible
Collecting data	Share experiences with supervisors and fellow students	Safeguard the PhD outcomes and share your own research experiences that have not gone to plan	Identify a point of contact within the organization who can operate 'on the ground' to help with participant recruitment
Understanding findings	Consider how findings are framed	Encourage students to make mind-maps and structure plans to help make sense of their research	Give feedback to researchers

Planning the research approach

The first learning points that I provide relate to planning the research program (i.e., mine was a part-time PhD), and setting up how it is approached (i.e., I used a co-design framework).

Part-time PhD

I undertook this PhD in a part-time capacity, initially alongside a part-time administrative role in another University. Then, as a part-time Research Assistant (RA) at Cardiff Metropolitan University on two separate, but related projects with the police. I also

worked as an Academic Associate to support delivery of undergraduate programs at Cardiff Metropolitan University, before being appointed as a .5 FTE lecturer in Sport and Exercise Psychology. The part-time PhD is a long project, and I developed resilience to continue with something that makes slow progress over seven years. This was frustrating at a time when all my peers were no longer students, working full time, earning full time wages, getting married, getting dogs, on permanent contracts that would give them maternity leave should they need it next. I felt at times that the rest of my life was on hold to finish this thesis. However, my DoS helped me to take on a different mindset and view the PhD as a training program, supporting my holistic development and not just that which was directly related to my thesis. He taught me to recognize that, because of the other roles my part-time capacity was enabling me to take opportunity of, I was developing a wide skillset with research, applied, and teaching experience. For example, my collaboration, workload, project, and time management skills were all enhanced through working with external organizations in a part-time capacity alongside the thesis.

Supervisor learning point: Support student holistic development in areas additional to PhD.

Managing the competing demands of part-time PhD research alongside other roles can be stressful. In June 2021, at the end of my first term lecturing, which I had been juggling with delivering a pilot of the Exertime intervention (a step beyond the thesis; see Figure 3.2), and another RA position, I lost an entire year of documents that had not been saving to Microsoft OneDrive as they appeared to. This was devastating, as I was missing a draft of an entire chapter of my thesis. This experience was the biggest challenge I encountered in my research program. I believe that if I had not been so stressed in the first place, I might have taken five minutes to back up my work before exchanging a laptop that led to the file loss. The lesson for PhD researchers (in addition to regularly backing up work in multiple locations) is to develop self-awareness so that you can recognize when you are stressed and

use coping mechanisms accordingly. Reflexive practice can aid self-awareness, but a crucial stage that I had omitted was the action plan stage that could help me improve the situation (Gibbs, 1988). When you do experience stress during your PhD, act on it by looking after your wellbeing and putting yourself before any work or research pressures.

PhD researcher learning point: Be self-aware and put your own wellbeing before research or other work demands.

Co-design

In Chapter 7, I suggested that future co-design research with police (and other external organizations) needs to start with scoping discussions. These discussions should engage senior leaders, set out the scope of the research and the necessary resources and interactions that will progress the research along agreed timescales. Supervisors know more of the realities of research than students who begin on a research program, and so supervisors need to lead on the discussions to manage the expectations of the external organization (and the expectations of the PhD researcher). My DoS effectively held these initial discussions and set up the steering group, thereby ensuring that I would have bi-monthly meetings with senior management from each partner police force. This was a vital mechanism in navigating the research²⁵. Following my research, I would also suggest that the scoping discussions for co-design research include consideration of progression and evaluation criteria (see Chapter 7).

Supervisor learning point: Lead on scoping discussions and set up a steering group with senior management to support the research throughout.

Another useful mechanism to set up from the beginning of co-design research is reporting parameters. Research (particularly that which is conducted part-time) and external organizations progress along competing timelines. In my experience, the partner police forces

²⁵ In Chapter 6 ‘Development of the Exertime intervention’, I discussed the importance of senior leader support.

expected things to be done much quicker than research (conducted systematically) allows, and I would frequently be asked when my findings would be available. To mitigate this, I sent ‘monthly updates’ to the steering group, providing a one-page summary of my progress. By doing so, the external organizations felt like that they were getting something back from my research and knew that there was progress, even if I could not yet produce completed findings. I also sent separate monthly updates to my supervisors, so that there was an open mechanism for their input too. A benefit of the monthly updates for me personally was that they helped me to recognize that, even if it felt slow, I had still made some progress to update on.

PhD researcher learning point: Send monthly updates to supervisors and external organizations so that you can all see progress.

The steering group understood the research scope (from the scoping discussions) and progress (from the monthly updates). However, the specific groups or teams who were involved across the research program did not always have the same understanding, so managing their expectations was a challenge. I would often be introduced to various participants and colleagues throughout the workforce as ‘here to support wellbeing’. While that association would help recognition of my research, it caused me to reflect on my position within the research as it might fuel a perception that I could (and would) give wellbeing support. I reflected that my role and research could have been better communicated after a

Study 2b interview with Davina, Force A:

What I did well – empathized with Davina when she was talking about her grievances with the workplace and steered her back to talking about physical activity.

What I could have done better – steered Davina back on track earlier! I said at the start that I couldn’t give specific wellbeing advice, and the interview purpose was to talk about where there might be opportunities for physical activity behavior change. The research could have been more clearly communicated to manage her expectations; I felt an expectation that I could solve all her wellbeing issues.

External organizations learning point: Communicate the scope of the research and role of the

researcher to the other groups or teams that are involved as the research progresses.

Developing research questions

Co-design research approaches are unique, as the target population drives the research process and the problems that it aims to solve (Hurley et al., 2021). My role was to integrate the extant evidence base within the research. I would often get so focused on theory or the minutiae (e.g., homing in on individual BCTs in the Exertime intervention in Chapter 6) that the bigger picture (i.e., what the research was actually trying to do) might get lost. Regularly communicating with the partner police forces helped me to learn to identify what in the literature was relevant. My DoS referred to this as ‘getting in your helicopter’ to hover above and consider the main points from another – wider - perspective. I produced additional reports for the steering group which summarized the research evidence (e.g., to inform variable selection in Study 1) and delivered invited presentations to police colleagues (e.g., providing findings from Study 1 in a presentation at the Oscar Kilo [OK] conference supported the direction taken for Study 2a). These activities required me to present complex theoretical concepts and/or results in lay person terms. Reflecting back, these were opportunities which helped me to gain insight as to which messages ‘landed’ with the police audience and had real world implications. Any conversation that I had offered another platform to discuss my research, better understand what it meant and what questions still needed to be asked (and answered).

PhD researcher learning point: Talk about research to others to develop understanding of where it ‘fits’ in theory and practice.

Having reflected that I did well in discussing my research to non-academic audiences, the partner police forces were excellent in offering me such opportunities. As outlined in Chapter 1, my PhD program began in 2016, when the term ‘wellbeing’ was just beginning to be used in police forces (previously there was a stress-based focus; Hart & Cotton, 2002).

Since, there have been national developments, (e.g., OK; see Phythian et al., 2021).

Operationally, this was reflected in the partner police forces in the creation of wellbeing groups. By inviting me to attend and/or present at their wellbeing group meetings, the partner police forces helped to integrate me further into their organizations. This supported my understanding of the context and visibility within their organization as I was introduced to a wider diversity of colleagues and able to develop relationships that could support the research (e.g., in data collection).

External organization learning point: Integrate the researcher where possible.

Working with the police could be a daunting environment. Over the course of the research program, I ‘found my voice’ in steering group meetings, as I had to give opinions which I am not naturally confident in. An example of my development is that between Study 1 and Study 2a (see Chapter 4 Interlude), I was not confident to emphasize directions that the research could take other than focusing on physical activity. In terms of feasibility, I acknowledge that changing perceptions, work factors, and the work-life interface (the other key drivers identified from Study 1 findings) might have seemed to the steering group like factors beyond our position of influence. On reflection, I could have highlighted examples of research that has influenced these factors to balance the discussion (e.g., the development of work-life balance initiatives; Doherty & Manfredi, 2006). By Study 3, my ability to put forward ideas and defend them had grown, and I was able to ensure that ‘modelling’ and supervisor support were included in the Exertime intervention (see Chapter 6). ‘Pre-meetings’ with my DoS were central to this development, as I could practice getting my point across to him before voicing it to the steering group. Prior to the pandemic, we had a 40-minute car journey to travel to meet the steering group which ensured we always had a ‘pre-meeting’. Now that meetings increasingly take place online, supervisors should consider scheduling ‘pre-meetings’ to support student development.

Supervisor learning point: Pre-meetings can be helpful to build student confidence.

Collecting data

Police forces are large organizations, and so identifying who to speak to for different aspects of data collection was a challenge (e.g., IT colleagues checked that my online survey passed police firewalls in Study 1, HR administrators populated the focus groups in Study 2a, the training department scheduled my attendance at supervisor sessions in Study 3). Steering group members were vital in engaging various colleagues as required, onboarding them with the background to my research and getting their buy-in to participate and/or support. Police officers and staff operate with high demands and so recruiting participants in Study 2a and 2b was a particular challenge, as the qualitative research required a longer time commitment. Sparkes and Smith (2014) outline the difficulty of bringing a group of people together at a mutually convenient time as one of the weaknesses of focus groups (Study 2a). I found this even more so due to the unpredictable nature of police work. For one of my focus groups, only one participant turned up due to an incident, so I utilized the session to pilot the Study 2b interview guide. For the next focus group, eight participants turned up. Email requests are easy to ignore, and what had made the difference was having steering group members who could operate ‘on the ground’, disseminate research information to potential participants in their canteen and knock on the door of departments to progress the data collection in a timely manner.

External organizations learning point: Have steering group members who can operate ‘on the ground’ to help with participant recruitment.

My data collection did not always go to plan, from common experiences (e.g., focus group recruitment challenges), to the unprecedented (e.g., the Covid-19 pandemic). At the start of the pandemic, no one knew what trajectory would be. Both partner forces explained that the Study 3 intervention could not be piloted with their adapted emergency operational

functioning (e.g., control rooms were split to create additional resilience sites). Although the desire to run the intervention when there was stable operational functioning was still there, the uncertainty of when this might be and what it might mean for my PhD was distressing. My supervisors were fantastic during this time. We met more frequently during lockdowns than previously, and I felt supported in securing some financial support and creating a plan to ‘safeguard’ my thesis. My supervisors reassured me that the outcomes of my PhD could still be achieved with a protocol for my intervention in Study 3. It could not be guaranteed when the control rooms would have capacity to support the Exertime intervention, but I would deliver the pilot when possible as a step beyond my thesis (see Figure 1.1). Hopefully, future PhD researchers will not be faced with another global pandemic, yet my experience has implications for how supervisors can support students when their data collection does not go to plan. Specifically, my supervisors offered reassurance that the PhD outcomes were safeguarded. Further, they were understanding from their own experiences (e.g., empathized with the difficulties and shared their own real-world research that had not gone to plan), which enabled me to be resilient to the uncertainty.

Supervisor learning point: Safeguard PhD outcomes so that students can be resilient to data collection challenges, sharing your own research experiences that have not gone to plan can support further.

I was aware (through reflection) that the pandemic put my PhD into perspective, but also that it was important to me to feel like I was still progressing. On my last day in the PhD office before the first lockdown I reflected:

This is very weird and distracting from my PhD, but I feel wrong going forward with the intervention and taking any of the police resource away from the Covid-19 response. It is all so uncertain, but my PhD is not the most important thing to me. My family and friends are. Just feel I need to look after my partner and focus on what I can control.

On the list of things that I could control and progress on were writing up the Literature Review and Research Design chapters in my thesis. I scheduled weekly catch-ups

online with friends who were also in the middle of their PhDs, and we made Covid-19 ‘to-do’ lists, trying to keep each other accountable for our progress. We laughed that we never achieved all we meant to. Had it not been for talking to friends and finding that they were also not progressing, I would have felt increasingly guilty and worried that my PhD was suffering. Their support (and that of my supervisors) normalized the change of focus from PhD to health and loved ones, and I would encourage any PhD researcher to share experiences with fellow students.

PhD researcher learning point: Talk regularly with your fellow students (and supervisors).

Understanding findings

I found understanding findings a challenge with qualitative research, as it was hard to know when to stop. There is always another viewpoint or way in which a quote, or group of quotes, could be themed or labelled. Even after giving reports on my qualitative studies to the partner police forces, I told my supervisors that I wanted to analyze Study 2a and 2b again when it came to writing up my thesis, as I thought there was a ‘better’ way to have represented the data. As a result of reflection, I realized that I was going round in circles and made a New Year’s resolution to be less of a perfectionist. In relation to research this meant recognizing that there is no perfect way to represent data, but when the research question can be answered by your representation of the data it is an appropriate time to stop (Braun & Clarke, 2022). My supervisors gave me practical tasks that helped to recognize that I had reached this stage and achieved the research aim. They suggested tasks which enabled me to make sense of my findings and situate them in my thesis. Specifically, I created mind-maps to provide an overview of my findings and wrote out the structure (headings and subheadings) of the story it was telling me. Having these mind-maps and structures helped me further when it came to write up, as I had the outlines ready to ‘fill in’.

Supervisor learning point: Encourage students to use mind-maps and structure plans to help

make sense of their data.

The tasks helped me to understand my findings at a theoretical and conceptual level, but for the practical level of understanding I needed to discuss my findings with the partner police forces (see ‘developing research questions’). Sometimes findings might be difficult to discuss with the organization. For example, framing how I reported findings around a permission culture that was driven by supervisors and that staff felt unable to prioritize their wellbeing needs (Study 2a, 2b, and 3). On reflection, several factors aided these discussions. To deliver findings, I would contextualize them in relation to previous research to avoid being critical of the partner police forces specifically (e.g., providing examples of other police research which supports the impact of supervisors on the work environment; Bell et al., 2022). Then, I would discuss preliminary findings with the steering group with whom I had developed good relationships, providing a platform for honest conversation around the findings – why they might be and what could potentially be done. In subsequent reports the findings which potentially had negative implications for the organization could then be reported with a recommendation for how it would improve, so that the focus was on actions for positive change. This mindset was facilitated by the principles of the co-design approach and Double Diamond framework (e.g., building relationships and generating solutions).

PhD researcher learning point: Consider how findings are framed (contextualize and provide with recommendations).

Over my research program, I produced reports and updates to disseminate my findings throughout the partner police forces. To better understand the impact of these, and which of the recommendations were taken forward, external organizations need to provide feedback to researchers. More feedback could also enable me to improve my research practice. I therefore encourage external organizations to follow-up on projects to inform future research endeavors.

External organization learning point: Give feedback to researchers.

Conclusion

The experience of conducting a part-time research program with two external organizations over the course of a global pandemic has provided me with a unique set of challenges and development opportunities. Reflection has helped to make sense of my research journey and the implications can contribute to knowledge for future researchers, supervisors, and external organizations working together. In this chapter, I have emphasized the importance of a steering group to support the research ‘on the ground’, a PhD researcher willing to discuss their research with the organization where possible, and supervisors who support their student’s holistic development. The learning points are provided in Table 8.1 to support other researchers and organizations working together to solve real-world challenges.

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Appendices

Appendix 1. Study 1 research article supplemental file 1: Multiple regressions

Relationship 1: Work demands and resources will significantly relate to psychological wellbeing outcomes

Table A1.

Standard multiple regression of work characteristics in prediction of depression.

Work characteristics	Depression		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	.15	.04	.15**
Change consultations	.11	.04	.11**
Effort	.01	.04	.01
Overcommitment	.23	.03	.25**
Work resources			
Control	.03	.04	.03
Reward	-.09	.05	-.08
Support	-.11	.04	-.10*
Supervisor relations	-.06	.04	-.05
<i>R</i> ²		.21	
<i>F</i>		24.62**	

p*<.05. *p*<.01.

Table A2.

Standard multiple regression of work characteristics in prediction of anxiety.

Work characteristics	Anxiety		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	.16	.04	.16**
Change consultations	.10	.04	.10**
Effort	-.01	.04	-.01
Overcommitment	.29	.03	.30**
Work resources			
Control	-.01	.04	-.01
Reward	-.13	.05	-.12**
Support	-.01	.04	-.01
Supervisor relations	-.05	.04	-.04
<i>R</i> ²		.22	
<i>F</i>		28.96**	

p*<.05. *p*<.01.

Table A3.
Standard multiple regression of work characteristics in prediction of job satisfaction.

Work characteristics	Job satisfaction		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	-.07	.04	-.07
Change consultations	-.10	.03	-.12**
Effort	-.00	.04	-.00
Overcommitment	-.04	.03	-.05
Work resources			
Control	.20	.03	.20**
Reward	.24	.04	.24**
Support	.17	.04	.16**
Supervisor relations	.13	.03	.13**
R^2		.39	
F		60.71**	

* $p < .05$. ** $p < .01$.

Table A4.
Standard multiple regression of work characteristics in prediction of negative mood.

Work characteristics	Negative mood		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	.11	.04	.11*
Change consultations	.17	.04	.17**
Effort	.03	.04	.03
Overcommitment	.20	.03	.22**
Work resources			
Control	-.00	.04	-.00
Reward	-.10	.05	-.10*
Support	-.08	.04	-.06
Supervisor relations	-.03	.04	-.02
R^2		.20	
F		23.61**	

* $p < .05$. ** $p < .01$.

Table A5.

Standard multiple regression of work characteristics in prediction of positive mood.

Work characteristics	Positive mood		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	-.07	.04	-.078
Change consultations	-.06	.03	-.07*
Effort	.05	.04	.06
Overcommitment	-.17	.03	-.21**
Work resources			
Control	.08	.04	.08*
Reward	.19	.04	.19**
Support	.19	.04	.19**
Supervisor relations	-.01	.04	-.01
R^2		.22	
F		26.28**	

* $p < .05$. ** $p < .01$.

