THE INFLUENCE OF JOB CHARACTERISTICS, PSYCHOLOGICAL CAPITAL, WORK SCHEDULE AND CHRONOTYPE ON THE ENGAGEMENT, BURNOUT AND GENERAL HEALTH OF SHIFT WORKERS

by Sophia M Smith

Thesis presented in partial fulfilment of the requirements for the degree of Master of Commerce (Industrial Psychology) in the Faculty of Economic and Management Sciences at Stellenbosch University

Department of Industrial Psychology
Supervisor: Mrs Michèle Boonzaier

March 2023

Declaration

By submitting this thesis electronically, I declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: March 2023

Acknowledgments

I would like to express my sincere gratitude to the following people:

- To my supervisor, Michèle Boonzaier, thank you for all of your knowledge, guidance and support you have given me throughout this challenging journey. The freedom you have provided me in exploring this topic and words of encouragement have moulded me into the researcher I am today.
- Thank you, Prof Martin Kidd, for all of your invaluable input with my data analysis and in generating my research results. I would have not been able to reach the finish line without your patience and guidance.
- To my mom, Sophia Smit, thank you for all of your love and support throughout this journey. You have always been my biggest cheerleader throughout my studies and pushed me to become the best version of myself.
- To my dad, Edward Smith, thank you for unwavering support. You have always been my inspiration by showing me that success can always be achieved through persistence and hard work.
- Finally, thank you to everyone who has helped me along the way, no part was too small and every action was deeply appreciated.

Abstract

Shift work is an important aspect of working time that is often associated with many negative outcomes. Although there are economic, technical, and social benefits for organisations in the use of shift work schedules, these benefits are conflicted by the social and health impairments for workers. Since the use of shift work is escalating, it is increasingly important for organisations to understand what the impact of shift work on their workers is and to implement interventions that aim to prevent, eliminate, or manage the challenges associated with it. The purpose of this research study was therefore to explore salient variables that contribute to variance in burnout, engagement, and general health in South African shift workers.

Using the framework of the Job Demands-Resources model, this quantitative study aimed to test the relationships between the five core job characteristics as described in the job characteristics model, psychological capital, non-standard work schedules and chronotype with the engagement, burnout, and general health of shift workers. An ex post facto correlational design was used, and data was collected from a non-probability sample of 175 South African shift workers using a survey method. Variables were measured using the MOS 36-Item Short-Form Health Survey (RAND-36), the Utrecht Work Engagement Scale (UWES-9), the Oldenburg Burnout Inventory (OLBI), the Job Diagnostic Survey – Revised (JDS-R), the Psychological Capital Questionnaire (PCQ-12), three questions for work schedule and the Horne – Őstberg Morningness Eveningness Questionnaire (MEQ). Data analysis made us of the PLS-SEM method. The findings indicated that job characteristics are antecedents of PsyCap. These personal resources in turn buffered against burnout and led to higher levels of engagement which fostered the psychological health of workers. Burnout was also found to be negatively related to both physical and psychological health. On the other hand, the relationship between non-standard work schedules and burnout, along with the moderating effect of chronotype on this relationship, was not found to be statistically significant. Furthermore, the relationship between job characteristics and engagement, as well as engagement and physical health, was also not found to be statistically significant. This study concluded that interventions aimed at developing PsyCap among employees could assist in transforming organisations to significant sources of happiness, satisfaction, meaningfulness, and general well-being.

Opsomming

Skofwerk is 'n belangrike aspek van werktyd wat dikwels met baie negatiewe resultate geassosieer word. Alhoewel daar ekonomiese, tegniese en maatskaplike voordele vir organisasies is in die gebruik van skofte, is hierdie voordele in teenstryd met die maatskaplike en gesondheidsvoordele vir werkers. Aangesien die gebruik van skofwerk aan die toeneem is, is dit toenemend belangrik vir organisasies om te verstaan wat die impak van skofwerk op hul werkers is en om ingrypings te implementeer wat daarop gemik is om die uitdagings wat daarmee gepaard gaan te voorkom, uit te skakel of te bestuur. Die doel van hierdie navorsingstudie was dus om opvallende veranderlikes te verken wat bydra tot veranderings in uitbranding, betrokkenheid en algemene gesondheid by Suid-Afrikaanse skofwerkers.

Aan die hand van die raamwerk van die “Job Demands-Resources” -model, het hierdie kwantitatiewe studie ten doel gehad om die verwantskappe tussen die vyf werkseienskappe soos beskryf in die “job characteristics”-model, sielkundige kapitaal (“psychological capital” - PsyCap), nie-standaard werkskedules en chronotipe te toets in terme van die betrokkenheid, uitbranding, en algemene gesondheid van skofwerkers. 'n Ex post facto korrelasie-ontwerp is gebruik, en data is ingesamel uit 'n nie-waarskynlikheidsteekproef van 175 Suid-Afrikaanse skofwerkers deur 'n opnamemetode te gebruik. Veranderlikes is gemeet deur gebruik te maak van die MOS 36-item Kortvorm Gesondheidsopname (RAND-36), die “Utrecht Work Engagement Scale” (UWES-9), die “Oldenburg Burnout Inventory” (OLBI), die “Job Diagnostic Survey – Revised” (JDS-R), die “Psychological Capital Questionnaire” (PCQ-12), drie vrae vir werkskedule en die “Horne – Őstberg Morningness Eveningness Questionnaire” (MEQ). Data-analise het van die PLS-SEM-metode gebruik gemaak. Die bevindinge het daarop gedui dat werkseienskappe die voorlopers van PsyCap is. Hierdie persoonlike hulpbronne het op hul beurt ’n buffer teen uitbranding gebied en het gelei tot hoër vlakke van betrokkenheid, wat die sielkundige gesondheid van werkers bevorder het. Daar is ook gevind dat uitbranding negatief verband hou met sowel fisiese en sielkundige gesondheid. Aan die ander kant is gevind dat die verband tussen nie-standaard werkskedules en uitbranding, saam met die modererende effek van chronotipe op hierdie verhouding, nie statisties betekenisvol is nie. Verder is daar ook nie gevind dat die verband tussen werkseienskappe en betrokkenheid, sowel as betrokkenheid en fisiese gesondheid, statisties betekenisvol is nie. Hierdie studie het tot die gevolgtrekking gekom dat ingrypings wat gemik is op die

ontwikkeling van PsyCap onder werknemers kan help om organisasies te omskep in beduidende bronne van geluk, tevredenheid, betekenisvolheid en algemene welstand.

Table of Contents

List of Figures

List of Tables

Chapter 1: Introductory Argument

1.1 Introduction

In general, working hours have a significant impact on the lives of people. Time – start and stop times, overtime, flexitime and part-time - is an essential characteristic of the work experience (Blyton, 1985; Davy, 2011). A significant problem around the globe relating to negative outcomes associated with working hours is the reality of shift work. According to Brown et al. (2020), approximately 25% of those individuals who are employed are engaged in shift work. Shift work is defined as a working system in which one group of workers is changed with another group of workers on a regular basis and within the same workplace (Folkard & Monk, 1985). It often refers to working hours that take place at night, in the early morning or on the weekends (Partonen, 2018). Brown et al. (2020) state that while there is no universal definition of shift work that is accepted, working outside of a typical 09:00 to 17:00 workday is common for approximately one fifth of workers globally.

Shift work is spread over a wide range of industries. Some industries have a greater tendency to make use of shift work than others. One of the most common sectors across the globe to have made use of shift work back in the 1990s up until today is the manufacturing sector, which includes the food, motor, chemical, rubber, textile and energy industries (Adler, 1991; Boivin et al., 2021). The leisure and hospitality industry also makes extensive use of shift work, as establishments such as restaurants and bars are known to conduct most of their business after 18:00 (McMenanin, 2007). Other industries that often make use of shift work include the arts, entertainment and recreations, transportation and warehousing, health care and emergency services, and mining industries (Boivin et al., 2021; McMenanin, 2007).

Shift work is designed to address technological constraints and increase productivity and flexibility for organisations by providing services throughout the day and night (Niedhammer et al., 2022). To be more specific, Blyton (1985) states three main reasons as to why organisations make use of shift work. The first is for economic purposes, such as capital utilisation or reducing overtime worker dependencies. Secondly, technical reasons such as the rising demand in continuous production industries demands shift work. Finally, shift work fulfils social purposes such as the provision of more continuous services to the general population. These continuous services are required in public transportation, public health,

radio and television services, bars and restaurants, entertainment centres and communication services (Folkard & Monk, 1985). For individuals, shift work can provide financial benefits as it often involves good earnings (Blyton, 1985).

Conflicts may exist between the economic benefits that shift working provides to organisations and the social and health costs of some shift working schedules for individual workers, making it an important aspect of working time studies (Blyton, 1985; Brown et al., 2020). More organisations across the globe are making use of shift work to reap the advantages of a 24/7 business which allows them to cope with increasing demands. These demands relate to an increasing need for continuous production, the provision of services and maximising returns on investment (Davy, 2011).

Since the prevalence of 24/7 economies is likely to grow greater in the future, and alternative work arrangements like contract workers, temporary workers, freelancers, and gig workers are becoming more common, the negative outcomes associated with shift work pose an even greater risk for workers across the globe (Bolino et al., 2021). Organisations are also likely to face issues such as higher absenteeism and presenteeism rates and poorer performance due to illness, sleep disturbances, and fatigue (Boivin et al., 2021; Gerstner et al., 2022; Hittle & Gillespie, 2018), higher error and accident rates (Brown et al., 2020), lower job satisfaction, job enrichment and organisational commitment and higher turnover rates (Bolino et al., 2021) with shift workers when compared to day workers, which result in high costs for the organisations involved. These issues make it increasingly important for organisations to consider the impact that working in shifts has on workers' well-being and how they can eliminate, or at least mitigate, the associated risks and consequences thereof (Partonen, 2018). In order to understand the risks and consequences associated with shift work, we first need to understand how and why it has such a large influence on the lives of people.

1.2 The Health, Well-being and Work-related Risks associated with Shift Work

The working arrangements inherent in shift work are associated with many health and work-related challenges. Shift work generally requires people to work when they should be asleep, when the circadian alerting signal is at its weakest, and to sleep when they should be awake, when the circadian alerting signal is at its strongest (Brown et al., 2020; Folkard &

Monk, 1985). There is a general consensus that the time-orientated functions of the human body are disrupted by shift work in a large proportion of the population (Blyton, 1985). Working at night is of particular concern as it is in contradiction with the functioning of the biological clock (or circadian rhythms) which governs the human metabolism, causing disturbances that result in circadian disruption (Blyton 1985; Boivin et al., 2021; Gibson, 2022 Partonen, 2018).

This circadian misalignment causes poor sleep cycles among shift workers, resulting in sleep time that is between one and four hours less than that which is required for effective functioning (Davy, 2014). In essence, these workers often experience worse sleep quality and less total sleep time than non-shift workers, with sleep-related impairments in daytime functioning being compounded for these individuals. These persistent and recurring patterns of sleep disturbances associated with working schedules are also known as shift work disorder (SWD) (Brown et al., 2020).