Relationship 2: Work demands and resources will significantly relate to perceived job stress

Table A6.

Standard multiple regression of work characteristics in prediction of perceived job stress.

Work characteristics	Perceived job stress		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	.26	.03	.31**
Change consultations	.05	.03	.06*
Effort	.14	.03	.16**
Overcommitment	.19	.03	.24**
Work resources			
Control	-.12	.03	-.13**
Reward	.02	.03	.02
Support	.02	.03	.03
Supervisor relations	-.02	.03	-.02
R^2		.41	
F		64.97**	

* $p < .05$. ** $p < .01$.

Table A7.

Standard multiple regression of work characteristics in prediction of organizational stress.

Work characteristics	Organizational stress		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	.01	.03	.01
Change consultations	-.03	.02	-.06
Effort	.04	.03	.07
Overcommitment	.05	.02	.09*
Work resources			
Control	-.03	.03	-.04
Reward	-.05	.03	-.08
Support	-.00	.03	-.01
Supervisor relations	.02	.03	.03
R^2		.03	
F		3.13**	

* $p < .05$. ** $p < .01$.

Table A8.

Standard multiple regression of work characteristics in prediction of operational stress.

Work characteristics	Operational stress		
	<i>B</i>	<i>SE B</i>	β
Work demands			
Demands	-.02	.03	-.03
Change consultations	.01	.02	.02
Effort	.05	.03	.09
Overcommitment	.04	.02	.09*
Work resources			
Control	-.06	.03	-.10*
Reward	-.02	.03	-.04
Support	.03	.03	.04
Supervisor relations	.02	.03	.04
R^2		.03	
F		3.30**	

* $p < .05$. ** $p < .01$.

Relationship 3: Perceived job stress will significantly relate to psychological wellbeing outcomes

Table A9.

Standard multiple regression of perceived job stress in prediction of depression.

Job stress	Depression		
	<i>B</i>	<i>SE B</i>	β
Perceived job stress	.40	.04	.33**
Organizational stress	.11	.09	.06
Operational stress	-.05	.09	-.03
<i>R</i> ²		.12	
<i>F</i>		36.42**	

p*<.05. *p*<.01.

Table A10.

Standard multiple regression of perceived job stress in prediction of anxiety.

Job stress	Anxiety		
	<i>B</i>	<i>SE B</i>	β
Perceived job stress	.48	.04	.39**
Organizational stress	.15	.09	.08*
Operational stress	-.12	.09	-.06
<i>R</i> ²		.16	
<i>F</i>		52.63**	

p*<.05. *p*<.01.

Table A11.

Standard multiple regression of perceived job stress in prediction of job satisfaction.

Job stress	Job satisfaction		
	<i>B</i>	<i>SE B</i>	β
Perceived job stress	-.31	.04	-.29**
Organizational stress	-.30	.08	-.18**
Operational stress	.11	.08	.07
<i>R</i> ²		.11	
<i>F</i>		34.65**	

p*<.05. *p*<.01.

Table A12.

Standard multiple regression of perceived job stress in prediction of negative mood.

Job stress	Negative mood		
	<i>B</i>	<i>SE B</i>	β
Perceived job stress	.36	.04	.30**
Organizational stress	.13	.09	.07
Operational stress	-.08	.09	-.04
R^2		.09	
F		28.98**	

* $p < .05$. ** $p < .01$.

Table A13.

Standard multiple regression of perceived job stress in prediction of positive mood.

Job stress	Negative mood		
	<i>B</i>	<i>SE B</i>	β
Perceived job stress	-.28	.04	-.27**
Organizational stress	-.20	.08	-.12*
Operational stress	.07	.08	.05
R^2		.08	
F		30.82**	

* $p < .05$. ** $p < .01$.

Relationship 8: Individual characteristics will significantly relate to perceived job stress

Table A14.

Standard multiple regression of individual characteristics in prediction of perceived job stress.

Personal characteristics	Perceived job stress		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	.02	.27	.00
Physical activity: High - Med	.25	.20	.04
Life satisfaction	-.10	.03	-.11**
Life stress	.15	.03	.18**
R^2		.05	
F		11.70**	

* $p < .05$. ** $p < .01$.

Med = Medium.

Table A15.

Standard multiple regression of individual characteristics in prediction of organizational stress.

Personal characteristics	Organizational stress		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	.04	.18	.01
Physical activity: High - Med	-.03	.13	-.01
Life satisfaction	-.04	.02	-.07
Life stress	-.02	.02	-.04
<i>R</i> ²		.00	
<i>F</i>		1.01	

p*<.05. *p*<.01.

Med = Medium.

Table A16.

Standard multiple regression of individual characteristics in prediction of operational stress.

Personal characteristics	Operational stress		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	.12	.18	.02
Physical activity: High - Med	-.32	.13	-.08*
Life satisfaction	-.03	.02	-.05
Life stress	-.02	.02	-.04
<i>R</i> ²		.01	
<i>F</i>		2.45*	

p*<.05. *p*<.01.

Med = Medium.

Relationship 9: Individual characteristics will significantly relate to psychological wellbeing outcomes

Table A17.

Standard multiple regression of individual characteristics in prediction of depression

Personal characteristics	Depression		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	.40	.28	.04
Physical activity: High - Med	-.14	.21	-.02
Life satisfaction	-.37	.03	-.33**
Life stress	.36	.03	.35**
<i>R</i> ²		.29	
<i>F</i>		83.45**	

p*<.05. *p*<.01.

Med = Medium.

Table A18.

Standard multiple regression of individual characteristics in prediction of anxiety

Personal characteristics	Anxiety		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	.31	.30	.03
Physical activity: High - Med	-.22	.22	-.03
Life satisfaction	-.28	.04	-.25**
Life stress	.37	.03	.35**
<i>R</i> ²		.22	
<i>F</i>		59.14**	

p*<.05. *p*<.01.

Med = Medium.

Table A19.

Standard multiple regression of individual characteristics in prediction of job satisfaction

Personal characteristics	Job satisfaction		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	-.20	.27	-.02
Physical activity: High - Med	-.13	.20	-.02
Life satisfaction	.46	.03	.46**
Life stress	.02	.03	.02
<i>R</i> ²		.21	
<i>F</i>		55.36**	

p*<.05. *p*<.01.

Med = Medium.

Table A20.

Standard multiple regression of individual characteristics in prediction of negative mood

Personal characteristics	Negative mood		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	.42	.29	.05
Physical activity: High - Med	-.13	.22	-.02
Life satisfaction	-.32	.04	-.29**
Life stress	.30	.03	.29**
<i>R</i> ²		.21	
<i>F</i>		54.41**	

p*<.05. *p*<.01.

Med = Medium.

Table A21.

Standard multiple regression of individual characteristics in prediction of positive mood

Personal characteristics	Positive mood		
	<i>B</i>	<i>SE B</i>	β
Physical activity: High – Low	-.58	.24	-.07*
Physical activity: High - Med	.24	.18	.04
Life satisfaction	.45	.03	.46**
Life stress	-.18	.03	-.19**
R^2		.30	
F		89.12**	

* $p < .05$. ** $p < .01$.

Med = Medium.

Appendix 2. Study 1 research article supplemental file 2: Parallel multiple mediations

Relationship 4: Perceived job stress mediates the relationships between work characteristics and psychological wellbeing outcomes and job satisfaction

Table B1.

Parallel multiple mediator model for reward and depression.

Consequent																				
	M1 (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Depression)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Reward)	a ₁	-.01	.03	-.08	.06	a ₂	-.02	.03	-.07	.04	a ₃	-.03	.03	-.09	.02	<i>c'</i>	-.11	.05	-.20	-.02
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.27
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.06	.09	-.12	.23
Constant		3.07**	.34	2.40	3.74		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.95**					3.33*					3.10*					18.31**	
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.01	.01	a ₂ b ₂	.00	.00	-.01	.01	a ₃ b ₃	-.00	.00	-.01	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B2.

Parallel multiple mediator model for reward and anxiety.

		Consequent															
		MI (Job stress)				M2 (Op. stress)				M3 (Org. stress)				Y (Anxiety)			
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI	<i>B</i>	<i>SE B</i>	LLCI	ULCI	<i>B</i>	<i>SE B</i>	LLCI	ULCI	<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Reward)	a ₁	-.01	.03	-.08	.06	a ₂	-.02	.03	-.07	.04	a ₃	-.03	.03	-.09	.02	c'	-.14*
M1 (Job stress)		-	-	-	-	-	-	-	-	-	-	-	-	b ₁	.23**	.05	.14
M2 (Op. stress)		-	-	-	-	-	-	-	-	-	-	-	-	b ₂	-.15	.09	-.33
M3 (Org. stress)		-	-	-	-	-	-	-	-	-	-	-	-	b ₃	.11	.09	-.07
Constant		3.07**	.34	2.40	3.75	2.27**	.28	1.71	2.83	3.38**	.28	2.82	3.94	2.14**	.53	1.10	3.19
<i>R</i> ²			.42				.03				.03				.25		
<i>F</i>			66.96**				3.31*				3.00*				23.32**		
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.02	.01	a ₂ b ₂	.00	.01	-.01	.01	a ₃ b ₃	-.00	.00	-.01	.00		

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B3.

Parallel multiple mediator model for reward and job satisfaction.

		Consequent															
		MI (Job stress)				M2 (Op. stress)				M3 (Org. stress)				Y (Job satisfaction)			
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI	<i>B</i>	<i>SE B</i>	LLCI	ULCI	<i>B</i>	<i>SE B</i>	LLCI	ULCI	<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Reward)	a ₁	-.01	.03	-.08	.06	a ₂	-.02	.03	-.07	.04	a ₃	-.03	.03	-.09	.02	c'	.22**
M1 (Job stress)		-	-	-	-	-	-	-	-	-	-	-	-	b ₁	-.17**	.04	-.25
M2 (Op. stress)		-	-	-	-	-	-	-	-	-	-	-	-	b ₂	.13	.07	-.01
M3 (Org. stress)		-	-	-	-	-	-	-	-	-	-	-	-	b ₃	-.23*	.07	-.37
Constant		3.05**	.34	2.38	3.73	2.29**	.28	1.74	2.85	3.39**	.29	2.83	3.95	3.75**	.42	2.94	4.57
<i>R</i> ²			.42				.03				.03				.42		
<i>F</i>			66.96**				3.32*				3.05*				48.38**		
Bootstrap indirect effects	a ₁ b ₁	.00	.01	-.01	.01	a ₂ b ₂	-.00	.00	-.01	.01	a ₃ b ₃	.01	.01	-.01	.02		

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B4.

Parallel multiple mediator model for reward and positive mood.

Consequent																				
	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Reward)	a ₁	-.01	.03	-.08	.06	a ₂	-.02	.03	-.07	.04	a ₃	-.03	.03	-.09	.02	<i>c'</i>	.16**	.04	.08	.24
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.23	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.11	.08	-.26	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.46	4.48	6.30
<i>R</i> ²			.42					.03					.03					.23		
<i>F</i>			67.45**					3.35*					3.00*					20.01**		
Bootstrap indirect effects	a ₁ b ₁	.00	.01	-.01	.01	a ₂ b ₂	-.00	.00	-.01	.00	a ₃ b ₃	.00	.00	-.00	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B5.

Parallel multiple mediator model for reward and negative mood.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Reward)	a ₁	-.01	.03	-.08	.06	a ₂	-.02	.03	-.07	.04	a ₃	-.03	.03	-.09	.02	<i>c'</i>	-.08	.05	-.18	.01
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.12*	.05	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.34	.02
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.29**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.44	3.51
<i>R</i> ²			.41					.03					.03					.20		
<i>F</i>			65.56**					3.26*					2.88*					17.46**		
Bootstrap indirect effects	a ₁ b ₁	-.00	.00	-.01	.01	a ₂ b ₂	.00	.01	-.01	.01	a ₃ b ₃	-.00	.01	-.01	.00					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B6.

Parallel multiple mediator model for control and depression.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Depression)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Control)	a ₁	-.10*	.03	-.17	-.04	a ₂	-.06*	.03	-.11	-.01	a ₃	-.04	.03	-.09	.01	<i>c'</i>	.04	.04	-.05	.12
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.27
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.06	.09	-.12	.23
Constant		3.07**	.34	2.40	3.74		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.46**	.53	1.43	3.50
<i>R</i> ²			.42					.03					.03					.21		
<i>F</i>			66.94**					3.33*					3.10*					18.31**		
Bootstrap indirect effects	a ₁ b ₁	-.02 ¹	.01	-.03	-.00	a ₂ b ₂	.00	.01	-.01	.02	a ₃ b ₃	-.00	.00	-.01	.01					

p*<.05. *p*<.01.¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B7.

Parallel multiple mediator model for control and anxiety.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Anxiety)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Control)	a ₁	-.11*	.03	-.17	-.04	a ₂	-.06*	.03	-.11	-.01	a ₃	-.04	.03	-.09	.01	<i>c'</i>	.00	.04	-.08	.09
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.03
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.02	.09	-.07	.29
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.14**	.53	1.10	3.19
<i>R</i> ²			.42					.03					.03					.25		
<i>F</i>			66.96**					3.31*					3.00*					23.32**		
Bootstrap indirect effects	a ₁ b ₁	-.02 ¹	.01	-.05	-.01	a ₂ b ₂	.01	.01	-.00	.03	a ₃ b ₃	-.00	.01	-.02	.00					

p*<.05. *p*<.01.¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B8.

Parallel multiple mediator model for control and job satisfaction.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Job satisfaction)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Control)	a ₁	-.11*	.03	-.17	-.04	a ₂	-.06*	.03	-.11	-.01	a ₃	-.04	.03	-.09	.01	<i>c'</i>	.21**	.03	.14	.28
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.25	-.10
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.13	.07	-.01	.27
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.23*	.07	-.37	-.09
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.74	2.85		3.39**	.28	2.83	3.95		3.75**	.42	2.90	4.57
<i>R</i> ²			.42					.03					.03					.42		
<i>F</i>			66.96**					3.24*					3.05*					48.38**		
Bootstrap indirect effects	a ₁ b ₁	.02 ¹	.01	.01	.03	a ₂ b ₂	-.01	.01	-.02	.00	a ₃ b ₃	.01	.01	-.00	.03					

p*<.05. *p*<.01.¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B9.

Parallel multiple mediator model for control and positive mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Control)	a ₁	-.11*	.03	-.17	-.04	a ₂	-.06*	.03	-.11	-.01	a ₃	-.04	.03	-.10	.01	<i>c'</i>	.09*	.04	.01	.16
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.14*	.04	-.23	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.08	-.26	.05
Constant		3.05**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.46	4.48	6.30
<i>R</i> ²			.42					.03					.03					.23		
<i>F</i>			67.45**					3.35*					3.00*					20.01**		
Bootstrap indirect effects	a ₁ b ₁	.01 ¹	.01	.00	.03	a ₂ b ₂	-.00	.01	-.02	.01	a ₃ b ₃	.00	.00	-.00	.02					

p*<.05. *p*<.01.¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B10.

Parallel multiple mediator model for control and negative mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Control)	a ₁	-.12**	.03	-.18	-.05	a ₂	-.06*	.03	-.11	-.01	a ₃	-.04	.03	-.09	.01	c'	-.02	.04	-.10	.07
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.12*	.05	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.34	.02
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		5.39**	.53	1.44	3.51
<i>R</i> ²				.41					.03					.03					.20	
<i>F</i>				65.56**					3.26*					2.88*					17.46**	
Bootstrap indirect effects	a ₁ b ₁	-.01 ¹	.01	-.03	-.00	a ₂ b ₂	.01	.01	-.00	.03	a ₃ b ₃	-.00	.01	-.02	.00					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B11.

Parallel multiple mediator model for support and depression.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Depression)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Support)	a ₁	.02	.03	-.04	.08	a ₂	.03	.03	-.02	.08	a ₃	.00	.03	-.05	.05	<i>c'</i>	-.10*	.04	-.19	-.02
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.07**	.34	2.39	3.74		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.93		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.95**					3.33*					3.10*					18.31**	
Bootstrap indirect effects	a ₁ b ₁	.00	.01	-.01	.02	a ₂ b ₂	-.00	.00	-.01	.01	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B12.

Parallel multiple mediator model for support and anxiety.

Consequent																				
Antecedent X (Support)	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Anxiety)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
	a ₁	.02	.03	-.04	.08	a ₂	.03	.03	-.02	.08	a ₃	.00	.03	-.05	.05	<i>c'</i>	.01	.04	-.07	.10
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.03
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.11	.09	-.07	.29
Constant		3.07**	.34	2.39	3.75		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.12**	.53	1.10	3.18
<i>R</i> ²				.42					.03					.03					.25	
<i>F</i>				66.96**					3.31*					3.00*					23.32**	
Bootstrap indirect effects	a ₁ b ₁	.00	.01	-.01	.02	a ₂ b ₂	-.00	.01	-.02	.00	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B13.

Parallel multiple mediator model for support and job satisfaction.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Job satisfaction)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Support)	a ₁	.02	.03	-.04	.09	a ₂	.03	.03	-.02	.08	a ₃	.00	.03	-.05	.05	<i>c'</i>	.17**	.03	.10	.23
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.25	-.10
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.13	.07	-.01	.27
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.23*	.07	-.37	-.09
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.73	2.85		3.39**	.28	2.83	3.95		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.96**					3.24*					3.05*					48.38**	
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.02	.01	a ₂ b ₂	.00	.00	-.00	.01	a ₃ b ₃	.00	.01	-.01	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B14.
Parallel multiple mediator model for support and positive mood.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Support)	a ₁	.02	.03	-.04	.08	a ₂	.03	.03	-.02	.08	a ₃	.00	.03	-.05	.05	<i>c'</i>	.21**	.04	.13	.28
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.14*	.04	-.22	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.08	-.26	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.46	4.48	6.30
<i>R</i> ²				.42				.03					.03					.23		
<i>F</i>				67.45**				3.24*					3.00*					20.01**		
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.01	.01	a ₂ b ₂	.00	.00	-.00	.01	a ₃ b ₃	-.00	.01	-.01	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B15.
Parallel multiple mediator model for support and negative mood.

Consequent																				
	MI (Job stress)				M2 (Op. stress)				M3 (Org. stress)				Y (Negative mood)							
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Support)	a ₁	.03	.03	-.04	.09	a ₂	.03	.03	-.02	.08	a ₃	.00	.03	-.05	.05	<i>c'</i>	-.09	.04	-.17	.00
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.11*	.49	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.33	.02
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.43	3.51
<i>R</i> ²				.41					.03					.03					.20	
<i>F</i>				65.56**					3.26*					2.88*					17.46**	
Bootstrap indirect effects	a ₁ b ₁	.00	.00	-.00	.01	a ₂ b ₂	-.00	.01	-.02	.00	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B16.

Parallel multiple mediator model for supervisor relations and depression.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)				Y (Depression)					
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Sup. rels)	a ₁	-.01	.03	-.07	.05	a ₂	.03	.03	-.02	.08	a ₃	.02	.03	-.03	.07	<i>c</i> ′	-.06	.04	-.14	.02
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.07**	.34	2.40	3.74		2.27**	.28	1.71	2.83		3.37**	.28	2.82	3.93		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.95**					3.33*					3.10*					18.31**	
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.01	.01	a ₂ b ₂	-.00	.00	-.01	.00	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

Sup. rels = Supervisor relations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B17.

Parallel multiple mediator model for supervisor relations and anxiety.

Consequent																				
MI (Job stress)						M2 (Op. stress)				M3 (Org. stress)				Y (Anxiety)						
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Sup. rels)	a ₁	-.01	.03	-.07	.05	a ₂	.03	.03	-.02	.08	a ₃	.02	.03	-.03	.07	<i>c'</i>	-.06	.04	-.14	.02
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.03
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.11	.09	-.07	.29
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.14**	.53	1.10	3.18
<i>R</i> ²				.42					.04					.03					.25	
<i>F</i>				66.96**					3.31*					3.00*					23.32**	
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.01	.01	a ₂ b ₂	-.00	.00	-.01	.00	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

Sup. rels = Supervisor relations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B18.

Parallel multiple mediator model for supervisor relations and job satisfaction.

Consequent																				
	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Job satisfaction)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Sup. rels)	a ₁	-.01	.03	-.07	.05	a ₂	.03	.03	-.02	.09	a ₃	.02	.03	-.03	.07	<i>c'</i>	.13**	.07	.07	.19
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.25	-.10
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.13	.07	-.01	.27
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.23*	.07	-.37	-.09
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.74	2.85		3.39**	.28	2.83	3.95		3.75**	.41	2.94	4.57
<i>R</i> ²			.42					.03					.03					.41		
<i>F</i>			66.96**					3.24*					3.05*					48.38**		
Bootstrap indirect effects	a ₁ b ₁	.00	.01	-.01	.01	a ₂ b ₂	.00	.00	-.00	.01	a ₃ b ₃	-.00	.01	-.02	.01					

p*<.05. *p*<.01.

Sup. rels = Supervisor relations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B19.

Parallel multiple mediator model for supervisor relations and positive mood.

Consequent																				
	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Sup. rels)	a ₁	-.01	.03	-.07	.05	a ₂	.03	.03	-.02	.08	a ₃	.02	.03	-.03	.07	<i>c</i> '	-.02	.04	-.09	.05
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.14**	.04	-.22	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.08	-.26	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.46	4.48	6.30
<i>R</i> ²			.42					.03					.03					.23		
<i>F</i>			67.45**					3.35*					3.00*					20.01**		
Bootstrap indirect effects	a ₁ b ₁	-.00	.01	-.01	.01	a ₂ b ₂	.00	.00	-.00	.01	a ₃ b ₃	-.00	.00	-.01	.01					

p*<.05. *p*<.01.

Sup. rels = Supervisor relations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B20.

Parallel multiple mediator model for supervisor relations and negative mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Sup. rels)	a ₁	-.01	.03	-.07	.05	a ₂	.03	.02	-.02	.08	a ₃	.02	.03	-.03	.07	<i>c'</i>	-.06	.04	-.14	.02
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.43	3.51
<i>R</i> ²				.41					.03					.03					.20	
<i>F</i>				65.56**					3.26*					2.88*					17.46**	
Bootstrap indirect effects	a ₁ b ₁	-.00	.00	-.01	.01	a ₂ b ₂	-.00	.01	-.02	.00	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

Sup. rels = Supervisor relations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B21.

Parallel multiple mediator model for demands and depression.

Consequent																				
MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Depression)					
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Demands)	a ₁	.28**	.03	.21	.34	a ₂	-.04	.03	-.09	.02	a ₃	-.00	.03	-.05	.05	<i>c'</i>	.08	.46	-.01	.17
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.07**	.34	2.39	3.74		2.27**	.28	1.71	2.82		3.37**	.28	2.82	3.93		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.95**					3.33*					3.10*					18.31**	
Bootstrap indirect effects	a ₁ b ₁	.05 ¹	.01	.02	.08	a ₂ b ₂	.00	.00	-.01	.01	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B22.

Parallel multiple mediator model for demands and anxiety.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Anxiety)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Demands)	a ₁	.28**	.03	.21	.34	a ₂	-.04	.03	-.09	.02	a ₃	.00	.03	-.05	.05	<i>c'</i>	-.08	.47	-.01	.18
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.29
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.11	.09	-.07	.29
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.14**	.53	1.10	3.18
<i>R</i> ²				.42					.03					.03					.25	
<i>F</i>				66.96**					3.31*					3.00*					23.32**	
Bootstrap indirect effects	a ₁ b ₁	.06 ¹	.02	.03	1.00	a ₂ b ₂	.01	.01	-.00	.02	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B23.

Parallel multiple mediator model for demands and job satisfaction.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Job satisfaction)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Demands)	a ₁	.27**	.03	.21	.34	a ₂	-.03	.03	-.09	.02	a ₃	.00	.03	-.05	.05	<i>c'</i>	-.10	.04	-.06	.08
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.25	-.10
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.13	.07	-.01	.27
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.23*	.07	-.37	-.09
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.74	2.85		3.39**	.28	2.83	3.95		3.75**	.41	2.94	4.57
<i>R</i> ²				.42					.03					.03					.41	
<i>F</i>				66.96**					3.24*					3.05*					48.38**	
Bootstrap indirect effects	a ₁ b ₁	-.05 ¹	.01	-.07	-.02	a ₂ b ₂	-.00	.00	-.02	.00	a ₃ b ₃	-.00	.01	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B24.

Parallel multiple mediator model for demands and positive mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Demands)	a ₁	.28**	.03	.21	.34	a ₂	-.04	.03	-.09	.02	a ₃	.00	.03	-.05	.05	<i>c'</i>	-.01	.04	-.09	.07
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.22	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.08	-.08	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.04	4.48	6.30
<i>R</i> ²				.42					.03					.03					.23	
<i>F</i>				67.45**					3.35*					3.00*					20.01**	
Bootstrap indirect effects	a ₁ b ₁	-.04 ¹	.01	-.07	-.01	a ₂ b ₂	-.00	.00	-.01	.00	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B25.

Parallel multiple mediator model for demands and negative mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Demands)	a ₁	.28**	.03	.21	.34	a ₂	-.04	.03	-.09	.02	a ₃	.00	.03	-.05	.05	<i>c'</i>	.06	.05	-.03	.15
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.12*	.05	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.33	.02
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.43	3.51
<i>R</i> ²				.41					.03					.03					.20	
<i>F</i>				65.56**					3.26*					2.88*					17.46**	
Bootstrap indirect effects	a ₁ b ₁	.03 ¹	.01	.01	.06	a ₂ b ₂	.01	.01	-.00	.02	a ₃ b ₃	.00	.00	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B26.

Parallel multiple mediator model for effort and depression.

Consequent																				
	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Depression)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Effort)	a ₁	.15**	.03	.08	.21	a ₂	.06*	.03	.01	.12	a ₃	.04	.03	-.01	.10	<i>c</i> ′	-.02	.45	-.11	.07
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.07**	.34	2.39	3.74		2.27**	.28	1.71	2.82		3.37**	.28	2.82	3.93		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.95**					3.33*					3.10*					18.31**	
Bootstrap indirect effects	a ₁ b ₁	.03 ¹	.01	.01	.05	a ₂ b ₂	-.00	.00	-.02	.01	a ₃ b ₃	.00	.01	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B27.

Parallel multiple mediator model for effort and anxiety.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Anxiety)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Effort)	a ₁	.15**	.03	.08	.21	a ₂	.06*	.03	.01	.12	a ₃	.04	.03	-.01	.09	<i>c'</i>	-.05	.05	-.13	.04
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.03
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.11	.09	-.07	.29
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94		2.14**	.53	1.10	3.18
<i>R</i> ²				.42					.03					.03					.25	
<i>F</i>				66.96**					3.31*					3.00*					23.32**	
Bootstrap indirect effects	a ₁ b ₁	.03 ¹	.01	.01	.06	a ₂ b ₂	-.01	.01	-.03	.00	a ₃ b ₃	.00	.01	-.00	.02					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B28.

Parallel multiple mediator model for effort and job satisfaction.

Consequent																				
	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Job satisfaction)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Effort)	a ₁	.15**	.03	.08	.21	a ₂	.06*	.03	.09	.12	a ₃	.04	.03	-.01	.10	<i>c'</i>	.01	.04	-.06	.08
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.25	-.10
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.13	.07	-.01	.27
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	3.75**	.07	-.37	-.09
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.74	2.85		3.39**	.28	2.83	3.95		3.75**	.41	2.94	4.57
<i>R</i> ²				.42					.03					.03					.41	
<i>F</i>				66.96**					3.24*					3.05*					48.38**	
Bootstrap indirect effects	a ₁ b ₁	-.03 ¹	.01	-.04	-.01	a ₂ b ₂	.01	.01	-.00	.02	a ₃ b ₃	-.01	.01	-.03	.00					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B29.

Parallel multiple mediator model for effort and positive mood.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Effort)	a ₁	.15**	.03	.08	.21	a ₂	.06	.03	.01	.12	a ₃	.04	.03	-.01	.10	<i>c'</i>	.08	.04	-.00	.15
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.14*	.04	-.22	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.08	-.08	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.04	4.48	6.30
<i>R</i> ²				.42					.03					.03					.23	
<i>F</i>				67.45**					3.35*					3.00*					20.01**	
Bootstrap indirect effects	a ₁ b ₁	-.02 ¹	.01	-.04	-.01	a ₂ b ₂	.01	.01	-.01	.02	a ₃ b ₃	-.00	.01	-.02	.00					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B30.

Parallel multiple mediator model for effort and negative mood.

Consequent																				
	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Effort)	a ₁	.15**	.03	.08	.21	a ₂	.06	.03	.01	.12	a ₃	.04	.03	-.01	.09	<i>c'</i>	.04	.05	-.05	.13
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.12*	.05	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.33	.02
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.43	3.51
<i>R</i> ²				.41				.03					.03					.20		
<i>F</i>				65.56**				3.26*					2.88*					17.46**		
Bootstrap indirect effects	a ₁ b ₁	.02 ¹	.01	.00	.04	a ₂ b ₂	-.01	.01	-.03	.01	a ₃ b ₃	.00	.01	-.00	.02					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B31.

Parallel multiple mediator model for change consultations and depression.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Depression)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Change)	a ₁	.04	.03	-.01	.09	a ₂	.00	.02	-.04	.04	a ₃	-.04	.02	-.08	.01	<i>c'</i>	.11*	.04	.04	.18
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17**	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.07**	.34	2.39	3.74		2.27**	.28	1.71	2.82		3.37**	.28	2.82	3.93		2.46**	.53	1.43	3.50
<i>R</i> ²				.42					.03					.03					.21	
<i>F</i>				66.95**					3.33*					3.10*					18.31**	
Bootstrap indirect effects	a ₁ b ₁	.01	.01	-.00	.02	a ₂ b ₂	-.00	.00	-.01	.00	a ₃ b ₃	-.00	.00	-.01	.00					

p*<.05. *p*<.01.

Change = Change consultations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B32.

Parallel multiple mediator model for change consultations and anxiety.

	Consequent															
	MI (Job stress)				M2 (Op. stress)				M3 (Org. stress)				Y (Anxiety)			
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI	
X (Change)	a ₁	.04	.03	-.01	.09	a ₂	.00	.02	-.04	.04	a ₃	-.03	.02	-.08	.01	c'
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.83		3.38**	.28	2.82	3.94	
R ²				.42					.03					.03		.25
F				66.96**					3.31*					3.00*		23.32**
Bootstrap indirect effects	a ₁ b ₁	.01	.01	-.00	.02	a ₂ b ₂	-.00	.00	-.01	.01	a ₃ b ₃	-.00	.00	-.01	.00	

p*<.05. *p*<.01.

Change = Change consultations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B33.

Parallel multiple mediator model for change consultations and job satisfaction.

	Consequent															
	MI (Job stress)				M2 (Op. stress)				M3 (Org. stress)				Y (Job satisfaction)			
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI	
X (Change)	a ₁	.04	.03	-.01	.09	a ₂	.00	.02	-.04	.04	a ₃	-.04	.02	-.08	.00	c'
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.74	2.85		3.39**	.28	2.83	3.95	
R ²				.42					.03					.03		.41
F				66.96**					3.24*					3.05*		48.38**
Bootstrap indirect effects	a ₁ b ₁	-.01	.01	-.02	.00	a ₂ b ₂	-.00	.00	-.01	.01	a ₃ b ₃	.01	.01	-.00	.02	

p*<.05. *p*<.01.

Change = Change consultations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B34.

Parallel multiple mediator model for change consultations and positive mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Change)	a ₁	.04	.03	-.01	.09	a ₂	.00	.02	-.04	.04	a ₃	-.03	.02	-.08	.01	<i>c'</i>	-.06*	.03	-.12	-.00
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.14*	.04	0.22	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.09	-.08	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.04	4.48	6.30
<i>R</i> ²			.42					.03					.03					.23		
<i>F</i>			67.45**					3.35*					3.00*					20.01**		
Bootstrap indirect effects	a ₁ b ₁	-.01	.00	-.02	.00	a ₂ b ₂	.00	.00	-.01	.01	a ₃ b ₃	.00	.00	-.00	.01					

p*<.05. *p*<.01.

Change = Change consultations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B35.

Parallel multiple mediator model for change consultations and negative mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Change)	a ₁	.05	.03	-.01	.10	a ₂	.00	.02	-.04	.05	a ₃	-.04	.02	-.08	.01	<i>c'</i>	.17**	.04	.10	.24
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.12*	.05	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.33	.02
M3 (Org.stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.43	3.51
<i>R</i> ²				.41					.03					.03				.20		
<i>F</i>				65.56**					3.26*					2.88*				17.46**		
Bootstrap indirect effects	a ₁ b ₁	.01	.00	-.00	.01	a ₂ b ₂	-.00	.00	-.01	.01	a ₃ b ₃	-.00	.00	-.01	.00					

p*<.05. *p*<.01.

Change = Change consultations. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B36.

Parallel multiple mediator model for overcommitment and depression.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Depression)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Overcomm.)	a ₁	.19**	.03	.14	.24	a ₂	.04*	.02	.00	.08	a ₃	.05*	.02	.01	.09	<i>c'</i>	.20**	.35	.14	.27
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.17*	.05	.07	.26
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.07	.09	-.24	.11
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.05	.09	-.12	.23
Constant		3.07**	.34	2.39	3.74		2.27**	.28	1.71	2.82		3.37**	.28	2.82	3.93		2.46**	.53	1.43	3.50
<i>R</i> ²				.42				.03					.03					.21		
<i>F</i>				66.95**				3.33*					3.10*					18.31**		
Bootstrap indirect effects	a ₁ b ₁	.03 ¹	.01	.01	.05	a ₂ b ₂	-.00	.00	-.01	.01	a ₃ b ₃	.00	.01	-.01	.01					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

Overcomm. = Overcommitment. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B37.

Parallel multiple mediator model for overcommitment and anxiety.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Anxiety)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Overcomm.)	a ₁	.19**	.03	.14	.24	a ₂	.04*	.02	.00	.08	a ₃	.05*	.02	.01	.09	c'	.25**	.04	.18	.32
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.23**	.05	.14	.33
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.15	.09	-.33	.03
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.11	.09	-.07	.29
Constant		3.07**	.34	2.40	3.75		2.27**	.28	1.71	2.84		3.38**	.28	2.82	3.94		2.14**	.53	1.10	3.18
R ²				.42				.03					.03					.25		
F				66.96**				3.31*					3.00*					23.32**		
Bootstrap indirect effects	a ₁ b ₁	.04 ¹	.01	.02	.07	a ₂ b ₂	-.01	.01	-.02	.00	a ₃ b ₃	.01	.01	-.00	.02					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

Overcomm. = Overcommitment. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B38.