These sleep disturbances are further complicated as the rest of the population who works normal working hours is active, creating more day-time noise when shift workers are trying to sleep. The most common types of noises reported include children and that from traffic (Adler, 1991; Folkard & Monk, 1985). This combination leads to an inferior quality of sleep. Other problems that cause more trouble sleeping during the day also include temperature and bodily functions (Adler, 1991). Living conditions are of particular importance as individuals in more unfavourable living conditions (those near roads with plenty of traffic and with small children in their households) have more complaints regarding well-being and health when compared to those in more favourable living conditions (Folkard & Monk, 1985). Studies show that these night-time shift workers are especially vulnerable to the negative outcomes and health risks associated with insufficient sleep and circadian disruption. These include hypertension, burnout, deficient physical activity, an unhealthy diet, obesity, Type 2 diabetes, pregnancy complications, reduced fertility, dementia, cardiovascular disease events, gastrointestinal problems, cancer and even higher mortality rates (Brown et al., 2020; Davy, 2014; Gibson, 2022; Jørgensen et al., 2020; Niedhammer et al., 2022).

The misalignments of daily rhythms resulting from shift work are now also more relevant than ever before, given the context of COVID-19. Due to the adverse effects on the immune system functioning, shift workers have an increased risk of infection and morbidity

in response to viral infection (Loef et al., 2022; Oved et al., 2021). Even one night's sleep deprivation before vaccination was found to reduce vaccine protection (Oved et al., 2021), increasing the risks and negative outcomes of shift work on health to a higher degree. This shows important implications not only for the individual, but also for the health of our overall society.

Insufficient sleep among shift workers over a typical work week has also shown to have negative effects on their maintenance of physical and psychological health, cognitive performance, alertness, reaction time, neuromuscular function, learning abilities, decision-making, physical performance and productivity (Boivin et al., 2021; Brown et al., 2020; Davy, 2014; Gerstner et al., 2022). These negative effects influence their performance within organisations negatively, decreasing the organisation's efficiency and effectiveness which further leads to an increase in the risk of errors and accidents in the workplace (Brown et al., 2020). In South Africa, shift workers, especially those working night shifts, are more prone to occupational injuries (Adler, 1991).

Brown et al. (2020) and Loef et al. (2022) further emphasise that workers who are tired or fatigued on the job in professions such as health care, first responders, and manufacturing, among others, could lead to safety risks. Police workers, for example, showed lower levels of health and fitness related to work with the risk of reduced work ability increasing significantly among those who have completed more than 20 years of work (Davy, 2011). Previous studies also show that anaesthetists experience a significant deficit in psychomotor activity in the course of one night's shift duty due to acute sleep deprivation, which in turn impacts on the health care offered to patients (Davy, 2011).

The safety risks of worker fatigue also extend to the transportation industry, especially drivers such as Uber drivers, taxi services, or long-haul truck drivers. Matthews et al. (2011) state that 7% to 10% of all road accidents can be attributed to driver fatigue. Given the prevalence of shift work structures for drivers, these findings should be of particular concern and interest to the transportation industry. In reality, any industry that employs shift workers who are expected to drive home at the end of their shift should be equally concerned with these issues around road safety. Overtime hours that are added upon shift work, whether in transportation, health or other industries, are also associated with an increased risk of sleep disturbances such as insomnia, which could further lead to fatigue and burnout. Worker

fatigue is a consequence that therefore should be of particular concern to organisations making use of this labour structure.

Night and rotating shift workers are also more prone to experiencing psychological health problems such as depression, anxiety, and alcohol abuse when compared to day-time workers (Brown et al., 2020). Wirth et al. (2017) observed that female nurses working any form of shift work had an increased risk of 52% in experiencing depression symptomology. Previous studies also indicate that men working night shifts for more than four years were more likely to report psychological health issues, while depressive symptomology was more likely to be found in women working varied shifts (Wirth et al., 2017). In their own study based on a representative United States (US) sample, Wirth et al. (2017) found that there was a higher chance of workers working night or rotating shifts to experience mild depressive symptoms when compared to day workers. However, due to limitations in their methodology, they were unsure whether scores among shift workers represented mild depressive symptoms or fatigue. In addition, poor social functioning and increased stress were also found to be associated with depression. It should be noted that fatigue, poor social functioning and stress are frequently correlated with shift work and, while it was not possible to disentangle the precise causal relationship in the study discussed, the results do suggest that working night or rotating shifts is likely to contribute more generally to a number of causes of depression. This relationship is also confirmed by other studies, including Booker et al. (2020), Chellappa (2020), Sadeghniiat-Haghighi et al. (2021) and Wirth et al. (2017). Brown et al. (2020) emphasise that future research should focus on better understanding this complex interplay of shift work with sleep and psychological health.

Job context is another dimension of shift work that may impact on employee well-being. Previous studies indicate that organisational characteristics, with particular reference to job context, are seen as one of the antecedent factors contributing to the incidence of burnout (Cordes & Dougherty, 1993). Job contexts that require a lot of emotional demands, such as the services industry, are particularly a problem (Schreuder & Coetzee, 2016). Jobs such as nurses, bartenders and waiters/waitresses that require shift work may therefore be challenged by continuous emotional demands that lead the depletion of emotional resources. The depletion of emotional resources, in turn, may impact negatively on their ability to think clearly as they become overwhelmed by the amount of information that they need to process (Schreuder & Coetzee, 2016), while they suffer from additional physical challenges such as tiredness or health impairments caused by shift work. This experience of overload (the

amount of work, mental load and emotional load) in shift work causes shift workers to withdraw or disengage from their work as a way to replenish their resources (Rothmann et al., 2006; Schreuder & Coetzeee, 2016). Long-lasting stressors in the work environment that are extreme are known to cause serious physiological problems when insufficient time is given for recuperation (Theorell, 2020). In the health care industry, the context of COVID-19 is especially relevant as it is said to give rise to the worst possible work environment for health-care staff.

According to Theorell (2020), all the bad psychosocial risk factors are magnified in the workplace, with health-care staff experiencing extremely high demands, a lack of control, and in some cases a lack of institutional support and a lack of reward. In addition, these staff members are also found working extreme shift work schedules and overtime. This contributes to an increased risk of depression and burnout (Theorell, 2020). While it is evident that specific job characteristics could lead to burnout, as with health-care staff, Bolino et al. (2021) emphasise that working non-standard hours in itself is likely to lead to higher levels of burnout and work stress. Therefore, a worker's shift can be seen as a salient factor of job context that contributes to burnout as it places a high demand on an employee's work and personal life. Although many studies have focused on how this variable has a direct association with burnout, research is still required to confirm these correlations, and to establish how organisational policies contribute to this relationship (Cordes & Dougherty, 1993), particularly in South Africa (Davy, 2011).

Burnout can have detrimental effects on both the individual and the organisation. It has been shown to correlate with dysfunctional consequences in workers, causing high financial risks to organisations due to high turnover, high rates of absenteeism and reduced productivity (Cordes & Dougherty, 1993). For example, Langenhoven and Boonzaier (2015) mention that call centre workers often experience high levels of burnout. It is no coincidence that call centres also experience one of the highest levels of staff turnover rates when compared to other industries, with 30% of their front-line agents having to be replaced on an annual basis. This further cause financial strain on these call centres in recruiting and training new front-line call centre agents. The persistence of poor health-related outcomes over the long term is one of the primary reasons why employees leave shift work (Folkard & Monk, 1985). This highlights the importance of organisations to understand the underlying factors that cause burnout and to develop interventions that aim to manage its symptoms while attempting to increase employee engagement levels.

In addition to these physical and psychological health consequences, shift work can also cause social and domestic problems for the worker (Boivin et al., 2021; Bolino et al., 2021). Boivin et al. (2021) and Brown et al. (2020) state that shift workers often report poor social activity engagement as socialisation activities, forms of entertainment, public transport systems, among others, are more coordinated with day-time hours as opposed to a round-the-clock working society. Workers tend to feel like they have less leisure time and they are less able to make and maintain friendships (Adler, 1991). Shift work, especially night-shift work, also prevents individuals from engaging in the natural processes of group formation and community development. In this way, many night-shift workers become isolated and struggle to become active members of the organisation at which they are employed (Folkard & Monk, 1985).

Furthermore, in areas where shift work is not common, workers are likely to suffer consequences relating to their social status. With their work hours at odds with those of their communities, these workers may fail to become completely integrated into the communities within which they live and work because these social groups may not regard them as a part of their communities. In addition to this marginalisation, workers' roles as employees and as members of their family or community, for instance the role of parent or spouse, may be in conflict, inducing further social and family challenges for the worker (Folkard & Monk, 1985).

In South Africa, shift work has been identified as causing family disruptions (Adler, 1991). In the family, the domestic organisation of lives is affected by factors such as keeping the house quiet during the day or deciding whether to follow the family's routine or an independent routine, for example eating times. Furthermore, family relationships can be affected negatively by limiting the length of time that family members spend with one another or by preventing the individual satisfying their personal roles, for example marital roles or parent roles, within the family (Bolino et al., 2021). Around the 1990s in South Africa, 62% of shift workers (in comparison with 31% of day workers) also believed that their work interfered a lot with their sexual relationships. In playing with their children, 63% of shift workers (in comparison with 30% of day workers) felt that their work interfered, with 62% feeling that work prevented them from giving guidance to their children (Adler, 1991). Bolino et al. (2021) found similar results in their research review that non-standard working hours put strain on marriages, decrease time spent with children (depending on the shift schedule) and deteriorate parenting quality.

Despite the growing body of research showing the negative consequences related to shift work, the use of these flexible working schedules among organisations is still common, and in many cases, unavoidable (Bolino et al., 2021; Davy, 2014). For example, in the aviation industry, pilots, flight attendants and traffic controllers are required to work around the clock to keep up with the demands of the industry. There is therefore a need for these organisations to employ alternative strategies to help their workers to manage and/or mitigate the risks of shift-related consequences on their health and well-being.

1.3 Current Shift Work Management Strategies

Shift workers are faced with particular health and safety problems due to their working conditions. These conditions need to be addressed by providing the appropriate conditions of service and in medical, dietary and other preventative measures to promote adaptation to shift work (Adler, 1991; Ritonja et al., 2019). A solution to alleviate fatigue associated with poor sleeping patterns in night-shift workers is to make use of forward rotating shift schedules, provide more rest breaks in their shifts or to allow workers to work shorter shifts of less than 10 hours (Blyton, 1985; Ritonja et al., 2019). Other useful strategies that could be used to manage fatigue in shift workers include changing the workplace temperature, light therapy, listening to music, napping, mental engagement, using caffeine, using technological performance aids, physical stimulation, team strategies and maintaining a dynamic and accurate mental model of the work to be performed (Bolino et al., 2021; Davy, 2011; Lam & Chung, 2021; Ritonja et al., 2019).

Something that has become more popular over the years in the management of shift work is self-rostering. Self-rostering allows employees to select their own working hours based on their personal needs or preferences. This has been seen to increase employee well-being. Davy (2011) mentions a study conducted to determine what the effects of self-rostering were on workers. This study concluded that after a year of self-rostering, shift workers reported less sleep disturbances and a lower need for recovery. Bolino et al. (2021) also mention that flexible working arrangements or flexitime may be helpful in improving productivity (especially for frontline workers), reducing absenteeism rates, decreasing intentions to quit and turnover rates, decreasing negative affect, increasing positive affect and improving job satisfaction among shift workers.

An interesting alternative towards shift work management is adjusting workers' shifts to accommodate their specific chronotypes. Vetter et al. (2015) implemented a shift system where eveningness chronotypes would not work morning shifts and morningness chronotypes would not work night shifts. As a result, they found that aligning workers' hours to their chronotypes was associated with longer sleep duration across their working schedule.