Parallel multiple mediator model for overcommitment and job satisfaction.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Job satisfaction)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Overcomm.)	a ₁	.19**	.03	.14	.24	a ₂	.04*	.02	.00	.08	a ₃	.05*	.02	.01	.09	<i>c'</i>	.01	.04	-.05	.06
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.17**	.04	-.25	-.10
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.13	.07	-.01	.27
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.23*	.07	-.37	-.09
Constant		3.05**	.34	2.38	3.73		2.29**	.28	1.74	2.85		3.39**	.28	2.83	3.95		3.75**	.41	2.94	4.57
<i>R</i> ²				.42					.03					.03					.41	
<i>F</i>				66.96**					3.24*					3.05*					48.38**	
Bootstrap indirect effects	a ₁ b ₁	-.03 ¹	.01	-.05	-.02	a ₂ b ₂	.01	.00	-.00	.02	a ₃ b ₃	-.01 ¹	.01	-.02	-.00					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

Overcomm. = Overcommitment. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B39.

Parallel multiple mediator model for overcommitment and positive mood.

Consequent																				
Antecedent	MI (Job stress)					M2 (Op. stress)					M3 (Org. stress)					Y (Positive mood)				
		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Overcomm.)	a ₁	.19**	.03	.14	.24	a ₂	.04*	.02	.00	.08	a ₃	.05*	.02	.01	.09	<i>c'</i>	-.14**	.03	-.20	-.08
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	-.14**	.04	-.22	-.06
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	.08	.08	-.08	.24
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	-.10	.08	-.26	.05
Constant		3.08**	.34	2.41	3.75		2.27**	.28	1.71	2.82		3.38**	.28	2.82	3.94		5.39**	.04	4.48	6.30
<i>R</i> ²			.42					.03					.03					.23		
<i>F</i>			67.45**					3.35*					3.00*					20.01**		
Bootstrap indirect effects	a ₁ b ₁	-.03 ¹	.01	-.05	-.01	a ₂ b ₂	.00	.01	-.00	.01	a ₃ b ₃	-.00	.00	-.02	.00					

p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

Overcomm. = Overcommitment. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

Table B40.

Parallel multiple mediator model for overcommitment and negative mood.

Consequent																				
MI (Job stress)						M2 (Op. stress)					M3 (Org. stress)					Y (Negative mood)				
Antecedent		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI		<i>B</i>	<i>SE B</i>	LLCI	ULCI
X (Overcomm.)	a ₁	.19**	.03	.13	.23	a ₂	.04*	.02	.00	.08	a ₃	.05*	.02	.01	.09	c'	.17**	.04	.10	.24
M1 (Job stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₁	.12**	.05	.02	.22
M2 (Op. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₂	-.16	.09	-.33	.02
M3 (Org. stress)		-	-	-	-		-	-	-	-		-	-	-	-	b ₃	.10	.09	-.08	.28
Constant		3.11**	.34	2.44	3.79		2.28**	.28	1.73	2.84		3.39**	.28	2.83	3.95		2.47**	.53	1.43	3.51
R ²				.41				.03						.03				.20		
F				65.56**				3.26*						2.88*				17.46**		
Bootstrap indirect effects	a ₁ b ₁	.02 ¹	.01	.00	.04	a ₂ b ₂	-.01	.01	-.02	.00	a ₃ b ₃	.00	.01	-.00	.02					

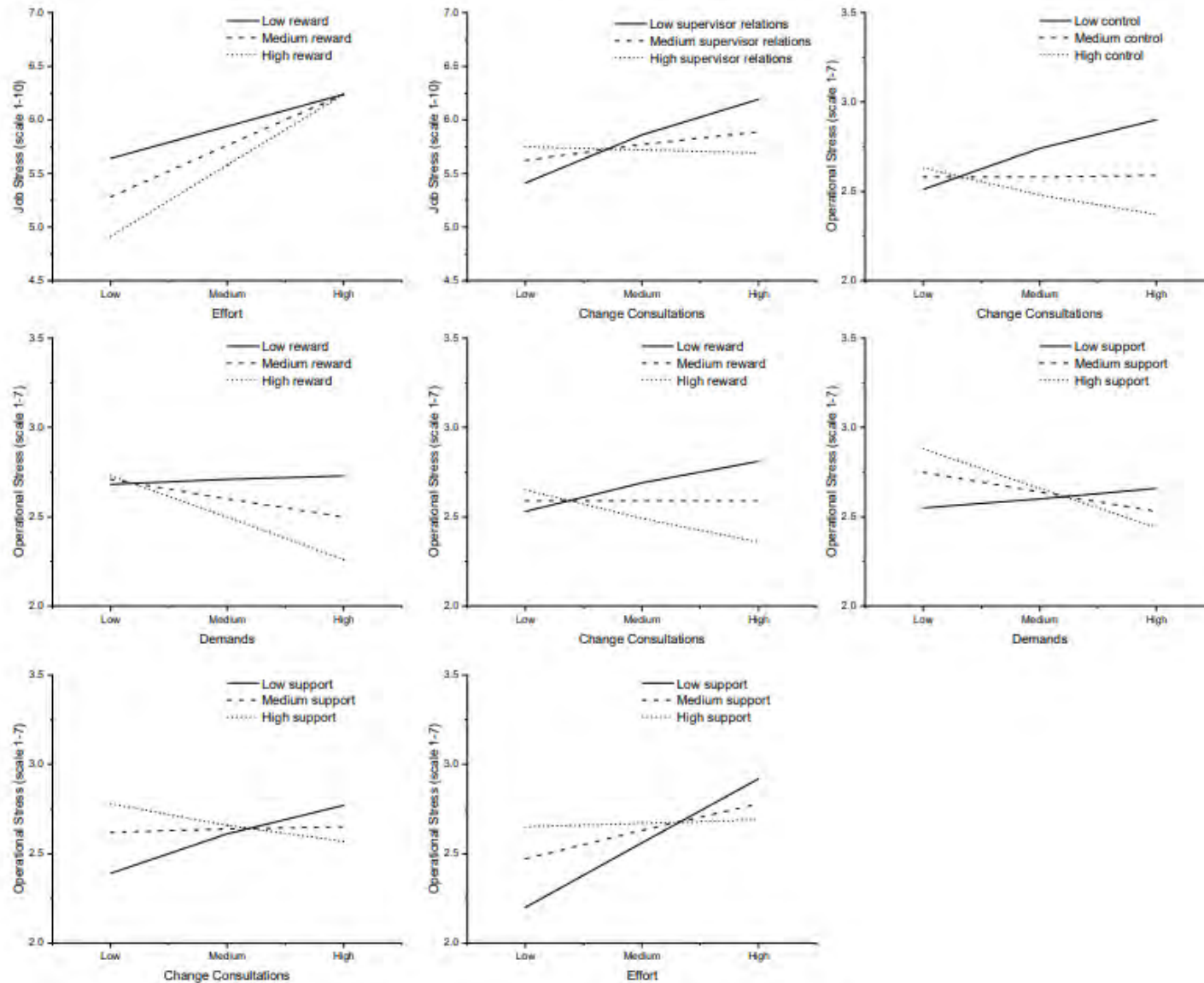
p*<.05. *p*<.01.

¹Indirect effect CI did not include zero

Overcomm. = Overcommitment. CI = Confidence interval. Op.stress = Operational stress. Org.stress = Organizational stress.

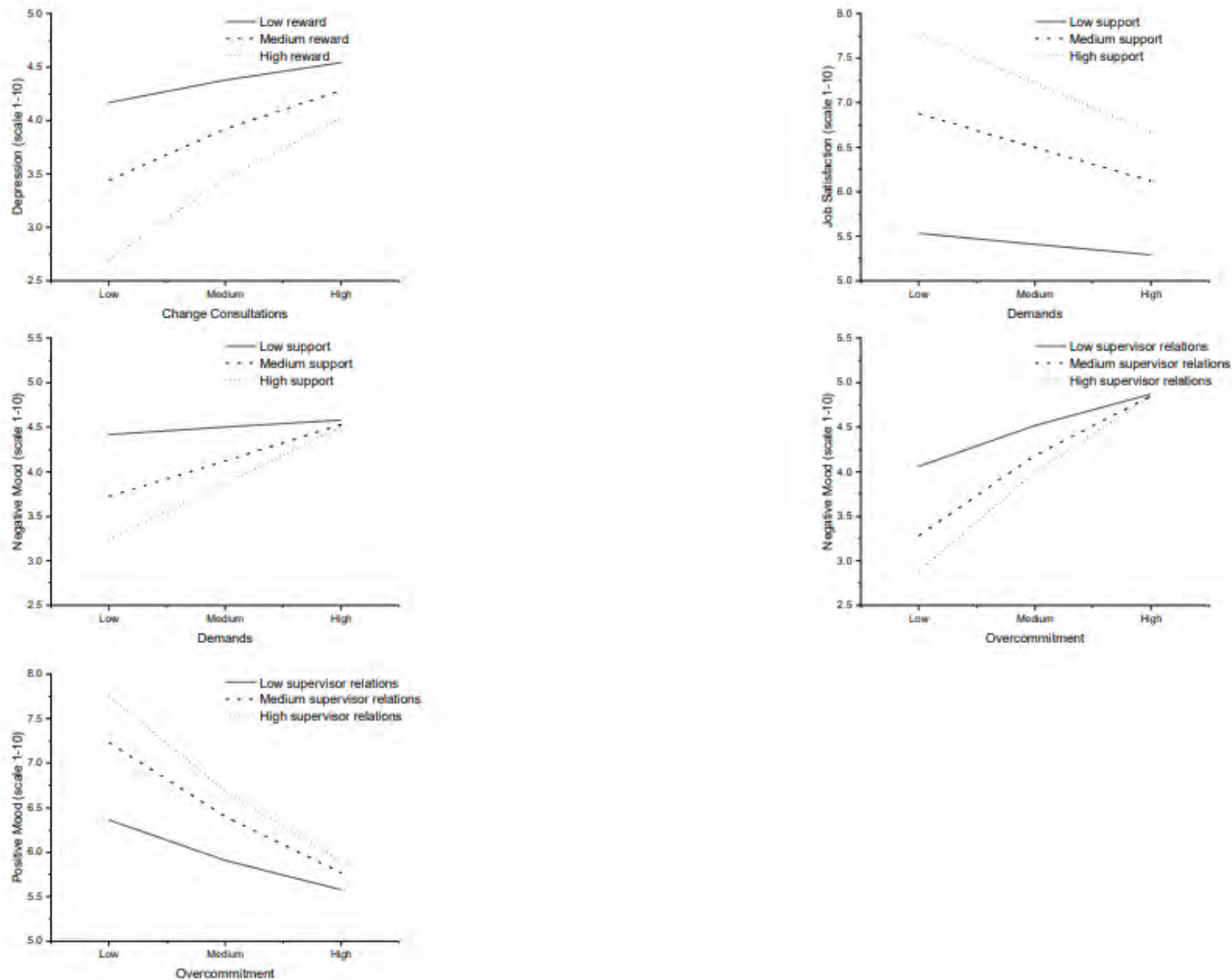
Appendix 3. Study 1 research article supplemental file 3: Significant moderations

Relationship 5: Work resources will significantly moderate work demands and perceived job stress



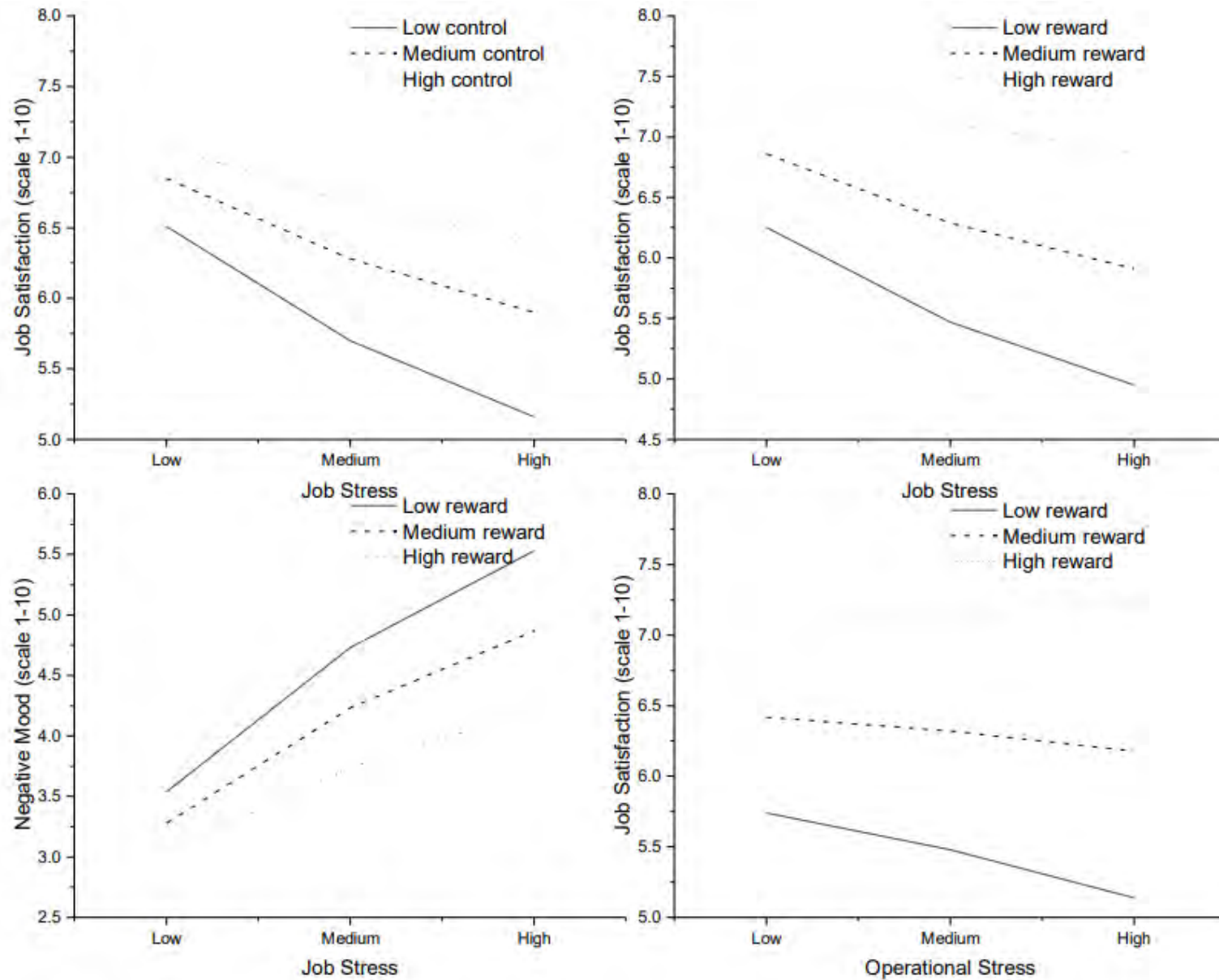
Figures C1 - C8. Work resources as moderators of the relationships between work demands and perceived job stress

Relationship 6: Work resources will significantly moderate work demands and psychological wellbeing outcomes



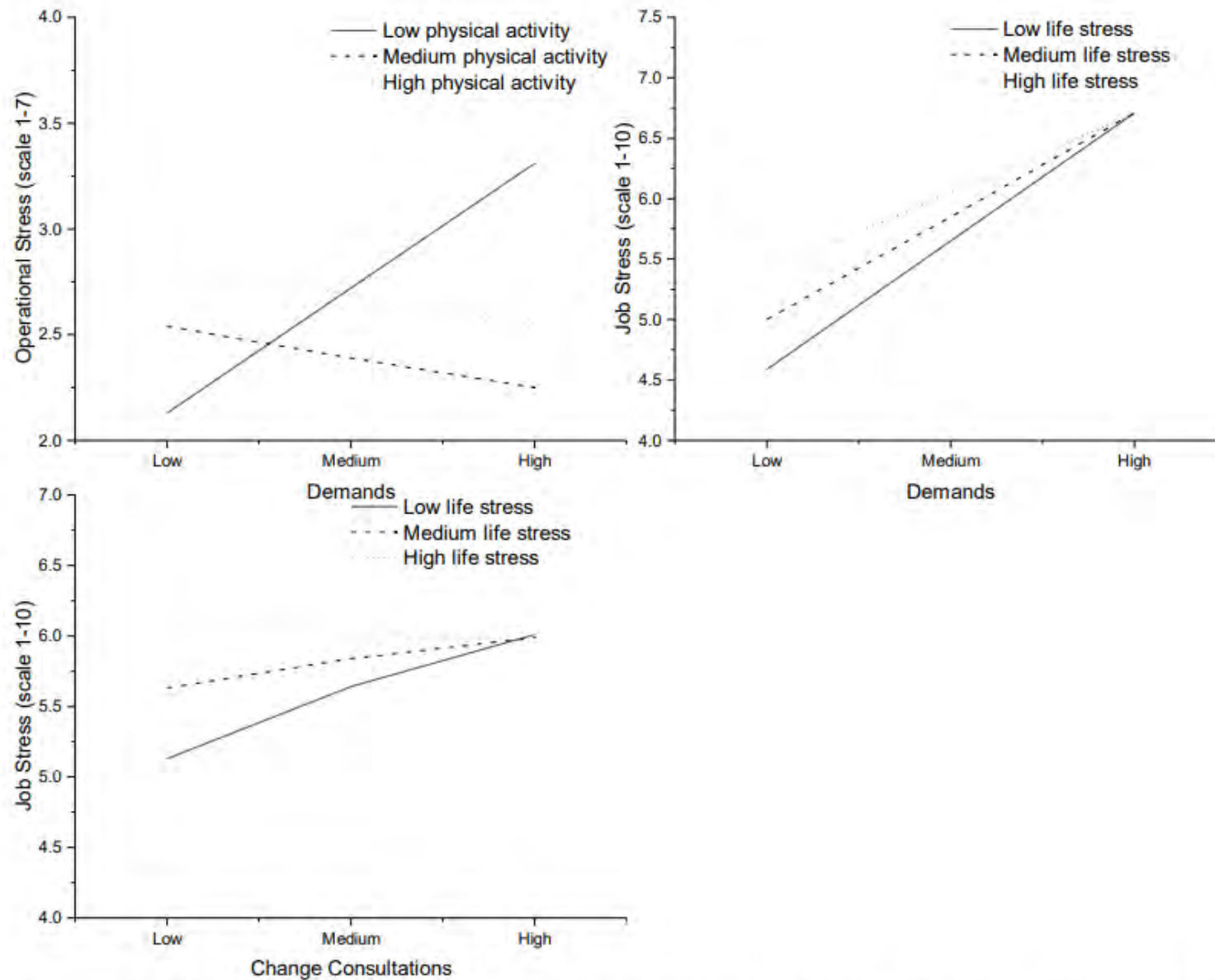
Figures C9 - C13. Work resources as moderators of the relationships between work demands and psychological wellbeing outcomes

Relationship 7: Work resources will significantly moderate perceived job stress and psychological wellbeing outcomes



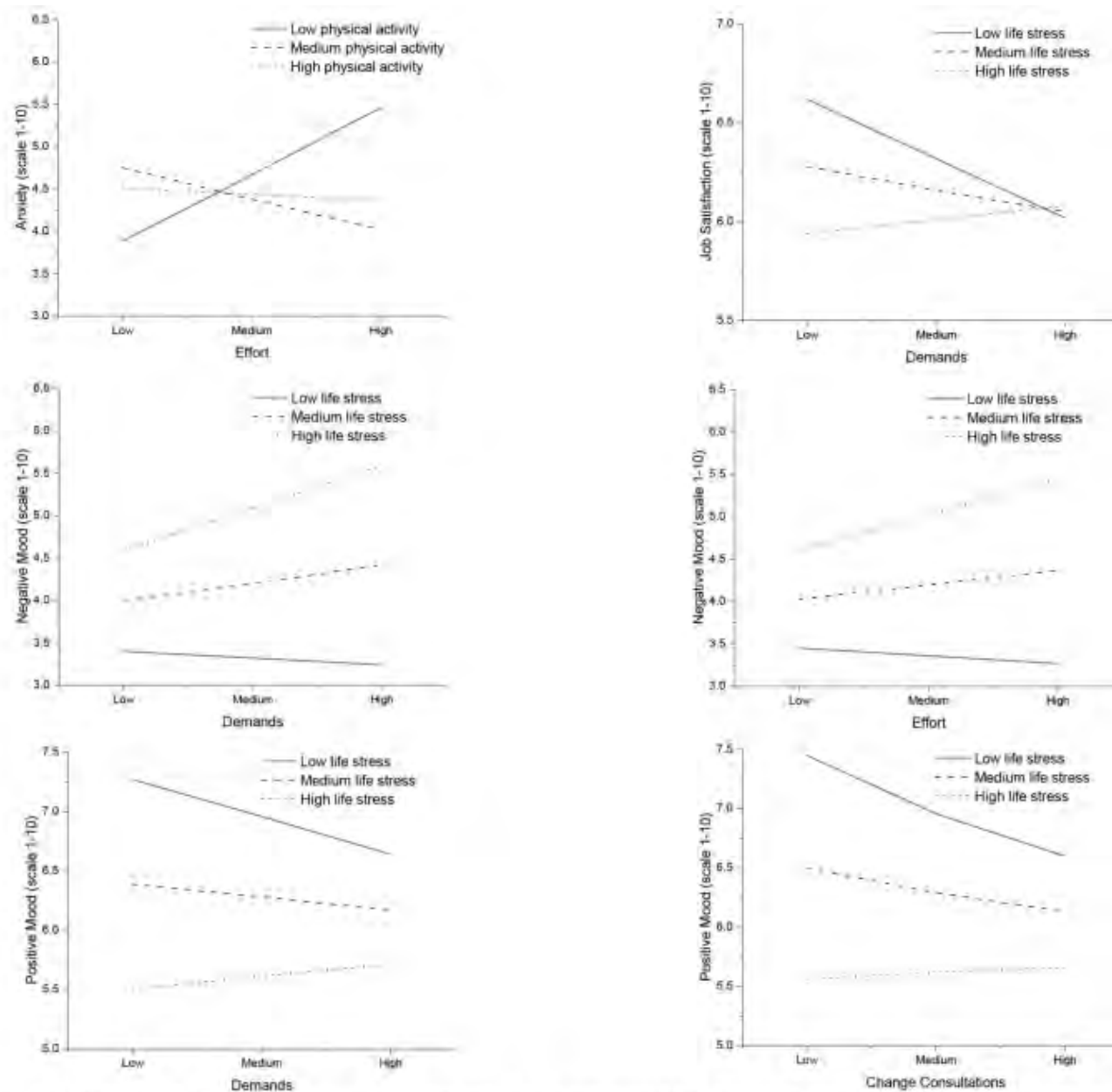
Figures C14 - C17. Work resources as moderators of the relationships between perceived job stress and psychological wellbeing outcomes

Relationship 10: Individual characteristics will significantly moderate work demands and psychological wellbeing outcomes

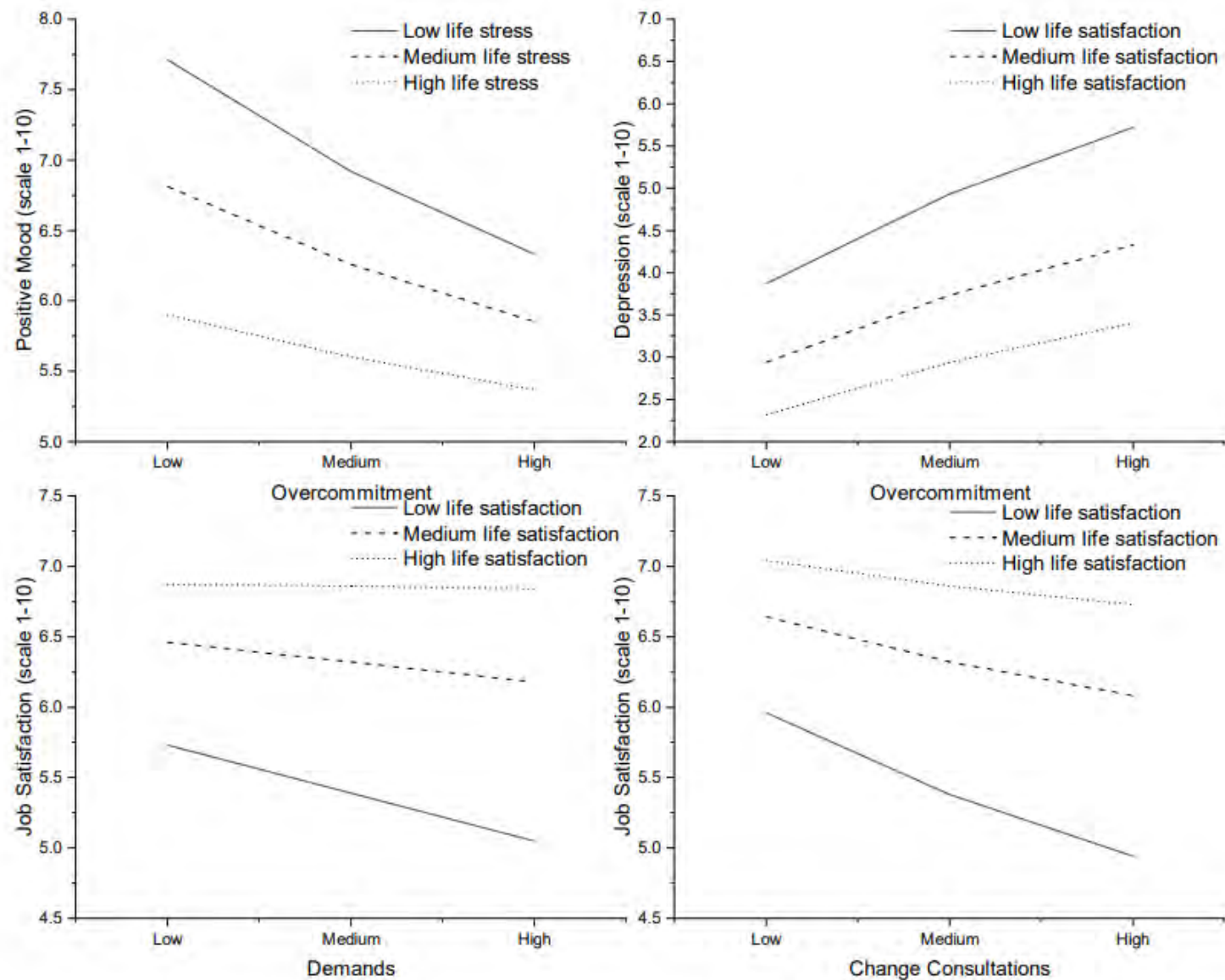


Figures C18 - C20. Individual characteristics as moderators of the relationships between work demands and perceived job stress

Relationship 11: Individual characteristics will significantly moderate work demands and psychological wellbeing outcomes

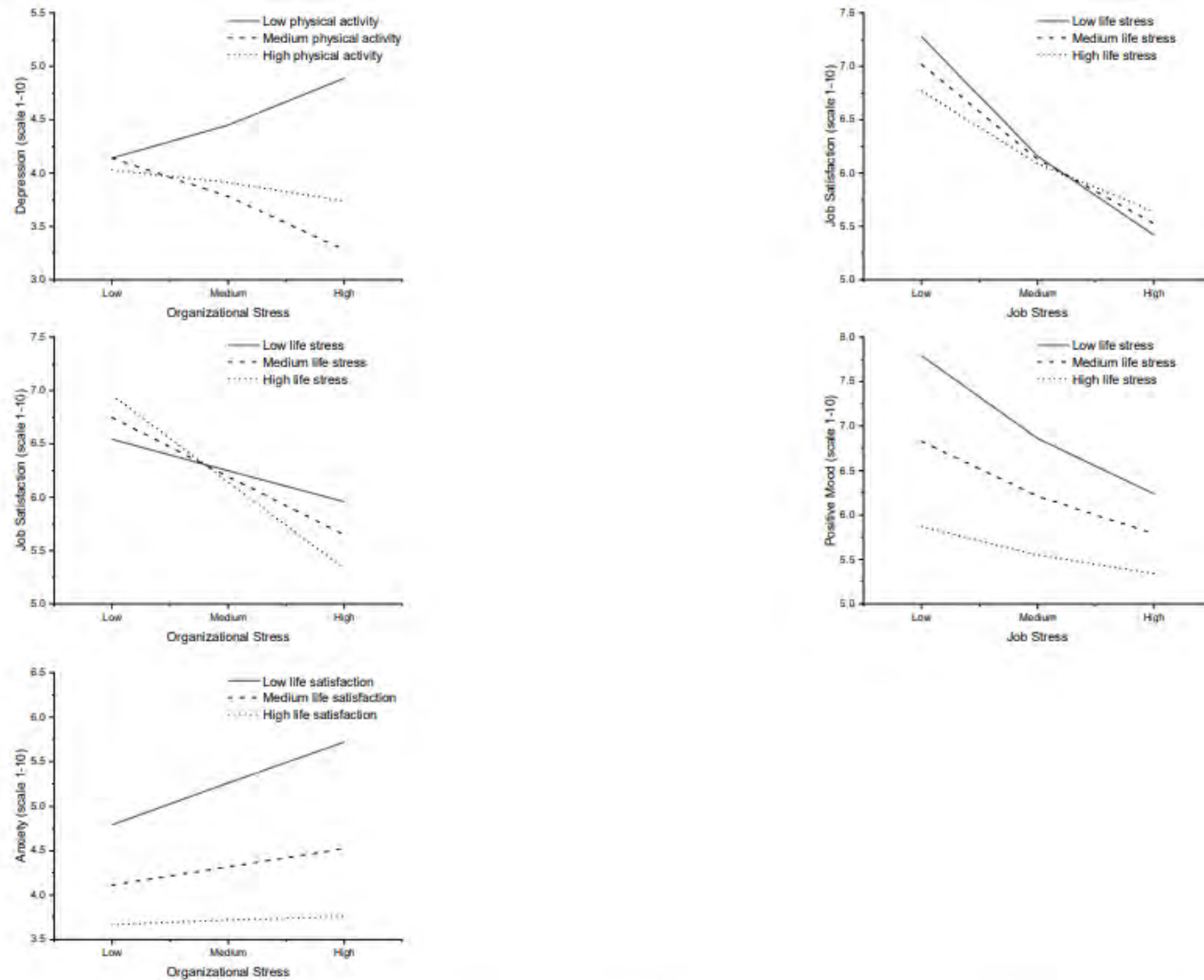


Figures C21 - C26. Individual characteristics as moderators of the relationships between work demands and psychological wellbeing outcomes



Figures C27 - C30. Individual characteristics as moderators of the relationships between work demands and psychological wellbeing outcomes

Relationship 12: Individual characteristics will significantly moderate perceived job stress and psychological wellbeing outcomes



Figures C31 - C35. Individual characteristics as moderators of the relationships between perceived job stress and psychological wellbeing outcomes

Appendix 4. Study 2a focus group guide with personas

1. Physical activity and work
 - What is your understanding of the term ‘physical activity’?
 - What is your opinion on physical activity?
 - What are the benefits/consequences/outcomes to you or colleagues?
 - Why does physical activity have that effect?
 - How can physical activity be of value in the workplace?
 - Tell me about a time at work when people came together
 - To support someone, or to change something for example?
 - Is there anything we can learn here relevant to supporting people being active?
2. Role of physical activity in wellbeing
 - Can you think of any physical activity initiatives that might positively impact your wellbeing in the workplace? *Be creative*
 - How will this impact wellbeing?
 - How might we make it easier for people to be physically active?
 - Opportunities about the workplace, resources, environment
3. Personas
 - What might work to support physical activity and wellbeing for *personas*?
 - What positive difference would it make?
 - What physical / mental / social effects?
4. Closing.
 - Has anyone got anything to add?
 - Is there anything you can think of we’ve not discussed and might be useful in relation to the goal of understanding physical activity and wellbeing at work?

Personas

Callum

"keen to make a good impression"



Age: 25 and under

Marital status: Single, living at home

Role: New officer on probation

What is most important to Callum?

"Having a good career"

Needs and Motivations

Callum grew up with just his Dad at home, who he wanted to make proud by joining the police.

He puts a lot of effort in at work to make a good impression.

Negative previous experiences have put Callum off the idea of sport. He is convinced he is "not built for it" and needs some help on different ways to be physically active.

Things to bear in mind:

Low social confidence – intimidated by group settings where he might be embarrassed or people might judge him.



Low income



Sometimes finds it hard to switch off from work

GOALS

Callum is keen to 'fit in' with the force and wishes he had the confidence to socialise with colleagues more.

He would like to improve his physical health because he feels that it would make him a better police officer.

Ameera

"resistant and needs convincing"



Age: 26-40

Marital status: Married with young children

Role: Administrative assistant

What is most important to Ameera?

"Taking care of my family"

Needs and Motivations

Deteriorating health as a result of increasing caring responsibilities and family pressures.

Prioritises work and family and doesn't consider her own health as important. Needs help understanding how physical activity would benefit her.

Social, friendly person who does enjoy meeting people and having a good chat.

Things to bear in mind:

Lack of time is a big factor – Ameera has three young children plus she is taking care of her elderly parents. From her point of view, the last thing she has time for is exercise!



Prefers women-only facilities or groups



Lack of free time

GOALS

In an ideal world, Ameera would love to have more "me-time", although currently she doesn't see how that is possible.

She would like to lose weight and have more energy – at the moment she doesn't sleep well and always feels tired. She would also like to get rid of the niggling aches and pains she keeps feeling.

Lee

"frustrated with the organisation"



Age: 26-40

Marital status: Married with a new baby

Role: Sergeant aiming for promotion

What is most important to Lee?

"Being successful and a role model to the family"

Needs and Motivations

Self-motivated and a "do-it-yourself" sort of person. Currently fed up from feeling like he always has to prove himself at work and is starting to disengage.

Plays football and is a member of his local running club – preferring to exercise away from work as it fits his lifestyle.

Things to bear in mind:

With a new family to take care of, Lee is increasingly aware of the need to provide financially.

Works hard and juggles childcare with his partner. Physical activity is his chance to escape from all of these pressures.



Drives own car, can travel if necessary



Up to date with latest gadgets and technology

GOALS

Although Lee is happy with life and an active person outside of work, he wishes life was going as well at work too. He just sees organisational loopholes to jump through, and would love to be recognised for his efforts.

Lee wants to feel valued and proud, like he did when he joined the force.

Katie

"high support needs"



Age: 41-55

Marital status: Living with disabled partner and teenage children

Role: Constable

What is most important to Katie?

"Staying healthy so that I keep my job and don't need to have time off work"

Needs and Motivations

Katie has a lot of life stress and feels like she is in a rut.

She knows that her health is declining due to sedentary lifestyle but does not see what she can do about it. Needs support to act on advice and reduce her amount of sitting time.