Educational and training programmes also offer a unique and useful alternative to the management of stress and fatigue among shift workers. Davy (2014) argues that in industries such as aviation, the management of sleep deprivation and fatigue is especially important and should require the implementation of Fatigue Risk Management Systems. Although these systems provide a multifaceted approach to managing fatigue and other specific risks, they also sometimes fail to include scientifically-based awareness and educational programmes. These programmes typically provide information and training on the best approaches and strategies to employ when dealing with the effects of shift work and associated work and health-related risks. Strategies may include how to practise good sleep hygiene in both work and home environments and how to recognise and manage sleepiness and fatigue in the context of work.

In South Africa, there seems to be a lack of these types of formal education and training programmes among pilot and air traffic controllers (Davy, 2011). This is cause for great concern as their daily operations include a large number of staff and passengers which make the management of fatigue and sleepiness particularly important. While these programmes generally require large investments in time and expertise, they pay off in the long run by proactively reducing incidences of fatigue-related accidents in and out of the workplace. They also empower workers to take responsibility over their own lives and so yield benefits for both the worker and the organisation. While these education and training programmes are specifically related to fatigue management in the aviation industry, it could be applied to various other shift-related working industries as well and potentially increase their well-being in the process (Davy, 2011). These programmes could focus on raising awareness on a number of related issues, including sleep hygiene, fatigue, managing work-related stress, on-the-job-safety and personal health.

According to Davy (2014), previous studies that have implemented such fatigue management programmes aiming to help workers manage a shift work lifestyle have found positive results for both the workers and organisations. Workers, for instance, reported

enhanced perceptions of their health, less gastrointestinal-related problems, improved quality and quantity of sleep, reduced intake of caffeine and improved time management with work and home-related duties. Organisations, on the other hand, benefited from reduced absenteeism rates, reduced turnover rates and fewer fatigue-related accidents in the workplace. Such programmes therefore provide an effective alternative to those organisations that are not able to provide their staff with traditional day working hours.

1.4 Personal Resources Development as a useful Shift Work Management Strategy

Some researchers argue that behavioural factors may be connected to shift work tolerance through certain coping strategies (Ritonja et al., 2019). Workers who have more favourable coping strategies, like healthy eating behaviours and exercise, may show a higher inclination towards shift work tolerance. In contrast, workers who show a stronger shift work tolerance may also develop healthier behaviours compared to those with weaker shift work tolerance (Ritonja et al., 2019).

In addition to these physiological coping strategies, some researchers have found certain psychological traits to be related to shift work tolerance. Langenhoven and Boonzaier (2015) found that enhanced personal resources in call-centre workers increased their ability to cope with work demands, which resulted in increased work engagement among workers. Roemer and Harris (2018) also mention that the accumulation of personal resources facilitates a person's ability to cope with stress, which could be especially helpful for organisations to prevent the incidence of burnout in the workplace. Some of the most common types of personal resources include resilience, self-efficacy, hope and optimism (Roemer & Harris, 2018).

Bolino et al. (2021) further emphasise that while shift work is generally unappealing to most people, some shift schedules may be appealing to certain individuals. This suggests that it may be worthwhile to further investigate the fit between the work schedule and the worker based on personal factors such as personality, living situation or any other reason that may influence a person's preference for working non-standard working hours. It is therefore important that future studies consider mediating or moderating variables when looking at shift work and its outcomes (Bolino et al., 2021).

A fit between work schedules and personal factors provides an alternative approach that organisations could use in the management of shift work-related consequences. Instead of organisations trying to focus on interventions that would help to eliminate or mitigate the negative outcomes associated with shift work, such as burnout, they could instead focus on preventative measures that influence and build on their workers' abilities in coping successfully with the work demands presented in shift work. Ritonja et al. (2019) emphasise that more research on psychological traits is needed when considering behaviours and coping among shift workers.

Given all of the opportunities that shift work management programmes offer to employees, it is still important to develop these programmes and interventions in the context of South Africa. South Africa is particularly challenging when trying to understand the impact of shift work and related working arrangements, as the effects of HIV/AIDS, violence-related trauma, cardiovascular disease and infectious disease add further complexity to the matter (Davy, 2011). To develop appropriate management-related educational programmes and interventions, the family and social life situations of South African shift workers, together with these other context-specific challenges, would need to be understood. Research that includes these South African-specific challenges in the understanding of work shift-related consequences will also add to the local body of knowledge that leads to a more precise and relevant understanding of shift work in South Africa.

1.5 Research Initiating Question

Given the consequences related to shift work for both workers and organisations, and the increase in the likelihood of organisations increasing their use of shift work, more research is needed to explore the salient influencing factors associated workplace well-being and general health in the South African shift workforce. Bolino et al. (2021) emphasise that it is increasingly important to further our understanding of non-standard working schedules and their associations with the negative consequences thereof. They further suggest that more attention needs to be given to theory development surrounding the implications of working non-standard hours. Further research is also needed on factors that may manage and/or mitigate the adverse consequences of shift work in order to develop contextually appropriate interventions (Brown et al., 2020). This study therefore aimed to answer the following

research initiating question: What causes variance in burnout, engagement and general health in South African shift workers?

1.6 Research Goal and Objectives

We cannot always assume that shift workers know how to cope with their working schedules and that they know how to manage the negative consequences thereof (Davy, 2014). This being said, we can also not assume that people know how to recognise and manage burnout and general health when it comes to shift work. It is therefore important, especially in the context of South Africa, to develop appropriate interventions and programmes that will educate and train workers across various industries to be able to recognise and cope with stress related to shift work as a way to decrease their risk of burnout and general health issues.

Therefore, the **primary research goal** was to explore salient factors that cause variance in burnout, engagement and general health in shift workers. The **research objectives** were as follows:

Objective 1: To explore salient factors that cause variance in burnout, engagement and general health in shift workers.

Objective 2: To use the results to suggest interventions to manage the variables of burnout, engagement and general health among the shift work population.

Objective 3: To provide recommendations of future research in the variances in burnout, engagement and general health among shift workers.

Chapter 2: Literature Review

2.1 Introduction

This chapter aims to conduct a comprehensive and thorough review of all the relevant literature in an attempt to gain a better understanding of some of the most important variables influencing burnout, engagement and the general health of South African shift workers. To gain this understanding, the Job Demands-Resources (JD-R) theory is discussed and applied as a theoretical framework within the context of shift work. Burnout, engagement and general health are then discussed and conceptualised in more detail in order to gain a better understanding of their underlying constructs. Work schedule, chronotype, psychological capital, and job characteristics are identified as salient variables that influence burnout, engagement and general health in shift work and so are discussed in more detail. The relationships between all of these variables are then hypothesised and depicted in a conceptual model which served as the conceptual framework for this research study.

2.2 The Job Demands-Resources Model as the Theoretical Framework

To date, the JD-R theory has been used by many organisations, government agencies and Occupational Health and Safety regulators globally as a way to inform risk assessments and psychosocial education activities and policies. This model was originally used as a way to explain burnout, but has now, since its development more than 15 years ago, also been used to explain various types of employee well-being (Bakker & Demerouti, 2017). The JD-R model is therefore a highly valuable framework to use in providing context for the problem of shift work in South Africa.

Bakker and Demerouti (2017) state that all aspects of a job can be classified into one of two separate categories, namely job demands or job resources. Job demands instigate a health impairment process and include those aspects of the job requiring sustained physical or psychological effort and are associated with physiological or psychological costs as a result. These job aspects, such as shift work, are therefore seen as risk factors and important indicators of health problems, such as cardiovascular disease and depression, and predict burnout over time. This job strain is seen to have a negative impact on performance. Job resources, on the other hand, instigate a motivational process and include aspects of the job that help to achieve work goals, reduce job demands and their effects, and stimulate personal

growth. Thus, job aspects, such as autonomy and performance feedback, are important indicators of motivation and can predict organisational commitment and positive well-being over time. This motivation has a positive impact on performance.

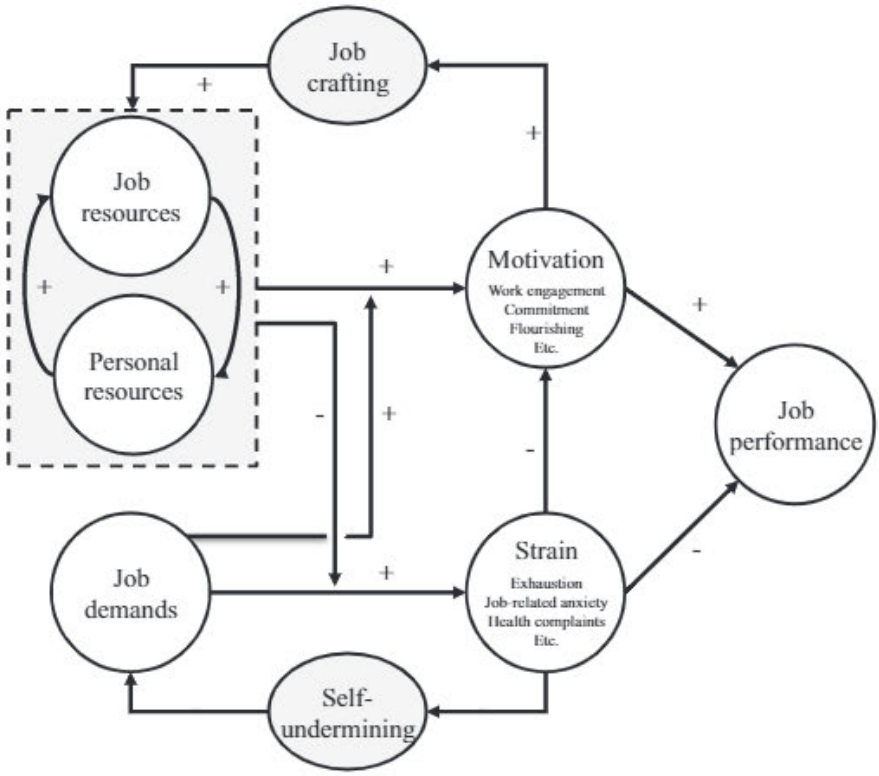
The JD-R model further proposes that job resources buffer the impact of job demands on strain and that job resources also influence motivation most when job demands are high. So, job resources become particularly useful when they are most needed (Bakker & Demerouti, 2017). Some researchers have argued that certain types of job demands can also add to the motivation process and have thus made the distinction between challenge job demands and hindrance job demands. Hindrance job demands are undesirable job aspects that inhibit an individual to achieve their goals and therefore result in burnout and health issues. Challenge job demands, on the other hand, are referred to as those job characteristics that cost effort but have the potential to aid the individual in their achievement and to promote their personal growth. Challenge job demands can therefore play a positive role in the motivational process and in job performance. The distinction between hindrance job demands and challenge job demands is not always clear and largely depends on the work context. More research is needed to determine the conditions under which job demands act as challenges or hindrances (Bakker & Demerouti, 2017).

In addition to job resources, personal resources are also argued to buffer the negative impact of job demands on strain and enhance motivation. Personal resources can be defined as an individual's belief of the amount of control they have over their environment. Psychological capital (PsyCap) is a great example of personal resources. PsyCap refers to an individual's psychological state of development characterised by four facets of self – efficacy, hope, resilience and optimism (Roemer & Harris, 2018). Job resources aid the development of personal resources, allowing employees to flourish in the workplace and cope with work-related challenges. Bakker and Demerouti (2017) state that personal resources, in return, also aid in an individual's creation of job resources. Personal resources enhance engagement through the motivational process, and engaged employees are motivated to stay engaged and to create their own job resources over time. Thus, job resources affect personal resources positively, and vice versa, which contribute positively to employees' well-being and buffer the effects of job demands. However, Bakker and Demerouti (2017) suggest that further research is needed on the interaction between job demands and personal resources.