Things to bear in mind:

Katie is scared to ask for help, there have been organisational changes at work and she is concerned about losing her job.

She has her own long-term health problems - physical activity plans would need to take these into account.



Main source of income for the family



Big user of social media

GOALS

Katie is worried lately that she is 'falling apart' and thinks that she needs to take charge of her own health so that she can support her family. She wants to be able to do more and get back to moving comfortably.

Mentally, her multiple caring roles are taking a toll as she is less able to get out and about and feel better about herself.

Nigel

"can't teach an old dog new tricks"



Age: 55+

Marital status: Married

Occupation: Staff – middle management

What is most important to Nigel?

"Re-connecting with friends and spending quality time with my partner"

Needs and Motivations

Nigel is at the end of a long career. He has never been sporty as work takes up all of his time.

Frustrated about the number of health conditions he has to deal with and the number of appointments and different services he has to attend.

Needs reassurance and advice on how physical activity can be done safely within the limits of his condition.

Things to bear in mind:

A lot of movement or overdoing it can sometimes cause pain.

Low confidence in his physical health and worried about future deterioration, but daunted at trying something new when he now wants to slow down.



Comfortable financially



Enjoys good conversation

GOALS

Nigel's GP is always nagging him to lose weight - he has been told that he may have to go onto injectable medication and he definitely wants to avoid that. He would also like to get his blood pressure down.

Nigel does not like the fact that he now has to consider his health, but wants to age well so he can enjoy retirement.

Appendix 5. Study 2a focus group participant information sheet

PARTICIPANT INFORMATION SHEET – FOCUS GROUPS

Improving wellbeing with physical activity: a qualitative study with two British police forces

You are being invited to take part in this study. The study is *completely voluntary*, you will not be disadvantaged in any way should you decide not to take part. Before you decide whether you want to take part, please read the following information explaining why the research is being done, and what your participation will involve. Please feel free to ask any questions or discuss the research with us, if you wish.

Background and aims of the study:

The research is part of an ongoing doctoral programme which aims to explore wellbeing and physical activity in two British police forces. The research is funded by Police Force A and Police Force B, in partnership with academics at Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University.

A preliminary study conducted by the same research team in 2016 – 2017 found that police force workers reported low wellbeing. The research suggested that high physical activity levels were a contributing factor to a range of positive health outcomes, including better wellbeing. The purpose of this next study is to develop a clear understanding of physical activity and wellbeing within the police force, and how it can be improved. At the end of the study we aim to have direction on what physical activity strategies you perceive to be feasible and acceptable, so that they can be developed into a subsequent intervention that meets your wellbeing needs.

What you will be asked to do:

The study involves participation in a focus group interview of 4 – 8 participants. You will be asked to sign a consent form and complete a short demographic questionnaire at the start of the focus group. This is only to ensure that our participants are representative of the forces in terms of gender, role, rank, physical activity and wellbeing. Single item questions only will be asked (e.g. “overall, how physically active are you?”) and will not be stored or used for any other purposes.

The focus group will then consist of a series of questions around the themes of physical activity and wellbeing. There are no right or wrong answers in the focus groups – we are simply interested in hearing your opinions. The focus groups are expected to last between one and two hours, and will be arranged at a time and location that is convenient for all involved.

What will happen to the data that is collected?

Each focus group will be audio-recorded and transcribed by a member of the research team. In order to ensure anonymity, pseudonyms will be given to participants at the start of the focus group so that individuals cannot be identified from either the recordings or transcriptions. All data and analysis will be stored on a password-protected, encrypted USB memory stick and will be managed in line with the General Data Protection Regulations 2018. Only research team members from Cardiff Metropolitan University will have access to the raw data, which will be stored for the duration of the study (8 months). After this, only anonymised transcripts will be utilised.

What are the risks of taking part in a focus group?

- As you are taking part in a focus group interview, there is a possibility that another member of the group might recognise you.

All participants in each focus group are asked to respect the confidentiality of their fellow participants as a condition of consent. We will not tell anyone else that you have taken part in the research, and will protect your anonymity using pseudonyms during the focus group itself and in any subsequent reports or publications. We will also ensure that the content of any quotes used does not reveal who you are, so no one will know what you have said. If you would like to check the level of personal anonymity provided, then you will be given an opportunity to do so.

- You may not agree with the views of somebody else in the focus group.

This is ok! The researcher leading the focus group will guide the discussion to include the perceptions of everyone in a way that is comfortable and non-judgemental. Disagreement is even encouraged, as we want to hear views from everyone.

- Some of the discussion around wellbeing might relate to experiences of stress or adverse health.

The focus group questions are aimed to develop a positive physical activity intervention that benefits wellbeing. In the unlikely event that you feel distressed by any answer that unfolds in the focus group, you are reminded that you do not have to share any experience which you do not want to, and you are free to withdraw at any point without reason.

If there are issues raised which you believe are having a negative effect on your wellbeing, or if you have any concerns about your health and wellbeing, you are encouraged to discuss these with your line manager who will be able to deal with your queries, or signpost you to other areas for assistance. Alternatively, for personal matters of a confidential nature, you can email the *police force contact details*.

If there are any issues raised which we believe to indicate potential malpractice then under a duty of care, we reserve the right to share information to prevent harm. We will inform you if we deem this necessary.

What are the benefits of being involved in the study?

Taking part will give you the opportunity to tell us about your physical activity, wellbeing and experiences within the police force. We will report our findings to Force A and Force B, which will directly inform the development of a physical activity intervention that will benefit the police in future. By taking part, you will be contributing to our understanding of police wellbeing, and having a say in the strategic considerations of the forces.

What do I do now?

If you would like to take part, or if you would like further information, please contact the PhD researcher, Helen Oliver (email: holiver@cardiffmet.ac.uk) or the Director of Studies, Dr Owen Thomas (email: othomas@cardiffmet.ac.uk).

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, and wish to speak to an independent contact, please email our Research and Enterprise Officer, Susie Powell (spowell@cardiffmet.ac.uk).

Appendix 6. Study 2a focus group participant consent form

PARTICIPANT CONSENT FORM – FOCUS GROUPS

Improving wellbeing with physical activity: a qualitative study with two British police forces

Please tick the boxes

☐ The purpose and details of this study have been explained to me in the Participant Information Sheet, and I have had an opportunity to ask any questions.

☐ I understand that my participation is voluntary and I have the right to withdraw from this study at any point, without reason or prejudice.

☐ I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be handled in accordance with General Data Protection Regulations 2018 and may be reported in future publications in an anonymised fashion.

☐ I agree to take part in the above study and procedures detailed in the Participant Information Sheet.

☐ I agree to respect the confidentiality of all other participants and not to repeat any information shared during the focus group.

Signature of participant: _____

Name of participant: _____

Appendix 7. Study 2b interview participant information sheet

PARTICIPANT INFORMATION SHEET - INTERVIEWS

Improving wellbeing with physical activity: a qualitative study with two British police forces

You are being invited to take part in this study. The study is *completely voluntary*, you will not be disadvantaged in any way should you decide not to take part. Before you decide whether you want to take part, please read the following information explaining why the research is being done, and what your participation will involve. Please feel free to ask any questions or discuss the research with us, if you wish.

Background and aims of the study:

The research is part of an ongoing doctoral programme which aims to explore wellbeing and physical activity in two British police forces. The research is funded by Police Force A and Police Force B, in partnership with academics at Cardiff School of Sport and Health Sciences, Cardiff Metropolitan University.

A preliminary study conducted by the same research team in 2016 – 2017 found that police force workers reported low wellbeing. The research suggested that high physical activity levels were a contributing factor to a range of positive health outcomes, including better wellbeing. The purpose of this next study is to develop a clear understanding of physical activity and wellbeing within the police force, and how it can be improved. At the end of the study we aim to have direction on what physical activity strategies you perceive to be feasible and acceptable, so that they can be developed into a subsequent intervention that meets your wellbeing needs.

What you will be asked to do:

The study involves participation in an individual interview. You will be asked to sign a consent form and complete a short demographic questionnaire at the start. This is only to ensure that our participants are representative of the forces in terms of gender, role, rank, physical activity and wellbeing. Single item questions only will be asked (e.g. “overall, how physically active are you?”) and will not be stored or used for any other purposes. The interview will then consist of a series of questions around the themes of physical activity and wellbeing. There are no right or wrong answers – we are simply interested in hearing your opinions. The interview is expected to take less than an hour, and will be arranged at a time and location of your choice.

What will happen to the data that is collected?

Interviews will be audio-recorded and transcribed by a member of the research team. In order to ensure anonymity, you will be given a pseudonym at the start of the interview so that you cannot be identified from either the recordings or transcriptions. All data and analysis will be stored on a password-protected, encrypted USB memory stick and will be managed in line with the General Data Protection Regulations 2018. Only research team members from Cardiff Metropolitan University will have access to the raw data, which will be stored for the duration of the study (8 months). After this, only anonymised transcripts will be utilised.

What are the risks of taking part in an interview?

- You may be concerned about confidentiality.

We will not tell anyone else that you have taken part in the research, and will protect your anonymity using pseudonyms during the interview itself and in any subsequent reports or publications. We will also ensure that the content of any quotes used does not reveal who you are, so no one will know what you have said. If you would like to check the level of personal anonymity provided, then you will be given an opportunity to do so.

- Some of the discussion around wellbeing might relate to experiences of stress or adverse health.

The interview questions are aimed to develop a positive physical activity intervention that benefits wellbeing. In the unlikely event that you feel distressed, you are reminded that you do not have to share any experience which you do not want to, and you are free to withdraw at any point without reason.

If there are issues raised which you believe are having a negative effect on your wellbeing, or if you have any concerns about your health and wellbeing, you are encouraged to discuss these with your line manager who will be able to deal with your queries, or signpost you to other areas for assistance. Alternatively, for personal matters of a confidential nature, you can email the *police force contact details*.

If there are any issues raised which we believe to indicate potential malpractice then under a duty of care, we reserve the right to share information to prevent harm. We will inform you if we deem this necessary.

What are the benefits of being involved in the study?

Taking part will give you the opportunity to tell us about your physical activity, wellbeing and experiences within the police force. We will report our findings to Force A and Force B which will directly inform the development of a physical activity intervention that will benefit the police in future. By taking part, you will be contributing to our understanding of police wellbeing, and having a say in the strategic considerations of the forces.

What do I do now?

If you would like to take part, or if you would like further information, please contact the PhD researcher, Helen Oliver (email: holiver@cardiffmet.ac.uk) or the Director of Studies, Dr Owen Thomas (email: othomas@cardiffmet.ac.uk).

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, and wish to speak to an independent contact, please email our Research and Enterprise Officer, Susie Powell (spowell@cardiffmet.ac.uk).

Appendix 8. Study 2b semi-structured interview schedule

1. Work

- What role are you working in?
- Tell me what a normal day is like
 - Is there structure to your working day?
 - What sort of environment do you work in? (e.g., office)
 - What is your team like?

2. Physical activity

- What is your understanding of physical activity?
 - Have you got examples?
- What are the effects of physical activity or moving more?
 - Physical health, mental, social?
- Are there any effects for the workplace?

3. COM-B

- Capability – Are you physically able to be active to work?
- Capability – Do you know how you would be more active, if so how?
- Opportunity – Could there be something that was changed about your working environment to help you be more active?
 - Could something prompt the behaviour?
- Opportunity – What do colleagues do in relation to physical activity?
 - What do they say?
 - Social norms in your team?
- Motivation – How do you think your working habits and routines could change to include physical activity?
 - What do you do on lunch?
- Motivation – Would it be possible for you to develop plans or set goals to be more active?
- What else would enable you to do more physical activity at work? What do you need?

4. Closing

- Is there anything you can think of not discussed and might be useful in relation to the goal of trying to get more people physically active in work?

Appendix 9. Study 2b interview participant consent form

PARTICIPANT CONSENT FORM - INTERVIEWS

Improving wellbeing with physical activity: a qualitative study with two British police forces

Please tick the boxes

☐ The purpose and details of this study have been explained to me in the Participant Information Sheet, and I have had an opportunity to ask any questions.

☐ I understand that my participation is voluntary and I have the right to withdraw from this study at any point, without reason or prejudice.

☐ I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be handled in accordance with General Data Protection Regulations 2018 and may be reported in future publications in an anonymised fashion.

☐ I agree to take part in the above study and procedures detailed in the Participant Information Sheet.

Signature of participant: _____

Name of participant: _____

Appendix 10. Study 2b interview participant pre-screening questionnaire

PARTICIPANT QUESTIONNAIRE

Improving wellbeing with physical activity: a qualitative study with two British police forces

This questionnaire is to ensure that our participants are representative of the forces. Your responses will not be stored or used for any other purposes. Please tick/circle the appropriate box per question.

What is your role?

☐ Staff ☐ Officer ☐ PCSO ☐ Other (please specify)

What is your gender?

☐ Male ☐ Female ☐ Prefer not to say ☐ Other (please specify)

What is your rank?

☐ Practitioner ☐ Supervisor ☐ Middle Manager ☐ Senior Manager/Executive

Please state which division you are from: _____

How long have you been in service for the police force?

☐ Less than 2 years ☐ 2-5 years ☐ 6-10 years ☐ 11-15 years
☐ 16-20 years ☐ 21-25 years ☐ 25+ years

Which age group do you belong to?

☐ 25 and under ☐ 26-40 ☐ 41-55 ☐ 55+

Overall, what best describes your physical activity level?

☐ Vigorously active for at least 30 minutes, 3 times a week
☐ Moderately active for at least 3 times per week
☐ Seldom active, preferring sedentary activities

Appendix 11. Study 3 Exertime intervention supervisor training session PowerPoint slides

Physical activity, health and wellbeing project:
It's control room 'Exertime'!


Helen Oliver


 Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd



Study 1

- Medium – high physical activity levels were beneficial for health and wellbeing;
- Protected against negative effects of stress;
- Significant effects from meeting WHO guidelines.



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Study 2

- Opportunities for physical activity are provided (e.g., gyms, clubs..);
- Social support and psychological capability are needed to make use of them;
- Control room staff / officers feel unable to access existing physical activity initiatives.

Control room observations

- Busy shifts – goes quickly... but there are quiet periods;
- People do stand, notice pain / stiffness;
- Know should be physically active but less aware of sitting risks;
- Social norms.



Intervention

Physical activity

- Up to 35% lower risk of coronary heart disease and stroke
- Up to 50% lower risk of type 2 diabetes
- Up to 50% lower risk of colon cancer
- Up to 20% lower risk of breast cancer
- 30% lower risk of early death
- Up to 30% lower risk of depression
- Up to 30% lower risk of dementia
- Boosts self-esteem, mood, energy, and sleep quality.



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Sedentary behaviour

- **Higher risk of..**
 - Heart disease, stroke, type 2 diabetes, cancer, deep vein thrombosis...
- **Slows the metabolism...**
 - Regulation of blood sugar, blood pressure, ability to break down fat...
- **Exercise can't offset prolonged sitting**
- **Recommend breaks / short bouts of activity**

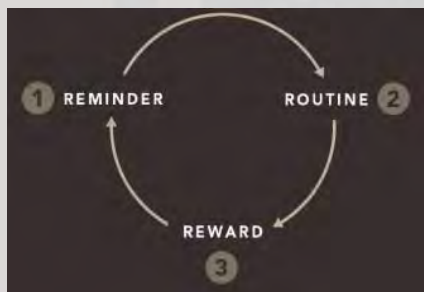


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Sitting is a habit

- **Automatic behaviour** – save time or mental energy thinking about it!



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Exertime

The Prompt

The Selection

The Feedback

- **Users choose:**
 - When to delay prompt, when to engage
 - Which activity
 - For how long



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Tasmania Exertime

- Reduced blood pressure
- Increased calorie expenditure
- 12 week intervention
(first few weeks need effort)
- Additional exercises



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**How can you support staff
to use 'Exertime'?**



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Appendix 12. Study 3 Exertime education session PowerPoint slides


Physical activity, health and wellbeing project:
It's control room 'Exertime'!


Helen Oliver

 Cardiff Metropolitan University | Prifysgol Metropolitan Caerdydd 

What is health and wellbeing?

- “Health is a state of complete **physical, mental and social wellbeing**, and not merely the absence of disease”...
- ...“The ability to adapt and **self-manage**”



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My research

- Medium physical activity levels were beneficial for health and mental wellbeing;
- Protected against negative effects of stress;
- Significant effects from meeting WHO guidelines....not running marathons!



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Physical activity benefits

- Up to 35% lower risk of coronary heart disease and stroke
- Up to 50% lower risk of type 2 diabetes
- Up to 50% lower risk of colon cancer
- Up to 20% lower risk of breast cancer
- 30% lower risk of early death
- Up to 30% lower risk of depression
- Up to 30% lower risk of dementia
- Boosts self-esteem, mood, energy, and sleep quality.



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Sedentary behaviour

- **Higher risk of..**
 - Heart disease, stroke, type 2 diabetes, cancer, deep vein thrombosis...
- **Reduced metabolism...**
 - Regulation of blood sugar, blood pressure, ability to break down fat...
- **Exercise can't offset prolonged sitting**
- **Recommend breaks / short bouts of activity**

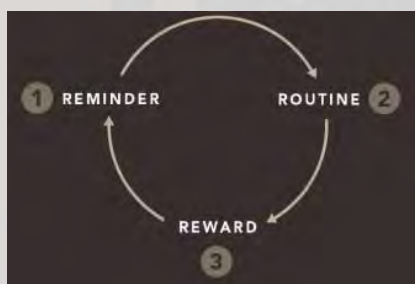


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Sitting is a habit

- **Automatic behaviour** – save time or mental energy thinking about it!



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Exertime



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LEARNING | INNOVATION | RESEARCH

Exertime

The Prompt

The Selection

The Feedback

- **You choose:**
 - When to delay prompt, when to engage
 - Which activity
 - For how long



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Opportunity for control room

- Knowledge – what you can do at your desk and what exercises are beneficial;
- Prioritising your health – reminders to move, short breaks help your mental wellbeing;
- Support – colleagues and supervisors helping you to participate (social wellbeing).



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Tasmania Exertime

- Reduced blood pressure
- Increased calorie expenditure
- 12 week intervention
(first few weeks need effort)
- Additional exercises



Demonstration

- I will collect baseline data;
- The first time you use Exertime you register a few details then it runs automatically;
- If you have a natural break (i.e., go for lunch or go to the loo) you can log it...

For example....



Number	Name	Targets
1	Arm pumps with foot tap	Cardio, arms
2	Bicep curls	Standing, arms
3	Double knee lift	Legs
4	Front raise to tricep*	Standing, arms
5 and 6	Hip flexions (with knee extension)	Legs
7	Standing*	Standing
8	Seated crunch	Cardio
9	Knee hug*	Standing, legs
10	Seated march	Cardio
11	Single leg lift	Legs
12	Stair climb	Standing, cardio
13	Standing lunge	Standing, legs
14	Stork stand	Standing
15	Take a hike	Standing, cardio
16	Toe raises	Standing, legs
17	Neck glides*	Standing, stretch
18	Shoulder shrugs / circles*	Standing, stretch
19	Hand press*	Standing, stretch
20	Side leg raise*	Standing, legs
21	Chair rotations*	Stretch
22	Hopscotch	Cardio

Number	Name	Targets
1	Arm pumps with foot tap	Cardio, arms
2	Bicep curls	Standing, arms
3	Double knee lift	Legs
4	Front raise to tricep*	Standing, arms
5 and 6	Hip flexions (with knee extension)	Legs
7	Standing*	Standing
8	Seated crunch	Cardio
9	Knee hug*	Standing, legs
10	Seated march	Cardio
11	Single leg lift	Legs
12	Stair climb	Standing, cardio
13	Standing lunge	Standing, legs
14	Stork stand	Standing
15	Take a hike	Standing, cardio
16	Toe raises	Standing, legs
17	Neck glides*	Standing, stretch
18	Shoulder shrugs / circles*	Standing, stretch
19	Hand press*	Standing, stretch
20	Side leg raise*	Standing, legs
21	Chair rotations*	Stretch
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7	Standing*	Standing
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9	Knee hug*	Standing, legs
10	Seated march	Cardio
11	Single leg lift	Legs
12	Stair climb	Standing, cardio
13	Standing lunge	Standing, legs
14	Stork stand	Standing
15	Take a hike	Standing, cardio
16	Toe raises	Standing, legs
17	Neck glides*	Standing, stretch
18	Shoulder shrugs / circles*	Standing, stretch
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19	Hand press*	Standing, stretch
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13	Standing lunge	Standing, legs
14	Stork stand	Standing
15	Take a hike	Standing, cardio
16	Toe raises	Standing, legs
17	Neck glides*	Standing, stretch
18	Shoulder shrugs / circles*	Standing, stretch
19	Hand press*	Standing, stretch
20	Side leg raise*	Standing, legs
21	Chair rotations*	Stretch
22	Hopscotch	Cardio

To register interest / take part
please email:

holiver@cardiffmet.ac.uk

Appendix 13. Study 3 Exertime exercises

Exercises Summary

Number	Name	Targets	Where from
1	Arm pumps with foot tap	Cardio, arms	Exertime
2	Bicep curls	Standing, arms	Exertime, Physiotherapist
3	Double knee lift	Legs	Exertime
4	Front raise to tricep	Standing, arms	Exertime, Physiotherapist
5	Hip flexions	Legs	Exertime
6	Hip flexions with knee extension	Legs	Exertime
7	Phone call standing	Standing	Exertime
8	Seated crunch	Cardio	Exertime
9	Standing knee hug	Standing, legs	Exertime
10	Seated march	Cardio	Exertime, Physiotherapist
11	Single leg lift	Legs	Exertime
12	Stair climb	Standing, cardio	Exertime
13	Standing lunge	Standing, legs	Exertime
14	Stork stand	Standing	Exertime
15	Take a hike	Standing, cardio	Exertime
16	Toe raises	Standing, legs	Exertime
17	Neck glides	Standing, stretch	HSE
18	Shoulder shrugs / circles	Standing, stretch	HSE
19	Hand press	Standing, stretch	HSE
20	Side leg raise	Standing, legs	Physiotherapist
21	Chair rotations	Stretch	Physiotherapist

Exercise descriptions

Exertime

1. Arm pumps with foot tap
Sat down pumping arms above your head whilst tapping feet (22 seconds demo)
2. Bicep curls *also physiotherapist recommended
Stand up and hold water bottle in one arm. Extend and bend upwards at elbow. Repeat other side (36 seconds demo)
3. Double knee lift
Sat down repeatedly lift both knees and hold for 3seconds (26 seconds demo)
4. Front raise to triceps *also physiotherapist recommended
Stand up and raise water bottle out in front of you, lift straight above head then bend elbow to lower behind head. Reverse and repeat (30 seconds demo)
5. Hip flexions
Sat down raise one thigh at a time up (from hip) and repeat (36 seconds demo)

6. Hip flexions plus knee extension
5 but extend leg from knee out horizontally in front of you (35 seconds demo)
7. Phone call standing
Stand up during phone call (13 seconds demo)
8. Seated crunch
Sat down, hold arms above head like a rocket and crunch forward at waist (30 seconds demo)
9. Standing knee hug
Stand up and hug knee to chest one at a time (30 seconds demo)
10. Seated march *also physiotherapist recommended
Sat down march feet (stamping) and move arms as if walking (23 seconds demo)
11. Single leg lift
Sat down, rest both legs out in front of you (feet still on floor), then one at a time lift leg up whilst outstretched (20 seconds demo)
12. Stair climb
Stretches neck then camera follows model out of the room and whilst he jogs up and down the nearest stair case a couple of times (50 seconds demo)
13. Standing lunge
Stand up and lunge 3 times on each side (31 seconds demo)
14. Stork stand
Stand up and on one leg, cross the other leg in front of the other knee, and repeat (38 seconds demo)
15. Take a hike
Gets up and camera follows walking round the building, arm rotations and neck stretches as he goes (1 minute, 12 seconds demo)
16. Toe raises
Stand up and repeatedly raise up onto toes – hold onto a wall if needed. Both together legs together then one at a time (40 seconds demo)

HSE, 2011

4.2 NECK

During static and repetitive upper limb work muscles tend to be held in a particular position for extended periods or are used over and over again for prolonged periods. A build up of metabolic waste occurs within the muscles and can result in muscle fatigue. This can occur within the neck, especially when the task is visually intensive. 'Neck glides' are an exercise which could help to reduce muscle discomfort within the neck.

4.2.1 Neck glide Lee et al. [1992] evaluated the neck glide exercise and found that it was beneficial to VDT workers in reducing musculoskeletal discomfort. 'Neck glides' are also suggested by The Society of Radiographers. Is the exercise conspicuous: Somewhat.

17. Neck glide instructions: Sit or stand up straight, glide head back, as far as it will go. Keeping head and ears level. Now glide head forward. (20 seconds demo)
Muscle groups recruited: 1. Lower cervical, thoracic and lumbar extensors, neck flexors. 2. Upper cervical extensors and neck flexors. Anatomic Structures stretched: • Anterior ligaments of the lower cervical and thoracic spine, upper cervical extensors. • Posterior ligaments of the lower cervical and thoracic spine, lower cervical and thoracic extensors.

4.3 SHOULDERS

Exercises such as 'shoulder shrugs' or 'shoulder circles' can help to reduce muscle discomfort caused by the build up of metabolic waste within the muscles.

4.3.1 + 4.3.2 Shoulder shrug Lee et al. [1992] evaluated the shoulder shrug and shoulder circles exercise and found that it was beneficial to workers. 'Shoulder shrugs' are also suggested by The Society of Radiographers and at: Shelter Online, and 'Shoulder circles' are also suggested at: RSI Warrior & Magnitude International. Is the exercise conspicuous: Somewhat.

18. Shoulder shrugs and circles instructions: Sit or stand up straight, bring shoulders up towards ears. Then circle shoulders backwards three times, with arms relaxed by the side. (15 seconds demo)

Muscle groups recruited: Scapular upwards rotators and adductors; scapular downward rotators and shoulder abductors. Anatomic Structures stretched: Scapular downward rotators; abductors, scapular upward rotators and abductors.

4.6 HANDS

Exercises such as 'forward presses' could be performed to reduce muscle discomfort within the hands when muscles are fatigued due to static or repetitive work. The Chartered Society of Physiology (UK) recommends that the best way to exercise the hands/fingers is to perform a forward press.

4.6.1 Forward press. Is the exercise conspicuous: Somewhat

19. Hand press instructions: Gently interlock your fingers. Press your palms away from your body, gently stretching the forearm muscles, fingers and the muscles between your shoulder blades. (10 seconds demo)

Chartered Society of Physiotherapy

Easy exercises:

- **20.** Side leg raise instructions: Placing your hands on a table for support, raise one leg straight out to the side and slowly lower it again. repeat 5 times, then switch legs (27 seconds demo)

Simple stretches:

- 21.** Sitting slightly forward in your chair, rotate your upper body to the right, to reach the right-hand side of the backrest with your left hand. Then swap sides (11 seconds demo)

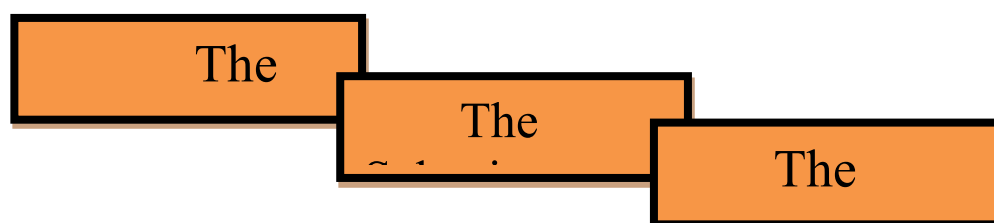
Appendix 14. Study 3 Exertime instructions

GUIDE TO USING EXERTIME

Exertime is an e-health and wellbeing initiative, designed to reduce the amount of time you spend seated at work by replacing this habit with short-bursts of physical activity performed regularly throughout the workday.

Exertime is a software application located on your desktop computer that links to a central webpage. This online communication will provide you with a variety of exercise video demonstrations. Moreover, your progress will be collected and used to provide you with individualised feedback to increase your motivation and facilitate your adherence to the program.

Exertime is based on a three-tiered approach:



REGISTRATION

- The first time that you launch Exertime....

THE EXERTIME ICON

- The Exertime icon sits in your taskbar, in the lower right hand corner of your computer screen.



➤ *Double-click* this icon and the Exertime prompt will appear.

➤ Although, you do not have to voluntarily click the icon to initiate the prompt.

Exertime has a time-initiated prompting feature.

THE PROMPT

- Every hour the Exertime sequence initiates with a prompt bubble appearing in the bottom right hand corner of the computer screen.
- From here you have two options: 'Exertime Now' or 'Postpone'.
- Choosing **Exertime Now** will initiate the Exertime sequence. This causes Exertime to take over your computer screen.
- If it is not a suitable time to Exertime, you can **Postpone** the prompt for 5 minutes, 10 minutes, 15 minutes, or the maximum minutes allowed. This will reset the prompt to initiate at the indicated time.
- It is important for you to note that once Exertime has been initiated it will automatically take over your computer screen, compelling you to move. The only way to close Exertime will be to engage in some form of physical activity, or use the 'Emergency Exit' button, if a 999 situation arises. As you progress through the Exertime screens, you will be asked to stand up, participate in a short-burst physical

activity, record your progress, and then you will regain control over your computer screen.

- *Remember:* The aim of this e-health initiative is to help *YOU* break the habit of prolonged occupational sitting.

THE SELECTION

- Once the Exertime sequence has been initiated, the first screen displayed is a video selection screen. This screen is divided, with a category margin on the left and video thumbnails on the right.
 - *First:* Look at the **Exertime Selection Categories** in the left margin.
 - Exertime activities are classified in one of three categories: **Easy**, **Moderate**, and **Challenging**.
 - You can view the video demonstration thumbnails within each category by selecting one of these options.
 - Alternatively, by selecting **All**, you can view all the video demonstration thumbnails.
 - Clicking the **Random** button will generate a randomly selected video demonstration thumbnail.
 - You can use the **Favourites** feature to sort all your favourite activities, allowing for easy access.
 - To add an Exertime activity to this folder, simply click the **Gold Star** located beneath the video demonstration thumbnail of your desired Exercise.
 - You can also remove an activity from this folder by clicking on the **Gold Star** again.
 - Each video demonstration thumbnail also includes the title of the exercise, the category for the exercise, and the type of progress you need to record for that exercise.
 - Exercises that require you to count the number of repetitions are labelled with an 'R', whereas timed exercises are labelled with a clock.
 - For timed exercises, Exertime automatically submits the amount of time you engaged in the exercise, so there is no need to personally record time of activity engagement.
- Once you have selected your chosen video demonstration thumbnail, click on it to proceed to the video demonstration screen.
 - On this screen you can view the video demonstration of the selected activity by clicking the **Play** arrow button on the video player.
 - While viewing you may decide you do not want to perform this exercise. Simply, click the **Back** arrow button on the left side of the screen to return to the video selection screen to select another exercise.
 - Once you have selected the exercise you want to perform click the green **Start** button below the right side of the video player to begin.

- This will take you to the countdown screen.
 - Here you have five seconds to stand up out of your chair to prepare to exercise.
 - When the clock reaches zero, it is time to do the exercise.
- You will now be taken back to the video demonstration screen.
 - You will notice a running clock at the bottom.
 - This clock should correspond with the amount of time you are out of your chair and exercising.
 - When you have finished exercising click the red **Stop** button, and then you can return to your seat.
- Once you have stopped exercising you will be prompted to record your progress.
 - Simply record the number of repetitions you performed in the text box, and then click **Finish**.
 - Remember, if the chosen activity was a timed recording exercise there is no need to record progress as it is done automatically.
 - Due to this feature it is *IMPORTANT to be standing and exercising* the entire time between clicking the **Start** and **Stop** buttons.
- Over time you will feel more comfortable doing the exercises on your own; thus, there is no need to play the video each time the Exertime sequence is initiated.
 - Exertime is entirely self-directed. As such, you can choose to do as little or as many repetitions as you desire.
- Once you have recorded your progress and clicked **Finish**, you are taken to the complete screen which provides two options: **Exit** or **Progress**.

THE FEEDBACK

- To help motivate you adhere to the program, Exertime provides personalised feedback through a series of bar graphs that are separated by tabs at the top of the screen.
 - You can click on these separate tabs to view your caloric expenditure, non-sitting time, or frequency of activities.
 - These can all be viewed in daily, weekly, or monthly formats.
 - The daily energy expenditure bar graph has an adjustable caloric goal feature, so you can set goals to help motivate you throughout the workday.
- When you are done reviewing your progress, simply click the **Close** button to regain control of your computer screen.
- At this time the prompt resets, and will reinitiate in an hour.

*An additional feature of Exertime can be viewed if you right-click the **Exertime icon** in your taskbar.

- This will allow you to **Run Exertime Now** or **Log Additional Exertime**.
- The **Log Additional Exertime Activities** function allows you to bypass the Exertime sequence and immediately record progress on a selected activity.
 - You can use this function to log any movements you did while you were away from your desk, such as taking the stairs to a meeting or walking back from the bathroom.
 - On the **Log Additional Exertime** screen, you can select the exercise you performed from a drop down menu before recording repetitions and seconds in text boxes. You can then *submit* your entry.
- You may also **Run Exertime Now** by clicking this selection.
 - This will allow you to bypass the Exertime prompt bubble so you can immediately begin the Exertime sequence.

Appendix 15. Study 3 example Exertime participant information sheet, consent form and PAR-Q

PARTICIPANT INFORMATION SHEET

Physical activity, health and wellbeing project – it's control room Exertime!

You are being invited to take part in this study. The study is *completely voluntary*, you will not be disadvantaged in any way should you decide not to take part. Before you decide whether you want to take part, please read the following information explaining why the research is being done, and what your participation will involve. Please feel free to ask any questions or discuss the research with us, if you wish.

Background and aims of the study:

This project is part of an ongoing doctoral programme exploring health and wellbeing within two British police forces. The initial research from Cardiff Metropolitan University identified that medium – high physical activity levels benefitted a range of positive health outcomes, including wellbeing, and protected against some of the adverse effects of work-related stress. However, a follow-up study found that staff and officers working in the control room felt unable to make use of existing physical activity initiatives due to the demands of their roles. Cardiff Metropolitan University are therefore undertaking another project aiming to decrease sedentary behaviour and enable control room workers to move more using 'Exertime', an e-health software programme that aims to replace sitting habits with short-bursts of physical activity. The impact of the 'Exertime' intervention will be assessed on a range of occupational sitting, health and wellbeing variables.

What will happen if you agree to take part in this study?