Since the early development of the JD-R theory, Bakker and Demerouti (2017) incorporated two additional propositions into the model. The first recognises that individuals are often proactive by changing their current work tasks and situation through personal initiative. Employees who are motivated are likely to engage in job crafting behaviours, which further enhance their motivation, increase their job and personal resources, and also decrease the negative impact of job demands. The second proposition added to the JD-R model suggests that it is not only job demands that cause strain, but also the employees' experience of strain that often leads to the perception and creation of more job demands over time. This process is the result of self-undermining behaviour. Thus, employees who experience high strain from their work are more prone to engage in self-undermining behaviours which result in an increase in job demands and a further increase in their level of strain. Bakker and Demerouti (2017) summarise the JD-R theory in the model depicted in Figure 1.

Figure 1:

The Job-Demands Resources Model



Source: Bakker & Demerouti (2017)

2.3 Variables

Shift work and the tolerance of working these unorthodox hours is a complex phenomenon and include a variety of physically and psychologically determined factors (Ritonja et al., 2019). Through theoretical exploration on the topic of shift work in the introductory argument, the salient outcome variables associated with non-standard work schedules include burnout, engagement and general health. These variables are therefore discussed in more conceptual detail.

In terms of the latent variables identified to influence these outcome variables, it is important to bear in mind that shift work tolerance is a multi-factorial construct that involves physical, psychological, behavioural and social differences. The literature shows that men, ethnic minorities and part-time employees are more likely to be shift workers (Brown et al., 2020). Furthermore, factors consistently positively related to shift work tolerance are younger age, eveningness types, low languidity, neuroticism, extraversion, an internal locus of control, flexibility and male sex (Ritonja et al., 2019).

While there are various factors that influence the health and work well-being of shift workers, the latent variables to be discussed for the purposes of this research focus on (non-standard) work schedule as a job demand, job characteristics as a job resource, psychological capital as a personal resource and chronotype as an additional personal attribute.

2.3.1 General Health

In order for organisations to survive in a continuously changing environment, they need to have employees who are in overall good health and show signs of positive well-being (Schreuder & Coetzee, 2016). In looking at the concept of well-being, there are two perspectives in definition, namely hedonia and eudaimonia. The hedonic perspective defines well-being as the experience of maximised pleasure and the avoidance of pain (Schreuder & Coetzee, 2016). Hedonic well-being is therefore affective in nature (Roemer & Harris, 2018). The eudaimonia perspective, on the other hand, defines well-being in terms of the content of an individual's life and the different processes that are involved in living a good life (Schreuder & Coetzee, 2016). Eudaimonic well-being refers to living life congruent to one's "true self" (Schreuder & Coetzee, 2016) and involves individuals striving to become the best that they could possibly be. Individuals therefore show eudaimonic well-being when they are motivated and actively strive to achieve their fullest potential and show a positive

psychological functioning (Roemer & Harris, 2018). Roemer and Harris (2018) state that the distinction between hedonic and eudaimonic well-being is more philosophical than scientific in nature, as previous studies have shown that there is a high correlation between their underlying constructs. Thus, well-being is considered to incorporate both hedonic and eudaimonic characteristics, which translate into one general well-being factor.

In applying this definition of holistic well-being to the shift worker population, it is well known that these workers present with various negative health outcomes in terms of their physical, mental and social functioning and well-being. Physically, shift workers often sleep less and have a worse sleep quality compared to workers who work normal hours. They therefore experience persistent and recurring patterns of sleep disturbances which impact negatively on their functioning (Boivin et al., 2021; Brown et al., 2020; Davy, 2014; Geiger-Brown et al., 2011) and make them vulnerable to negative health risks such as burnout, fatigue, deficient physical activity, cardiovascular disease events, gastrointestinal problems, cancer (Boivin et al., 2021; Bolino et al., 2021; Brown et al., 2020; Davy, 2014; Gibson, 2022), and COVID-19 infections (Oved et al., 2021). Additionally, shift workers are also more at risk of experiencing psychological health problems such as depression, anxiety, and alcohol abuse (Boivin et al., 2021; Bolino et al., 2021; Brown et al., 2020). Poor social functioning is also often correlated with shift work as many workers frequently experience social and domestic problems, with many shift workers often reporting poor social activity engagement (Boivin et al., 2021; Bolino et al., 2021; Brown et al., 2020), a lack of integration within their communities and further social and family challenges as a result of role conflict (Bolino et al., 2021; Folkard & Monk, 1985; Maume & Sebastian, 2012).

Taking these prominent health and well-being issues into account, general health for the purposes of this research refers to an individual's functioning and well-being in the physical, psychological and social life domains. The conceptual definition of general health in this study therefore aligns with Hays and Morales' (2001) definition of health-related quality of life (HRQoL), which refers to the ways in which health impacts on a person's ability to function and on their perceived physical, psychological and social well-being. An individual's ability to function relates to basic activities (e.g. bathing and dressing), work related activities (e.g. paid work or household chores), and social functioning (e.g. interacting with friends and family). The functioning part of an individual's HRQoL is more objective as the self-report information gathered from an individual can be compared to other observed or performance-driven measures of data (Hays & Morales, 2001). The well-being part of

HRQoL, on the other hand, is more subjective in nature as it relies on the subjective perceptions of individuals (Hays & Morales, 2001).

Therefore, for a clearer conceptualisation, well-being involves a holistic positive assessment on the physical, psychological and social domains of life. This includes the emotional well-being of an individual (e.g. whether they are happy, sad, anxious or depressed), whether they are energetic or lethargic and whether they are in pain or not in pain (Hays & Morales, 2001). When looking at one of the most well-known measures of HRQoL, the 36 Item Short Form Survey (SF-36), factor analyses revealed strong support for a 2-factor model of health: physical health and psychological health (Hays & Morales, 2001). Social functioning and well-being, along with general perceptions of health and energy/fatigue, are reflected in both of these dimensions (Hays et al., 1994). The functioning and well-being part of HRQoL can therefore be divided into two main dimensions: physical health and psychological health.

2.3.1.1 Physical Health

Physical health consequences of non-standard schedules generally include conditions like cancer, heart problems, and physical injury (Bolino et al., 2021). Looking at these consequences in more depth, the physical health dimension of HRQoL looks at an individual's physical functioning and any role limitations that arise from physical health problems (Hays & Morales, 2001). Additionally, level of pain, energy or fatigue, social functioning and general health perceptions also affect an individual's physical health (Hays et al., 1994). Therefore, individuals can be seen to be physically healthy when they do not experience any limitations in the activities that they do because of their physical health and when their physical health does not impede their ability to fulfil their roles in terms of doing work or other regular daily activities. In addition, physically healthy individuals are also able to function in social activities (interact with friends, family or other groups), experience little to no pain, feel more energetic than lethargic and have general positive perceptions of their health (Hays et al., 1994).

2.3.1.2 Psychological Health

The psychological health consequences of shift work look at an individual's psychological well-being, and usually include depression, anxiety and other psychological health impairments (Bolino et al., 2021). Looking at the HRQoL definition, the psychological

health dimension involves an individual's emotional well-being and any role limitations that arise from emotional problems. As is the case with physical health, an individual's level of pain, energy or fatigue, social functioning and general health perceptions will also influence their psychological health and are therefore also included in its definition (Hays et al., 1994). Thus, an individual has good psychological health when their emotional problems do not interfere with their ability to do work or other regular daily activities and when they have a generally positive mood or affect (i.e. do not suffer from depression, anxiety or other general negative moods or affect). Additionally, the health of these individuals will also not impede their ability to function in social activities and interact with friends, family and other groups; they do not feel pain to the extent that it will interfere with their roles, they feel energetic rather than lethargic and have general positive perceptions of their health (Hays et al., 1994).

2.3.2 Engagement

Work engagement has a strong motivational power that has shown to be important in work life and the health of workers (Hakanen & Lindbohm, 2008; Parzefall & Hakanen, 2010; Salanova et al., 2005). Engagement is the worker's experience of fulfilment and positive feelings due to work (Pienaar & Willemse, 2008). It refers to the involvement, satisfaction and enthusiasm that an individual has with the work that they do (Robbins et al., 2016). Engagement is also seen as a pervasive state. It is not focused on any one event, individual or object (Schaufeli, Martinez et al., 2002). This positive and pervasive motivational state further allows workers to be creative and persistent at work and further increases performance (Barnes & Collier, 2013; Christian et al., 2011). Engagement is therefore an important concern for organisations.

Engagement includes three components, including a physical, cognitive and emotional component. The physical component, known as vigour, refers to the individual being energetically involved in their work. The cognitive component, known as absorption, describes the individual as being mentally alert and absorbed in their work. Finally, the emotional component, known as dedication, refers to the individual finding meaning in their work and showing dedication to their work tasks (Schaufeli, Salanova et al., 2002; Schreuder & Coetzee, 2016). According to Chandni and Rahman (2020), this multidimensional approach is the most accepted operationalisation of employee engagement and will therefore be used in this research paper.

2.3.3 Burnout

Burnout is defined as a negatively persistent state of mind characterised by exhaustion, distress, decreased motivation, a sense of ineffectiveness and the development of dysfunctional behaviours and attitudes at work (Schreuder & Coetzee, 2016). It is the consequences of prolonged exposure to chronic job stress, which arises from the perception of environments being too difficult or intimidating (Kokt & Ramarumo, 2014). In other words, it involves an imbalance of personal and job demands placed on an individual and can be seen as the final stage of breakdown (Kokt & Ramarumo, 2014). This prolonged exposure to job stress could cause chronic dysfunction at work.

Burnout has been the subject of many debates in its definition, conceptualisation, antecedents and how it is best measured. One central debate is whether burnout consists of one, two or three dimensions (Cox et al., 2005). According to Schaufeli (2003), burnout can be globally conceptualised by three distinct characteristics, namely exhaustion, cynicism and a low professional efficacy.

Exhaustion refers to the depletion of emotional and cognitive resources in the individual. The exhaustion characteristic represents the energetic component of burnout in that individuals feel "used up". Individuals who experience burnout generally feel like their energy has been drained and are therefore not able to perform (Schaufeli, 2003; Schreuder & Coetzee, 2016). Cynicism refers to the mental distancing of an individual through a negative detached response to their job and a cynical attitude towards their work, fellow colleagues and/or customers (Schreuder & Coetzee, 2016). The cynicism (mental distancing) characteristic represents the attitudinal component of burnout in that individuals display a cynical attitude (Schaufeli, 2003). Individuals who experience burnout become increasingly intolerant of exerting any effort at work, and therefore adopt an unwillingness to perform. This psychological withdrawal from work is seen as a dysfunctional coping mechanism to manage high levels of job demands, resulting in exhaustion and underperformance. In turn, job demands and exhaustion increase even further, resulting in a continuous negative cycle (Schaufeli, 2003). Low professional efficacy refers to an individual's feelings of being unable to perform their job successfully as required and the inability to meet customers' needs (Schreuder & Coetzee, 2016). The low professional efficacy characteristic represents the evaluative component of burnout in that individuals become self-doubting when evaluating their competence on the job (Schaufeli, 2003).

According to Cox et al. (2005), there are many researchers who remain loyal to the original three component conceptualisation of burnout (Maslach & Jackson, 1986; Taris et al., 2005), and therefore perceive the Maslach Burnout Inventory (MBI) to be the golden standard when measuring burnout. However, there are also many researchers who question whether all three of these MBI components (emotional exhaustion, depersonalisation and a lack of personal accomplishment) are necessary (Bekker et al., 2005; Kristensen et al., 2005; Schaufeli & Taris, 2005). Most agree that emotional exhaustion is the core component of burnout (Cox et al., 2005). To this end, authors such as Kristensen et al. (2005) and Bekker et al. (2005) argue that burnout is a unidimensional concept that consists primarily of exhaustion and that the other dimensions (a lack of personal accomplishment and depersonalisation) do not form part of the burnout phenomenon. These researchers in favour of this unidimensional concept argue that depersonalisation is a coping strategy that is developed in a specific situation and should therefore be studied and analysed together with other coping strategies related to stress. They further argue that the lack of professional efficacy is seen as a consequence of long-term stress and therefore does not form part of the burnout syndrome.

While Bekker et al. (2005) argue that burnout is primarily a form of work-related exhaustion, Kristensen et al. (2005) take it a step further by arguing that burnout is a general form of exhaustion, not necessarily related to work. Their argument therefore aligns with the Copenhagen Burnout Inventory (CBI) measure. The CBI measures three separate scales, including personal burnout, work-related burnout and client-related burnout. These domains allow for burnout to be measured in various domains as they argue against burnout being specific to the human service professions and in relation to work only. However, this argument seems to equate burnout to fatigue, which makes the term redundant and further makes the need for the development of burnout measures purposeless (Schaufeli & Taris, 2005).

Schaufeli and Taris (2005) therefore argue against these authors by stating that burnout is not context free and is a phenomenon that should be conceptualised in relation to work. They further argue that while the third component, personal accomplishment, is not as important to burnout (as it is also seen as either a precursor or consequence of burnout), the concept does consist of two inseparable parts, including inability (exhaustion) and unwillingness (withdrawal or depersonalisation). This conceptualisation aligns more with the Oldenburg Burnout Inventory (OLBI) measure of burnout, which argues that burnout can be

conceptualised by exhaustion (both cognitive and physical components which lead to a broader conceptualisation of burnout) and ‘‘disengagement’’ (or the counterpart of depersonalisation).

The stance taken by this research paper therefore aligns with Schaufeli and Taris (2005), who conceptualise burnout as a work-related phenomenon that consists of at least two dimensions: exhaustion and depersonalisation, that can be measured generally across a wide variety of occupations.

2.3.4 Work Schedule as a Job Demand

When looking at the negative outcomes associated with shift workers, working non-standard hours consistently come up as a common theme. It appears that the work schedule itself can be considered an important aspect of the work context that should be integrated into a broader framework of work design to better understand its effects and implications. This will especially be of value when incorporating it into a framework that considers other important determinants of employee attitudes and well-being (Bolino et al., 2021), such as the JD-R model.

Shift work can be regarded as the hours largely worked outside of the typical 09:00 to 17:00 workday (Brown et al., 2020; Wickwire et al., 2017). While Brown et al. (2020) and Wickwire et al. (2017) state that there is no universally accepted definition of shift work, the general categories found in the Shift Work Index (Barton et al., 2007) can be used as a guideline in defining work schedules. Work schedules may therefore include a morning (or early) shift, an afternoon (or early evening) shift and a night shift. It may also involve a rotation of day and night shifts. Each of these types of shifts, ranging from early morning to the late nights, has a different severity of consequences for the health and well-being of workers.

Most people consider shift work to be unadaptable to and physically onerous. Adler (1991) states that around the 1990s, 92% of South African shift workers and 95% of South African day workers preferred to work days only. For shift workers, adaptation to the inversion patterns of day and night activity can be lengthy, with full adaptation unlikely to be achieved. Shift work that takes place at night is especially physically challenging and demanding as it requires an individual to work against their biological clock (Blyton, 1985; Boivin et al., 2021).

An individual's circadian rhythm is innately more active during the day, with the body's temperature, blood pressure, breathing rhythm, pulse, cortisol levels and brain activity being higher. This all slows down and deactivates at night along with increased levels of melatonin (Blyton, 1985; Boivin et al., 2021; Wickwire et al., 2017). Therefore, an individual's rhythm is suited to day-time work, evening leisure and sleeping at night. This rhythm is not only applicable to the biological level but also shows in our environmental and social behaviours (Folkard & Monk, 1985). Therefore, further strain is placed on the individual as night shift work entails that the individual has to sleep during the day when the body is more active. Not surprisingly, this often leads shift workers to develop Shift Work Disorder (SWD), a circadian rhythm sleep-wake disorder characterised by excessive sleepiness during the waking period and insomnia during the sleep period (Wickwire et al., 2017). Chang and Peng (2021), in their meta-analysis, support this argument through their findings that found nurses who worked fixed night shifts showed poorer sleep quality than those who worked a fixed day shift. However, they further found that nurses who also worked rotating shifts had similar poor sleeping patterns.

Further implications arise based on an individual's tenure in the shift work industry. The negative implications of shift work are seen to develop in four phases, namely the adaptation phase, sensitisation phase, accumulation phase and a manifestation phase (Folkard & Monk, 1985). The adaptation phase takes place within the first five years of shift work. The individual has to overcome the new challenges associated with shift work and adapt to the new work environment, co-workers, work tasks and circadian rhythms alterations. In the sensitisation phase, which is from the fifth to the twentieth year of shift work, the individual needs and is pressured to improve family and working conditions. Their attitudes towards their work may change depending on the coping strategies used and state of career success. Their level of well-being therefore depends on their satisfaction with their work, family and social lives. The accumulation phase takes place from the 20th year of shift work up until the 40th year. Living, financial, social and family lives remain constant or improve as environmental hazards, risky behaviours and the negative aging factors associated with shift work tend to increase. Risk factors and quality of sleep show the strongest negative correlation to individual health and well-being in this phase. The final phase, manifestation, takes place from year 40 of shift work and beyond. Serious and chronic health disorders, such as gastrointestinal diseases, are at their highest peak during this phase.

Age is also negatively associated with shift work (Wickwire et al., 2017). Individuals in the late 40s and early 50s view shift work as more intolerable (Folkard & Monk, 1985). This may be related to four factors. As age is usually associated with work experience, the cumulative negative effects of shift work may cause older workers to find their work more intolerable. Age is also associated with a decline in health and coping abilities, which may lead to the inability to cope with the demands of shift work. An increase in age also causes circadian rhythms to flatten and for workers to become more sleep fragile (Folkard & Monk, 1985). This relationship is supported by other studies that suggest that older workers have a lower adaptability to the altered circadian requirements of shift work (Harma et al., 1994) and report more disturbed sleep and higher levels of sleepiness and fatigue as a result of shift work (Harma et al., 1994; Sack et al., 2007; Smith & Mason, 2001). In essence, research suggests that when it comes to shift work, older age is associated with increased vulnerability to negative consequences as a result of changes that affect the homeostatic and circadian sleep-wake systems (Wickwire et al., 2017).

While age and tenure, in addition to other characteristics, are seen to exacerbate the negative effects of shift work, it is clear that the different types of shifts, ranging from early morning to late nights, vary in their severity of negative consequences on workers (Boivin et al., 2021; Chang & Peng, 2021; Folkard & Monk, 1985; Wickwire et al., 2017). Working normal day-time hours (09:00 to 17:00) appears to be the least demanding as workers work according to their biological clocks. As the working hours become more "non-standard", so would it appear to produce more negative strain on the worker. Night work and a rotation of day and night shift would produce the most strain. Working at night would involve working against the human biological clock, making it the most physically demanding and challenging shift (Blyton, 1985; Gibson, 2022). The rotation of day and night shift, with intermittent rest days, could be argued to have an even worse effect as it further hinders circadian adaptation (Blyton, 1985). Individuals who work two weeks to a month on the same type of shift have the opportunity for their circadian rhythms to adjust somewhat to this work demand (Canadian Centre for Occupational Health & Safety [CCOHS], 2017). The problem then occurs on their days off as they revert back to their normal schedules or when they are expected to work the inverse pattern of their shift, as this hinders any form of adaptation to take place. A rotation of night and day shifts is therefore argued to be the most demanding and detrimental to the health and well-being of workers (Bolino et al., 2021). However, rapid shift rotation could possibly reduce this disruption (CCOHS, 2017; Itani & Kaneita, 2016).

Folkard (2008) also concludes in their study that only a small minority of permanent night shift workers completely adjusted their circadian rhythms to their shift schedules and further argues that rapidly rotating shift schedules are less detrimental to workers. It is clear that further research is still needed on which type of shift (permanent night shift or rotating shifts) produces more strain. It should also be noted that while many workers have negative perceptions of shift work, especially night shifts, individual differences could influence how employees feel about shift work (Bolino et al., 2021), and should therefore also be investigated.

2.3.5 Job Characteristics as a Job Resource

Bolino et al. (2021), in their review on non-standard work schedules, emphasise the need of future research to investigate contextual factors, such as quality of work or the motivating potential of the work, and their influence on how workers respond to non-standard working schedules. As job characteristics are seen as an important contextual factor that could influence motivation, job satisfaction and other employee outcomes, it is worthwhile investigating their influence within the realm of shift work. Job characteristics in the context of this research refer to the five job characteristics formulated by Hackman and Oldham (1974) in their job characteristics model. The job characteristics model describes the nature of jobs and is a widely used framework for job redesign (Boonzaier et al., 2001). This model proposes that jobs can be described through five core job dimensions, which include skill variety, task identity, task significance, autonomy and feedback.

According to Hackman and Oldham (1974), skill variety refers to the degree to which the job involves the use of a variety of skills or different activities to be carried out by the employee in order to complete the work. Task identity is the degree to which the job requires the completion of a whole piece of work from beginning to end. Task significance refers to the degree to which the job has a meaningful impact on the work or lives of others, whether internal or external to the organisation. Autonomy on the job is linked to the degree of responsibility that the job provides to the employee in that the job allows the employee a lot of freedom and independence in getting the job done. Thus, it involves scheduling their own work and freely carrying out the work according to their own procedures. Finally, feedback from the job refers to the degree to which clear and direct information is provided on the effectiveness of the employee's performance as the work activities are carried out. This feedback contributes to the employee's knowledge of results.

The job characteristics model further proposes that these five core job characteristics or dimensions determine whether the three psychological states are experienced, which in turn influence the internal work motivation, job satisfaction and growth satisfaction of an employee. The three psychological states include experienced meaningfulness of the work, experienced responsibility in the job and knowledge of results (Hackman & Oldham, 1976). Meaningfulness of the work is experienced when a job contains high skill variety, task identity and task significance. It refers to the extent to which the job is identified with, and the work found meaningful. Responsibility on the job is experienced when there is a high presence of autonomy on the job. It involves personal responsibility on the part of the employee towards the success or the failure of work outcomes. Knowledge of outcomes is experienced when a job has a high degree of feedback. Thus, this psychological state is experienced when continuous knowledge on the effectiveness of job performance is given and understood (Hackman & Oldham, 1976; Robbins et al., 2016).

All five job characteristics mentioned can be used to calculate a single factor indicator of the overall motivating potential of a job. The motivating potential score (MPS) indicates the extent to which these five job characteristics are present in the job. The higher the presence of these five core job characteristics in the job, the higher the motivation, satisfaction and performance potential should be in the job (Hackman & Oldham, 1976; Robbins et al., 2016). As a higher presence of these five core job characteristics involves a motivational process, they are seen as a job resource within the JD-R model. In a South African study of more than 6,000 employees in 130 job categories, Boonzaier and Boonzaier (1994) confirmed the basic tenets of the model.