If you agree to participate in this study, you will have access to the 'Exertime' intervention for a 12 week period. Before the intervention begins you will be emailed a short online questionnaire. The questionnaire is essential to our assessment of the impact of 'Exertime' and will ask about your self-reported sitting, social support, perceived job stress, health and wellbeing. This should not take longer than 15 minutes to complete. On the first shift of the intervention period the researcher (Helen Oliver) will attend to answer any additional questions and take blood pressure readings from each participant. This is to provide an objective physiological indicator of health (in addition to self-reported variables in the online questionnaire).

On this first shift during the intervention period you will need to launch 'Exertime' where you will have to answer a few basic questions to set up an 'Exertime' account and create a username and password. 'Exertime' will ask for basic demographic data (name, email, six figure force number, date of birth, weight, gender, height, job title).

Following this initial set up 'Exertime' will run automatically in the background whilst you work. Every hour, 'Exertime' will flash up a prompt to engage in a short-burst physical activity. You can choose to either do so, or to ignore the prompt if it is inconvenient. If you chose to engage, you can select an activity to follow, and for how long (typically 30 seconds – 1 minute). All activities can be

done in the vicinity of your desk, have been approved by occupational health and are in line with the Health and Safety Executive advice for exercises aimed to reduce musculoskeletal discomfort. Following each activity you simply record it in the 'Exertime' software and return to work as normal, until the next 'Exertime' prompt.

At the end of the 12 week intervention period, you will be asked to complete the same online questionnaire, and another blood pressure reading will also be taken. We will also ask for some volunteers who would be willing to take part in a short (approximately 20 minutes) interview to review the intervention. This interview will be recorded so that the research team can listen back to it at a later time. The interview will include asking about things such as: Your reasons for taking part, your experiences of 'Exertime' (what was good, what was bad), how running 'Exertime' interacted with your work routines and impacted on your behaviour, and what could be done differently.

What will happen to the data that is collected?

The basic demographic data associated with your 'Exertime' account are solely used to generate the feedback (e.g., calories burned) at the end of each 'Exertime' activity, and to track your movement during the study (e.g., if you have moved computers during a shift). 'Exertime' is owned by the University of Tasmania, and their data is securely held by C9, a processor in Sydney, New South Wales. The data associated with your 'Exertime' account will therefore be transferred to Australia, and governed under the Australian Privacy Principles (see [The Australian Privacy Principles](#)). These Principles offer different safeguards to the EU General Data Protection Regulations (GDPR, 2018), that are not recognised by the EU. Confidentiality clauses and data processing agreements have been set up between 'Exertime', Force A, Force B, and Cardiff Metropolitan University to cover the data transfer as an exception under Article 49 of the GDPR. Further information on Exertime's privacy policy can be viewed here: <http://www.exertime.com/Privacy>, and C9 here: <https://www.c9.com.au/Privacy>.

The questionnaire data will be securely stored online under password protection within South Wales and Gwent Police forces. At the end of the intervention, the 'Exertime' data will be securely sent to the Wellbeing Team in each police force, where it will be aligned to the questionnaire data. A member of the Wellbeing Team in each police force will remove any personally identifying information (i.e., your name and six figure force number). Instead your data will be coded with a random 'respondent number'. The anonymised data will then be securely sent to Cardiff Metropolitan University for analysis; the 'respondent number' is the only number that will be seen by the research team.

'Exertime' data will be retained for a period of 6 months while it is analysed by Cardiff Metropolitan University. After 6 months, 'Exertime' will delete the information from the software. Cardiff Metropolitan University will retain the anonymised data spreadsheet in an encrypted, password protected electronic format for the remaining duration of the doctoral programme (12 months).

If you also participate in an interview then your interview recording will be transcribed by the researcher before being deleted from the recording device. The information you provide Cardiff Metropolitan University with will be anonymised and managed in line with the GDPR 2018.

Results of the research that are reported will always be collective (never on an individual basis) and always anonymous. This means only summaries of results will be reported and your responses will never be known to any police force.

Are there any benefits from taking part?

Your sitting time might decrease during the intervention and provide some associated physical and psychological health benefits. We may use the data to help underpin research publications and conference presentations. We hope that this will lead to changes that will benefit the police in future by highlighting what works, and what could be improved, and what the benefits the wellbeing of the police workforces.

Your rights

Your participation in the study is voluntary and therefore you are free to withdraw from the research at any time without any repercussions. If you would like to withdraw, please email *police force contact details*.

If any part of the intervention raises issues which you believe are having a negative effect on your wellbeing, or if you have any concerns about your health and wellbeing, you are encouraged to discuss these with your line manager who will be able to deal with your queries, or signpost you to other areas for assistance. Alternatively, for personal matters of a confidential nature, you can email *police force contact details*.

What do I do now?

If you would like to take part, or if you would like further information, please complete the consent form and questionnaire and return to the PhD researcher, Helen Oliver (email: holiver@cardiffmet.ac.uk).

Helen Oliver

Cardiff Metropolitan University

Email: holiver@cardiffmet.ac.uk

Dr Owen Thomas.

Cardiff Metropolitan University

Email: othomas@cardiffmet.ac.uk

If you wish to complain or have any concerns about any aspect of the way you have been approached or treated during the course of this study, and wish to speak to an independent contact, please email our Research and Enterprise Officer, Susie Powell (spowell@cardiffmet.ac.uk). For any queries specific to data protection, please contact: dataprotection@gwent.police.uk, or dataprotection@cardiffmet.ac.uk.

PHYSICAL ACTIVITY READINESS QUESTIONNAIRE

Personal Details			
Name			
Health Screening			
	YES	No	
1. Has a doctor told you that you have a heart condition AND must seek medical advice before participating in regular exercise?	<input type="checkbox"/>	<input type="checkbox"/>	
2. Do you feel pain in your chest when you do physical activity?	<input type="checkbox"/>	<input type="checkbox"/>	
3. Do you lose your balance because of dizziness or do you ever lose consciousness?	<input type="checkbox"/>	<input type="checkbox"/>	
4. Do you have a bone or joint problem that could be made worse by physical activity?	<input type="checkbox"/>	<input type="checkbox"/>	
5. Are you currently on any medication for high blood pressure?	<input type="checkbox"/>	<input type="checkbox"/>	
6. Are you currently taking any medication for a heart problem?	<input type="checkbox"/>	<input type="checkbox"/>	
7. Do you have insulin dependant diabetes?	<input type="checkbox"/>	<input type="checkbox"/>	
8. Do you consider yourself to have a disability? If YES please state:	<input type="checkbox"/>	<input type="checkbox"/>	
9. Do you know of any other reason as to why you should not do physical activity?	<input type="checkbox"/>	<input type="checkbox"/>	
10. <u>Women Only</u> : Are you pregnant at the moment or have recently given birth?	<input type="checkbox"/>	<input type="checkbox"/>	
If you have answered YES to questions 1, 2, 3, 5 or 6 you will need to get a signature from your doctor to confirm it is safe for you to take part in physical activity <u>before</u> exercising.			
Please provide any other comments you feel are relevant:			
Declaration, Terms & Conditions			
I have read the statements above and can confirm that the information I have provided is correct. I understand that I am expected to participate in physical activity and exercise as this is a necessary part of this research. I am aware that participation in these activities involves the risk of injury. <u>I agree to inform a member of staff in the event of any change to either my personal or medical details.</u>			
Signature:		Date:	

PARTICIPANT CONSENT

Participant name: _____

Shift number / letter: _____

Title of Project:

Physical activity, health and wellbeing project – it's control room Exertime!

Name of Researchers: Helen Oliver

Participant to complete this section:

**Please click agree to confirm you have
read and agree with each point**

I confirm that I have read and understand the information sheet for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily.

☐

I understand that my participation is voluntary and that I am free to withdraw at any time, without giving any reason.

☐

I consent to the processing of my personal information for the purposes of this research study. I understand that such information will be handled in accordance with General Data Protection Regulations 2018, covered by an exception to restricted transfer to Australia.

☐

I consent to the processing of my anonymised information by Cardiff Metropolitan University, and understand that it may be reported in future publications in an anonymised fashion.

☐

I consent to blood pressure readings being taken for the purposes of this research study.

☐

CONSENT

Participant: I give my consent to participate in this study.

☐

Signature:

Appendix 16. Social Exertime supervisor statements against BCTs and MI techniques

Example to give to supervisors	BCT	MI Technique	Mechanism in BCW / Purpose in MI
<i>Week 1 – Goal setting</i>			
What ideas do you have for a goal to set using Exertime?	1.1 Goal setting (behavior)	24 Emphasize autonomy	Behavioral regulation = Psychological capability Relational, evoking technique
How can I best support you to do this?	3.1 Social support (unspecified)	35 Support change / persistence	Social influences = Social opportunity Relational, planning technique
<i>Weeks 2,3,4,5 – Social support</i>			
<ul style="list-style-type: none"> How are things going for you? Can you tell me a bit more about why Exertime is of interest to you? What are you looking for from Exertime? 		1 Open-ended questions	Relational, engaging technique
You are benefitting by using Exertime – we are benefitting as a team from doing Exertime.	3.1 Social support (unspecified)	2 Affirmation	Social influences = Social opportunity Relational, engaging technique
You are trying and you can do this, but Exertime can take a few weeks to get used to – what might need to change?	15.1 Verbal persuasion about capability	2 Affirmation	Belief about Capabilities = Reflective motivation Relational, engaging technique
I appreciate how difficult / busy it is	3.1 Social support (unspecified)	36 Offer emotional support	Social influences = Social opportunity Relational, planning technique
I think it's important that you are able to do this, I'm doing it myself and feeling better. How can I best support you to do this?	6.3 Information about others approval	35 Support persistence / change	Norms = Social opportunity Relational, planning technique
<i>Week 6 – Discuss goal progress</i>			
How are you progressing with your goal?	1.5 Review behavior goal	37 Review goal	Goals = Reflective motivation Content, planning technique
UNSURE: What will help you to know? How are you using the feedback in Exertime?	2.3 Self-monitoring of behavior	1 Open-ended questions	Behavioral regulation = Psychological capability Relational, engaging technique
LITTLE / NO PROGRESS: What are the challenges/barriers to Exertime? <ul style="list-style-type: none"> What ideas do you have for how we could resolve them? How can we create an environment where you feel comfortable to engage? How can we help each other to stick to it better? 	1.2 Problem solving	24 Emphasize autonomy 35 Support change / persistence	Behavioral regulation = Psychological capability Relational, planning techniques
GOOD PROGRESS: Great! What are the good things about it?		9 Running head start	Beliefs about consequences = Reflective motivation Content, evoking technique
<i>Weeks 7,8,9,10,11,12 – Social support</i>			

<ul style="list-style-type: none"> • So what is the next step for you? • What change can we take from Exertime? • Do you have any ideas for how to continue being more active at work without Exertime? • What has been good about Exertime? What was not so good, but we could change ourselves now or after the program? 	1.4 Action planning	32 Consider change options 24 Emphasize autonomy	Behavioral regulation = Psychological capability Content and relational planning techniques
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Appendix 17. Study 3 TIDieR checklist for the Exertime intervention



The TIDieR (Template for Intervention Description and Replication) Checklist*:

Information to include when describing an intervention and the location of the information

Item number	Item	Where located ** Primary paper (page or appendix number)
1.	<p>BRIEF NAME</p> <p><i>Exertime – a physical activity intervention for control room workers in two British police forces.</i></p>	_____
2.	<p>WHY</p> <p><i>Rationale and theory:</i></p> <p><i>Police staff and officers working in the control rooms have a highly stressful, demanding and sedentary role which is negatively associated with psychological wellbeing (Galbraith et al., 2020). Physical activity is positively associated with police psychological wellbeing (Oliver et al., in press), and so the goal was to develop a physical activity intervention in police control rooms. The Behavior Change Wheel and a co-design approach were used. Exertime, an e-health software, has previously been effective in reducing sedentary behavior in police populations (Pedersen et al., 2013), and was identified as an acceptable and feasible intervention for the control room context.</i></p> <p><i>Elements:</i></p> <p><i>Exertime prompts users to stand up every 45 minutes and engage in short bout of physical activity, following video demonstrations. Social norms and supervisor permissions drive staff behaviors in the control room, and so supervisors will demonstrate their support of staff engaging with the software using a series of statements</i></p>	<p>Key elements:</p> <p>Table 6.3 and Table 6.4</p>

aligned to Motivational Interviewing. The hypothesized mechanisms of action are behavioral regulation and social influence (Carey et al., 2018)

WHAT

- | | | |
|-----------|--|---|
| 3. | <p><i>Materials:</i></p> <p><i>Control groups will receive an education session on the importance of interrupting sedentary behavior and a link to the National Health Service information on sitting. The Exertime intervention group receive the same education session, as well as the Exertime intervention. The Exertime intervention comprises the Exertime e-health software, video demonstrations of exercises and Exertime instructions. The Social Exertime group receive the same education session as the control group and Exertime intervention group, and the same Exertime intervention as the Exertime intervention group. In addition, they receive social support delivered by their supervisors.</i></p> | <p>Education session
(Appendix 12)</p> <p>Exertime
exercises
(Appendix 13)</p> <p>Exertime
instructions
(Appendix 14)</p> <p>Supervisor
support
(Appendix 16)</p> |
| 4. | <p><i>Procedures:</i></p> <p><i>There are four phases in the Exertime Intervention Schedule:</i></p> <p><i>The Exertime intervention schedule involves four phases:</i></p> <ul style="list-style-type: none">• <i>Set-up phase (0-4 weeks): All staff working in the police control rooms will receive the education session during their staff training sessions. In order to participate, staff will be asked to complete consent forms and a PAR-Q (see example participant information sheet and consent form with PAR-Q in Appendix 15) following the education session. Registers will be</i> | <p>Participant
information sheet,
consent form and
PAR-Q
(Appendix 15)</p> |

taken at the training sessions to monitor recruitment. After four weeks (once all shifts have had their training session and been at work for one shift set to allow time to volunteer to participate), shifts will be randomly allocated to an intervention group. The supervisors in the Social Exertime group will be emailed instructions and information to deliver the social support aspects;

- *Baseline (week 5): On the first shift that participants can use Exertime, they receive demonstrations on how to use the software and collect data on primary and secondary outcomes (i.e., ensure self-report survey measures have been completed, take blood pressure data readings). Retention will be monitored over the 12-week intervention period;*
- *End (week 17): On the last shift that participants can use Exertime, there is another data collection and recruit for end-user interviews to assess perceptions of feasibility and acceptability;*
- *6-month follow-up: Another data collection on primary and secondary outcomes to determine any longer-term impacts of the Exertime intervention.*

WHO PROVIDED

5. *The education sessions and data collection is completed by a Sport and Exercise Psychology PhD researcher (BSc Psychology, MSc Sport Psychology). The PhD researcher received institutional training to take blood pressure readings from University-owned automated measurement devices. The police force supervisors receive training to deliver the social support aspects over email (facilitated by the PhD researcher).*

HOW

6.	<i>The Exertime intervention is installed and delivered on police computer systems for individual use. The education session is delivered face to face to groups on staff training days, and the supervisor support is delivered face to face to individuals.</i>	Modes of delivery Table 6.3
WHERE		
7.	<i>Exertime has been used in various contexts (e.g., Pedersen et al., 2013). For this description it is for use in two British police force control rooms.</i>	_____
WHEN and HOW MUCH		
8.	<i>Exertime is available for participants to use at all times they are in work during the 12 week intervention. Every hour participants will receive a prompt to engage in a physical activity. Participants are in control of whether they chose to engage or not, which exercise, and how long they do it for. Supervisors delivering support to their staff (participants) are given autonomy to decide on how often they speak to staff, to make it feel natural and respond to the needs to each staff member. However, it will be recommended to 'check-in' and deliver a supportive statement once a shift set (once every week), and at a minimum four times over the 12-week intervention.</i>	_____
TAILORING		
9.	<i>The supervisor support statements are planned to motivate and encourage individual behavior change, so is tailored. The Exertime intervention can also be tailed to be all delivered online and face to face during Covid-19 restrictions (e.g., with social distancing).</i>	See 'Impact of Covid-19 on Exertime pilot' in Chapter 6
MODIFICATIONS		

10.[‡]	<i>If the intervention was modified during the course of the study, describe the changes (what, why, when, and how).</i>	N/A as protocol
HOW WELL		
11.	<i>The Exertime software collects usage data, and the end-user interviews will also provide data on perceived engagement with the software and social support elements.</i>	_____
12.[‡]	<i>Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.</i>	N/A as protocol

**** Authors** - use N/A if an item is not applicable for the intervention being described. **Reviewers** – use ‘?’ if information about the element is not reported/not sufficiently reported.

[†] If the information is not provided in the primary paper, give details of where this information is available. This may include locations such as a published protocol or other published papers (provide citation details) or a website (provide the URL).

[‡] If completing the TIDieR checklist for a protocol, these items are not relevant to the protocol and cannot be described until the study is complete.

* We strongly recommend using this checklist in conjunction with the TIDieR guide (see *BMJ* 2014;348:g1687) which contains an explanation and elaboration for each item.

* The focus of TIDieR is on reporting details of the intervention elements (and where relevant, comparison elements) of a study. Other elements and methodological features of studies are covered by other reporting statements and checklists and have not been duplicated as part of the TIDieR checklist. When a **randomised trial** is being reported, the TIDieR checklist should be used in conjunction with the CONSORT statement (see www.consort-statement.org) as an extension of **Item 5 of the CONSORT 2010 Statement**. When a **clinical trial protocol** is being reported, the TIDieR checklist should be used in conjunction with the SPIRIT statement as an extension of **Item 11 of the SPIRIT 2013 Statement** (see www.spirit-statement.org). For alternate study designs, TIDieR can be used in conjunction with the appropriate checklist for that study design (see www.equator-network.org).