2.3.6 Psychological Capital as a Personal Resource

Achieving success in any organisation depends on the physical and psychological participation of workers (Çavuş & Gökçen, 2015). PsyCap therefore plays a significant role in sustaining a competitive advantage in any industry. PsyCap is a higher order construct which incorporates the four distinct dimensions of self-efficacy, hope, resilience and optimism. It includes the strengths and positive aspects of human behaviour and originates in postmodern positive psychology (Çavuş & Gökçen, 2015). All of the four dimensions of PsyCap share variance with one another and contribute to attitudes that are desirable, goal accomplishment and workers' motivational levels (Roemer & Harris, 2018). PsyCap is adaptable and can be developed in individuals. Previous studies have shown success in being

able to develop and enhance individual levels of PsyCap through interventions (Roemer & Harris, 2018). Thus, organisations are able to develop and influence their employees' levels of PsyCap as a way to decrease burnout and work-related-stress in shift workers. The four dimensions of PsyCap are discussed in the sections that follow.

2.3.6.1 Self-efficacy

Self-efficacy refers to the personal belief of having the ability to perform required tasks successfully (Çavuş & Gökçen, 2015; Roemer & Harris, 2018; Schreuder & Coetzee, 2016). Individuals who have high self-efficacy feel motivated and energised in achieving goals and completing tasks as they believe that they have the necessary competencies and skills in order to perform their work well (Roemer & Harris, 2018).

2.3.6.2 Hope

Hope is defined as the cognitive state that drives individuals to achieve their goals by allowing them to set goals that are challenging as well as finding ways in which to achieve those set goals (Çavuş & Gökçen, 2015; Roemer & Harris, 2018). According to Snyder (2002), hope consists of two key components, namely that of pathways and agency. The pathways component refers to the planning that an individual engages in to meet goals and includes producing a route of action to achieve a goal successfully. In addition, pathways thinking also involves finding plausible alternative routes when the original plan to meet a goal is no longer possible. The agency component involves an individual's goal-directed energy and refers to their perceived mental energy to plan and achieve their goal. Agency thinking becomes particularly important when individuals face adversity as it helps them to gain the necessary motivation to find alternative ways to reach their goals. According to Roemer and Harris (2018), self-control and self-regulatory behaviours are also important for effective pathways thinking and agency, as it helps in the management of feelings, cognitions and behaviours that may impede goal attainment.

Individuals with high hope can therefore be seen as decisive in their production of a plausible route which they are confident will achieve their desired goal, they are able to find alternative ways to achieve their goals when needed, and they have the mental willpower to achieve their goals. Individuals who have low hope, on the other hand, tend not to develop well-articulated routes of action in achieving their goals, are unlikely to produce any

alternative routes of goal attainment and/or do not have the mental willpower to achieve their goals (Roemer & Harris, 2018).

2.3.6.3 Resilience

Resilience refers to the ability to adapt and grow in the face of adversity (Çavuş & Gökçen, 2015; Roemer & Harris, 2018). In the work setting, resilience refers to an individual's ability to demonstrate competence when experiencing adversity in the workplace, and professionally growing and developing from these adverse work experiences (Luthans et al., 2015). According to Luthans et al. (2015), many factors have been found to contribute to or hinder the development of resilience which can be classified into assets, risk factors and values. They emphasise that although risk factors can hinder the development of resilience, they also provide the opportunity to develop skills that would have not been discovered if not for those hindrances. Thus, risk factors also provide the opportunity for growth and skills development that may contribute to coping with future challenges successfully (Roemer & Harris, 2018). Individuals who have high resilience are therefore more likely to cope with stressful work situations.

2.3.6.4 Optimism

Optimism can be defined as one's general positive expectations that good outcomes will occur in the future and having an optimistic explanatory style that attributes failures to external, temporary factors and successes to internal, stable factors (Çavuş & Gökçen, 2015; Roemer & Harris, 2018; Schreuder & Coetzee, 2016). According to Roemer and Harris (2018), both of these elements in the definition of optimism are important, as positive expectations only occur in PsyCap optimism if one makes the correct attributions as to why certain events happen. An important aspect of PsyCap optimism is an individual's ability to adjust their level of optimism according to the required circumstances (Roemer & Harris, 2018). Perceptions of reality might become distorted if failure is consistently attributed to external factors. In addition, gratitude should also be shown to external factors which have contributed towards successes.

Individuals with high levels of optimism apply positive behavioural and cognitive strategies to manage and cope with critical life events (Schreuder & Coetzee, 2016). They practise positive cognitions on life by being lenient with their past, appreciating their present and seeking opportunities for their future (Roemer & Harris, 2018). Being confident about

their future, optimists tend to exert continuous effort to attain their goals, even when faced with adversity, and when an important goal becomes blocked, they reappraise their situations in a positive manner (Schreuder & Coetzee, 2016). Their coping strategies are generally problem-focused or emotion-focused in nature, depending on the context of the problems that they face.

2.3.7 Chronotype as a Personal Attribute

Brown et al. (2020) emphasise that the most important characteristic in shift work tolerance is the role of a person's "chronotype". Chronotype is also known as the individual differences in circadian preference (Roeser et al., 2015). The daily functioning of an individual's brain and body is regulated by a combination of circadian rhythms and homeostatic processes (Volk et al., 2017). These two processes interact with one another to determine the time of day in which the individual reaches their energetic peak, both physically and mentally (Urbán et al., 2011). An individual's chronotype is determined by the combination of genetics, the stages of human development and external influences (or "zeitgebers") (Hittle & Gillespie, 2018; Roeser et al., 2015) and therefore acts independently from the time spent awake. An individual's chronotype affects almost all of their physical and psychological processes (Volk et al., 2017), which makes it a critically important latent variable to examine when looking at employee health, burnout and work engagement.

Urbán et al. (2011) state that there are two different approaches found in chronotype studies – typology versus continuum. The first approach identifies different types in diurnal preferences. However, there is no firm agreement on the number of types in chronotype there is. For example, some studies identify two types, being morningness and eveningness (Horne & Östberg, 1976), while other studies identify three or more types: morningness, intermediate and eveningness types (Natale & Cicogna, 1996). Horne and Östberg (1976) further propose five types, from definitely morning type, three intermediate types, to definitely evening type. In research more known to the open public, chronotypes are commonly known as "early larks" or "early birds" and "night owls" (Urbán et al., 2011), or by the famous psychologist, Michael Breus (TEDX Talks, 2019), they are known as the "Lion" (morningness type), "Bear" (intermediate), "Wolf" (eveningness type) and the "Dolphin" (insomniacs). The second approach views chronotypes on a continuum between the two extremes: morningness and eveningness. Natale and Cicogna (2002) argue for the use of the morningness-eveningness continuum, as do Caci et al. (2009), who revealed in their psychometric analysis

that morningness-eveningness scales are multidimensional. In this study, classification was done using approximate categorisation. Thus, based on where individuals lie on the morningness-eveningness continuum, they were classified as being one of three chronotypes, namely morning, evening and intermediate chronotypes (Volk et al., 2017). The focus was those individuals who are classified as being a morningness type or eveningness type.

Approximately 60% of the population are intermediate chronotypes, while the rest of the population are either morning or evening chronotypes (Hittle & Gillespie, 2018). Morningness types prefer to get up and go to bed earlier than do eveningness types and feel more awake and functional in the early hours of the morning. Eveningness types, on the other hand, feel more energetic and productive in the late afternoon and evening hours, and thus prefer to get up and go to bed later than morningness chronotypes (Folkard & Monk, 1985; Roeser et al., 2015; Wickwire et al., 2017). According to Volk et al. (2017), intermediate chronotypes fall somewhat in the middle of the morningness and eveningness chronotypes in their energetic peaks and circadian preferences. Along with their energetic and productive peaks, there are other differences found among these different chronotype population groups, especially between the morningness and eveningness types.

Age and sex differences have been found among morningness and eveningness type populations. Weitzman et al. (1982) report a positive relationship between age and morningness types. Older people also show signs of reduced circadian control and so are more susceptible to rhythm disturbances. Shift workers of an older age may therefore be more prone to the negative effects of shift work as they are better suited to normal day-time working hours. Differences in sex are also found, with females showing more morningness type behaviours than males (Folkard & Monk, 1985). However, the most consistent individual differences are those between morningness and eveningness types.

Morningness and eveningness types differ in numerous ways (Folkard & Monk, 1985; Roeser et al., 2015). For instance, morningness types are seen to suffer less from daytime sleepiness, show higher levels of academic performance in schooling and show a higher learning motivation. Eveningness types show lower levels of academic performance but higher levels of cognitive ability and intelligence scores (Roeser et al., 2015). Higher levels of cognitive ability and lower levels of academic performance were also found among eveningness types in a study conducted by Preckel et al. (2011), while the opposite was found among morningness types.

Previous research indicates differences in personality between morningness and eveningness types. Morningness types tend to be more introverted (Folkard & Monk, 1985; Tankova et al., 1994), more conscientious and show fewer neurotic symptoms and behaviours, such as anxiety and depression (Tonetti et al., 2009). Folkard and Monk (1985) mention that introverts may have a higher level of arousability, which may be one of the reasons why introverts tend to be morningness types.

Eveningness types, on the other hand, tend to be more neurotic but are also higher on openness to experience (Tsaosis, 2010). Longitudinal studies indicate that being an eveningness chronotype may be an antecedent to depression, anxiety and substance abuse and that this may be related to neural processes in the brain related to reward and emotional regulation (Taylor & Haslor, 2018). Russo et al. (2012), however, indicate that these personality characteristics of neuroticism and openness to experience in eveningness types depend on individual levels of sensation seeking and impulsivity. These differences in cognitive abilities and personality are linked to individual skills and abilities, such as creative thinking (Roeser et al., 2015). While higher cognitive abilities and openness to experience may indicate that eveningness types are better in their creativity, morningness types are actually found to perform better in creative tasks as they are more attentive and have higher levels of motivation (Roeser et al., 2015).

Roeser et al. (2015) indicate that when one assesses job performance in different chronotypes, the time of day has to be taken into account as most job tasks are performed best at the optimal time of day. Thus, morningness types will perform better in the morning, while eveningness types will perform better in the evening. This is called the synchrony effect and has been found in a variety of performance tasks such as those involving intelligence, memory and executive functioning (Roeser et al., 2015). However, research also indicates that the asynchrony effect, in which tasks are better performed at the non-optimal time of day, has been found in implicit memory tasks involving priming (Roeser et al., 2015). Wieth and Zacks (2011) also found that the asynchrony effect has been found in problem-solving tasks as individuals performed better when solving insight problems at the non-optimal time of day.

In summary, chronotypes are an emerging topic of importance for all organisations as they are seen as a personal attribute of individuals that explain variances in performance and workplace behaviours distinct from other individual differences like personality (Volk et al.,

2017). An individual's chronotype is able to predict when they will feel most active and energetic during the day, which contributes to the understanding of the role of daily dynamics in employee performance levels. The literature provides evidence that suggests that an individual's chronotype influences one's ability to perform well on the job and also to adapt to shift work.

2.4 Relationships between Variables

Evidence shows that individuals adapt differently to shift work (Ritonja et al., 2019). According to the JD-R model, there are variables that can increase burnout levels and health-related issues in shift workers and decrease engagement (job demands and self-undermining behaviours), as well as variables that can decrease job burnout levels and health-related issues in shift workers, and increase engagement (job resources, personal resources and job crafting behaviours). As the JD-R theory is considered to be a flexible model, it is important to gain a clear understanding of the function of each job aspect in its application (Bakker & Demerouti, 2017). There are also multiple person-level characteristics that influence engagement and adaptability to shift work and should therefore be considered. These relationships can be divided into main effects and interacting effects.

2.4.1 Main Effects

The main effects include the direct positive and negative relationships found between the independent variables (job characteristics, PsyCap and work schedule) and the outcome variables (engagement, burnout, physical health and psychological health).

2.4.1.1 Engagement and General Health

Taken together, burnout and work engagement are seen as good measures of the psychological well-being of employees (Pienaar & Willemse, 2008). Specifically, employees with higher levels of engagement often experience more positive emotions and better psychological and physical health (Bakker, 2009). Allan et al. (2019) suggest that experiencing positive emotions from work, for one, may have many positive spill over effects into other domains of life, which may improve relationships and functioning, which result in improved health and well-being. Engaged individuals also show higher levels of well-being

because they are motivated and actively striving to achieve their fullest potential (Roemer & Harris, 2018).

Amano et al. (2020) also conducted a longitudinal study which suggests that higher levels of work engagement may precede improved health behaviour (such as drinking and exercising patterns) and that interventions that improve engagement also appear to change health behaviour for individuals. These findings suggests that targeted interventions that aim to improve work engagement among employees not only improve productivity within organisations, but also contribute towards employee well-being. Other studies support the hypothesis that higher levels of engagement lead to improved health and well-being (Shimazu et al., 2012; Shimazu et al., 2015; Shimazu & Schaufeli, 2009). The findings from Pienaar and Willemse (2008) in their study of South African service employees in the hospitality industry showed that of all the dimensions of engagement, dedication was an especially significant predictor of overall health. It is therefore predicted that individuals who are more engaged would show higher levels of psychological and physical health. Hypotheses 1 and 2 are therefore as follows:

Hypothesis 1: Engagement is positively related to physical health

Hypothesis 2: Engagement is positively related to psychological health

2.4.1.2 Burnout and General Health

Burnout is a well-researched work-related phenomenon, consisting of at least two dimensions, including exhaustion and depersonalisation (Schaufeli & Taris, 2005). The literature shows that in general, burnout is associated with poor physical and psychological health and well-being (De Carlo et al., 2014; Pienaar & Willemse, 2008; Schaufeli & Bakker, 2004). For example, Ahola et al. (2005) found that employees had a higher risk of depressive disorders (especially major depressive disorder) when their burnout was severe. Koutsimani et al. (2019) also found that higher levels of burnout not only related to higher levels of depression, but also increased levels of anxiety. Furthermore, a longitudinal study on social workers conducted by Kim et al. (2011) concluded that higher levels of burnout resulted in more physical health problems, including headaches, gastrointestinal issues and respiratory infections, and a greater decline in overall physical health. Schaufeli et al. (2008) emphasise that when it comes to burnout, the exhaustion component is most strongly related to ill health.

Individuals who experience burnout are therefore seen to have lower levels of physical and psychological health and well-being. Hypotheses 3 and 4 are thus as follows:

Hypothesis 3: Burnout is negatively related to physical health

Hypothesis 4: Burnout is negatively related to psychological health

2.4.1.3 Engagement and Burnout

According to the JD-R model, employees who experience burnout engage in a health impairment process (Hackman & Oldham, 1974). The argument follows that strain processes (burnout) affect motivational processes (engagement) negatively. This health impairment process causes workers to become disengaged with their work as it influences the motivational process negatively. Some studies also argue for a negative relationship of engagement on burnout. For example, De Carlo et al. (2014) argue that engagement is not the opposite of burnout, but rather serves as a protective factor against it, as engagement assists in building personal resources that buffer negative outcomes while also contributing positively to other outcomes such as improved health and well-being. Although not exact opposites of the same continuum, burnout and engagement show a negative relationship (Demerouti et al., 2010, Schaufeli et al., 2008). Hypothesis 5 is therefore as follows:

Hypothesis 5: Burnout is negatively related to engagement

2.4.1.4 Job Characteristics and Engagement

According to Hackman and Oldham (1974), the higher the presence of the five core job characteristics (skill variety, task identity, task significance, autonomy and feedback) within a job, the higher the motivating potential score of a job will be. Earlier versions of the JD-R theory also propose that job resources, such as skill variety, autonomy and feedback are important predictors of work engagement (Bakker & Demerouti, 2008; Demerouti et al., 2001; Schaufeli et al., ,2009), even in the South African context (Robbins et al., 2016).

Zahari and Kaliannan (2022) emphasise that a common theme found in the literature on work engagement is that individual psychological states, such as motivation, perceived meaningfulness and positive perceptions of the job, show a positive influence on work engagement among public employees. This is supported by Allan et al. (2019), who state that engagement is an immediate, consistent and salient outcome for employees who experience their work as meaningful because it drives them toward goal-directed behaviours and results

in positive affective states that are associated with engagement. Thus, a high prevalence of job characteristics, stimulating a motivational process, increases employee engagement levels. Therefore hypothesis 6 is as follows:

Hypothesis 6: Job characteristics are positively related to engagement

2.4.1.5 Psychological Capital and Engagement

The four facets of PsyCap have positive cognitive and behavioural processes which affect employees' well-being positively (Roemer & Harris, 2018). As personal resources decrease and the feelings of an inability to manage the job demands of shift work increase, shift workers become more exhausted, experience feelings of job incompetence and eventually become disengaged from their work (Schreuder & Coetzee, 2016). However, as personal resources, such as self-efficacy, optimism, and resilience increase, so does work engagement (Bakker & Demerouti, 2008; Bakker & Van Wingerden, 2020; Hakanen et al., 2008; Langelaan et al., 2006; Xanthopoulou et al., 2009a) This assumption is supported by Alessandri et al. (2018), who found that increased PsyCap levels in individuals predicted an increase in work engagement. Later versions of JD-R theory also support this relationship (Bakker & Demerouti, 2017; Xanthopoulou et al., 2009a).

Each individual facet of PsyCap has shown a positive correlation with engagement. Firstly, high self-efficacy is associated with higher levels of intrinsic motivation and engagement as employees feel confident and competent in being able to achieve their valued goals (Schreuder & Coetzee, 2016). According to Bakker and Demerouti (2017), previous studies have shown that individuals with a high self-efficacy show higher levels of work engagement, especially in working environments where emotional demands are quite high. These studies have also shown that work engagement was low among employees who encounter a lot of emotional demands at work when their self-efficacy was low. Secondly, individuals with high hope are flexible thinkers and effective in achieving their goals as they apply a good sense of self-control and self-regulation behaviours (Roemer & Harris, 2018). Thirdly, workers with more resilience demonstrate competence and professional growth from adverse experiences (Luthans et al., 2015). Lastly, individuals who are highly optimistic apply positive behavioural and cognitive strategies to manage life events and so tend to exert continuous effort towards goal attainment (Schreuder & Coetzee, 2016). Taking all of these relationships into account, it is therefore evident that higher levels of PsyCap will result in more engaged workers. Hypothesis 7 is therefore as follows:

Hypothesis 7: Psychological capital is positively related to engagement

2.4.1.6 Work Schedule and Burnout

The nature of shift work has a negative effect on the physical, cognitive and emotional resources of shift workers. According to Schreuder and Coetzee (2016), individuals depend on these resources in order to complete work-related tasks, and an increase in physical, cognitive and emotional demands of working non-standard work schedules may therefore lead to the depletion of these resources, resulting in burnout and health impairments. This relationship is supported by Bolino et al. (2021), who state in their review of research that working non-standard hours can lead to higher levels of burnout and work stress. Previous research further indicates that working fixed shifts results in less work stress when compared to those who worked rotational shifts (Baba & Jamal, 1991; Jamal & Baba, 1992). So, while the degree of burnout experienced may vary depending on the type of shift, it is hypothesised that working any form of non-standard hours will still result in burnout. Thus, it can be argued that non-standard work schedules, as a job demand, will increase the experiences of burnout. Hypothesis 8 is as follows:

Hypothesis 8: Non-standard work schedules are positively related to burnout

2.4.1.7 Job Characteristics and Psychological Capital

According to the JD-R model, job resources influence personal resources positively, which in turn affect the well-being of employees positively and buffer the negative effects of job demands (Bakker & Demerouti, 2017). The prevalence of job resources (job characteristics), for example, is a strong indicator of self-efficacy (one of the facets of PsyCap) in employees who do not suffer from overload (Roemer & Harris, 2018). A key finding from Sameer et al. (2019) further demonstrates a positive relationship between employees' perception of skill variety, task significance, job identity, autonomy and feedback with each of the four components of PsyCap. From these findings, they argued that the five core job characteristics could be seen as antecedents to PsyCap. In their study, job autonomy was the most significant predictor of PsyCap, showing the strongest positive relationship with self-efficacy. This may be because employees who have more job autonomy have more freedom in their jobs, which makes them feel self-officious as they accomplish a task and gain more experience. More job autonomy also affects hope as these employees would also feel more motivated in having the freedom to develop multiple pathways towards achieving

certain goals. It can also then be expected that they would be more optimistic and resilient because these employees would not be restricted in how they perform their jobs and would be more likely to adapt to change and adverse situations when and if their jobs allowed them to freely assess their resources and risks (Sameer et al., 2019). Other than job autonomy, a strong link was also found between optimism and job identity, perhaps because high job identity makes employees feel optimistic of future outcomes as they have control over the whole identifiable piece of work (Sameer et al., 2019). Thus, hypothesis 9 is as follows:

Hypothesis 9: Job characteristics are positively related to psychological capital

2.4.2 Interaction Effects

While it is important to study the direct effects that will contribute to shift workers' well-being at work and general health, it is also necessary to consider mediating and moderating variables. In a study conducted by Hulsegge et al. (2020), shift workers who were dissatisfied with their shift schedule or perceived that their shift schedule had a high impact on their personal lives experienced higher levels of burnout. However, the opposite was found for those who were satisfied with their shift schedules and experienced low impact of their shift schedules on their personal lives. While these findings were not expected in their final results, they emphasised an important limitation in their study by overlooking the buffering effects of job resources and personal resources on shift work. Bolino et al. (2021) further argue that while working non-standard hours is generally viewed as undesirable, it may still appeal to certain individuals. This suggests that it would be worthwhile to consider reasons for preferring a particular type of shift by looking at the fit between a person (e.g. personality, personal resources or other personal attributes) and the work schedule. The interaction effects investigated in this study therefore include the mediation and moderation effects of the independent variables (job characteristics, PsyCap, work schedule and chronotype) on the relationships previously discussed in the main effects.

2.4.2.1 The Mediating Effect of Engagement between the Relationship of Job Characteristics and General Health

The JD-R framework emphasises a mediating relationship between job resources, motivational processes and positive outcomes (Bakker & Demerouti, 2017). A high prevalence of job characteristics (skill variety, task identity, task significance, autonomy and feedback) within a job stimulates a motivational process which increases employee

engagement levels (Hackman & Oldham, 1974). High engagement levels, in turn, predict higher levels of health and well-being, as engaged employees are motivated to actively strive to achieve their fullest potential (Roemer & Harris, 2018).

Although job characteristics are better predictors of work-related outcomes (e.g. job satisfaction), while health issues (e.g. depression) are better predicted by work factors like interpersonal relations and organisational culture, there is still evidence that links job characteristics with health outcomes. For example, Peltzer (2000) found that job characteristics explained 7.6% of the variance in depression. Furthermore, Allan et al. (2019) also concluded in their meta-analysis that meaningful work, as a result of higher job characteristics, has a positive impact on well-being. This is because finding work meaningful results in positive emotional states and satisfaction with work, which in turn could have positive spill-over effects in other domains of life. For example, finding meaning in their work makes them happy when they come home from their jobs, which improves their relationships, social functioning and physical functioning, and in doing so improves their health and well-being (Allan et al., 2019). Thus, a higher presence of job characteristics in an individual's job stimulates a motivational process, and motivational processes result in positive outcomes such as improved health and well-being. It is therefore expected that engagement will act as a mediator of job characteristics and general health through its motivational process. Hypotheses 10 and 11 are as follows:

Hypothesis 10: Engagement mediates the relationship between job characteristics and physical health

Hypothesis 11: Engagement mediates the relationship between job characteristics and psychological health

2.4.2.2 The Mediating Effect of Engagement on the Relationship between Psychological Capital and General Health

Given that job resources and personal resources are both involved in motivational processes within the JD-R framework, it can be argued that a mediating relationship will also take place between personal resources, motivational processes and positive outcomes (Bakker & Demerouti, 2017). According to the JD-R model, individuals with high personal resources are intrinsically motivated to pursue their goals and are therefore likely to be more engaged. Individuals who are higher on PsyCap are also more likely to engage in activities that either

sustain or improve their health and so tend to be more persistent in achieving health-related goals (Amano et al., 2020; Luthans et al., 2013). It is therefore expected that engagement will act as a mediator of PsyCap (personal resources) and general health (outcome) through the motivational process found within engagement. Hypotheses 12 and 13 are as follows:

Hypothesis 12: Engagement mediates the relationship between psychological capital and physical health

Hypothesis 13: Engagement mediates the relationship between psychological capital and psychological health

2.4.2.3 The Mediating Effect of Burnout on the Relationship between Non-standard Work Schedules and General Health

Bolino et al. (2021) argue that those who work shifts, especially those working rotating shift schedules, have a higher likelihood of developing physical ailments, show increased risk of physical injury at work and report more physical health complaints. They further emphasise that working non-standard work schedules could further increase depression, depressive symptoms and lead to an overall decrease in self-reported psychological health. While it is clear that working non-standard work schedules leads to a decrease in physical and psychological health, the concept of burnout may explain how these workers actually end up experiencing these negative health consequences.

An individual's rhythm is suited to working during the day and sleeping at night (Boivin et al., 2021; Folkard & Monk, 1985; Wickwire et al., 2017). Therefore, those individuals working unorthodox hours would be involved in a process of strain (burnout) as they are required to work against their biological clocks (Blyton, 1985; Boivin et al., 2021). When exposed to such strain over long periods of time, individuals may experience allostatic overload, which eventually leads to the vulnerability of all organ systems (Theorell, 2020). While they did not specifically focus on working hours and shift workers, Hakenen et al. (2006) did find similar results in their study on teachers in which job demands, including pupil misbehaviour, workload, and physical work environment, predicted ill health through burnout. These findings emphasises the predictive power of the JD-R framework, which emphasises a mediating relationship between job demands, health impairment processes, such as burnout, and negative outcomes. It is therefore expected that burnout will act as a mediator

of non-standard work schedule and general health. Hypotheses 14 and 15 are therefore as follows:

Hypothesis 14: Burnout mediates the relationship between non-standard work schedules and physical health

Hypothesis 15: Burnout mediates the relationship between non-standard work schedules and psychological health

2.4.2.4 The Moderation Effect of Job Characteristics on the Relationship between Non-standard Work Schedules and Burnout

A high presence of job characteristics within a worker's role can be seen as a job resource in the JD-R model as it involves a motivational process. The job characteristics of skill variety, task identity, task significance, autonomy, and feedback, become particularly important when job demands become challenging as job resources become most useful and motivating when they are needed (Bakker & Demerouti, 2018). According to this framework, job characteristics will therefore buffer the positive relationship between non-standard work schedule and burnout. Hypothesis 16 is therefore as follows:

Hypothesis 16: Job characteristics have a buffering effect on the relationship between non-standard work schedules and burnout

2.4.2.5 The Moderation Effect of Psychological Capital on the Relationship between Non-standard Work Schedules and Burnout

The JD-R model (Bakker & Demerouti, 2018) suggests that PsyCap will have a significant negative influence on the relationship between a non-standard work schedule and burnout. This is because employees with higher PsyCap will likely have more positive perceptions of their job demands which promote well-being (Grover et al., 2018). It is well known that job demands and stressors can produce strain and have a negative impact on well-being (Harms et al., 2017). However, having a high level of PsyCap would mean that individuals would have the capacity to persevere through these job demands and possibly overcome burnout or adversity, which makes this construct particularly important in the health context (Harms et al., 2017).

Workers may often experience overload because shift work requires more physical, emotional and cognitive demands. In comparison, jobs that follow normal day-time working

hours require less such demands. As shift work includes the prolonged exposure to unorthodox working hours, with low levels of personal resources it is likely to lead to high work-related stress and burnout (Tims et al., 2012). Looking at the four facets of PsyCap as a personal resource, it may be of value to explore the prevalence of self-efficacy among workers, as self-efficacy is thought to buffer the negative effects that arise from a stressful working environment like shift work (Roemer & Harris, 2018). High self-efficacy contributes towards higher levels of energy and motivation in accomplishing work tasks and goals, which make workers less susceptible to stress and therefore less likely to experience burnout (Roemer & Harris, 2018). They are also able to engage in self-regulatory processes that help to reduce the negative emotions that arise from stress. They are therefore able to deal with the negative consequences arising from stressful work environments a lot better than those who have low self-efficacy (Roemer & Harris, 2018).

Higher hope is positively related to general health as people with high hope tend to engage more in preventative efforts and adopt better coping strategies with illnesses (Snyder, 2002). People with higher hope may engage in pathway thinking. They will therefore use information about physical health and illnesses either for prevention, such as physical exercises, or for developing better coping strategies in cases where they already have an illness. High hope also has a positive effect on individuals with psychological problems, such as depression (Snyder, 2002), and therefore contributes positively to employee well-being and health.

Those who have a low level of optimism (pessimists) tend to apply avoidance coping strategies and distance themselves from adversity (Schreuder & Coetzee, 2016). While optimists expect positive outcomes and therefore exert more effort in attaining their goals, pessimists expect negative outcomes and so disengage themselves from attaining their goals. Optimists and pessimists therefore have opposite effects on engagement, burnout and general health. Higher levels of optimism and lower levels of pessimism are therefore negatively related to burnout (Schreuder & Coetzee, 2016).

Job demands (or risk factors) provide the opportunity for growth which may lead to the development of coping mechanisms that help with the successful management of future challenges (Roemer & Harris, 2018). As a result, individuals who have high resilience are also therefore more likely to cope better with work stress and strenuous job demands. Based

on the negative correlation found between the four facets of PsyCap and burnout, hypothesis 17 is as follows:

Hypothesis 17: Psychological capital has a buffering effect on the relationship between non-standard work schedules and burnout

2.4.2.6 The Moderation Effect of Non-standard Work Schedules on the Relationship between Job Characteristics and Engagement

According to the JD-R model (Bakker & Demerouti, 2017), job demands may have an enhancing effect on the relationship between job resources and engagement. Although a direct positive relationship is hypothesised between job characteristics and engagement, in the presence of the challenges experienced in non-standard work schedules, access to these resources, like high skill variety, autonomy, task identity, task significance and feedback becomes more significant because they become particularly useful when they are needed. Examples are given in Bakker (2009) and Hakenen et al. (2005) to support this proposition, where they found that job resources such as skill variety, appreciation and innovation were most predictive of engagement when there was an unfavourable working environment or when students were misbehaving. In congruence with the JD-R model, hypothesis 18 is as follows:

Hypothesis 18: Non-standard work schedules have an enhancing effect on the relationship between job characteristics and engagement

2.4.2.7 The Moderation Effect of Non-standard Work Schedules on the Relationship between Psychological Capital and Engagement

While more research is needed on the relationship between job demands and personal resources, the JD-R model theorises that job demands will also have an enhancing effect on the relationship between PsyCap and engagement (Bakker & Demerouti, 2017). In the same way that job demands can have an enhancing effect on the relationship between job resources and motivation, so too can it have an enhancing effect on the relationship between personal resources (PsyCap) and motivation (engagement).

To clarify, in the presence of non-standard work schedules, having the personal resources of hope, optimism, self-efficacy and resilience become more significant because they are needed more when one wants to predict employee engagement. For example,

individuals who have high hope and high optimism have a positive outlook in that good things will happen to them and that they are capable of handling most or any job demand that comes their way. These individuals therefore hold beliefs that when they are faced with high job demands, they can actively approach them and deal with them in an effective way (Bakker & Demerouti, 2018). Bakker and Demerouti (2018) furthermore demonstrated in their research that nurses who scored high on optimism and self-efficacy viewed their emotionally demanding work of interacting with their patients as challenges which allow them to find more meaning in their work and become more engaged. It was also noted that when these nurses realised that they have many personal resources, they are able to deal with their job demands better. Thus, hypothesis 19 is as follows:

Hypothesis 19: Non-standard work schedules have an enhancing effect on the relationship between psychological capital and engagement

2.4.2.8 The Moderation Effect of Chronotype on the Relationship between Non-standard Work Schedules and Burnout

Chronotype is a trait associated with the ability to adapt to specific shifts (Boivin et al., 2021; Wickwire et al., 2017). Brown et al. (2020) and Wickwire et al. (2017) state that morningness types have a lower tolerance for shift work. These individuals often show higher levels of social jet lag when they work night shifts and tend to suffer less during morning shifts (Ritonja et al., 2019) However, eveningness chronotypes are usually more resilient to the consequences of night work as they have later and more flexible sleeping arrangements (Boivin et al., 2021). Ritonja et al. (2019) support this by stating that eveningness types show less rigid sleep timing and a higher tolerance towards shift work when compared to morningness types. Those who are flexible and late sleepers appear to suffer less from night shifts, while suffering more during morning shifts and day-time jobs (Oved et al., 2021; Ritonja et al., 2019). In addition to this, findings of various other studies found that a mismatch of chronotype with a worker's shift time has a larger influence on health, including cancer (Dickerman et al., 2016; Hansen & Lassen, 2012) and depression (Togo et al., 2017). The misalignment between work schedules and chronotypes may therefore explain why some individuals display more negative symptoms in job-related ill health, like higher levels of burnout, while others show fewer, less severe or no symptoms when undergoing the same levels of stress of shift work (Folkard, 2008; Folkard & Monk, 1985).

Studies have found that adjusting and aligning working hours according to workers' chronotype were associated with longer and improved sleep duration, sleep quality and decreased social jetlag (Juda et al., 2013; Kervezee et al., 2021; Vetter et al., 2015), which results in fewer negative health outcomes. The findings of Hittle and Gillespie (2018) further indicate that morningness types may have a decreased risk of developing Type 2 diabetes when working day shifts and increased risk when working extended night-time shifts. The opposite was found to be true for eveningness types. Therefore, the effects of chronotypes are especially relevant when matching individuals with personal work schedules (Volk et al., 2017), as circadian misalignment occurs when morning chronotypes work night shifts and eveningness chronotypes wake up early for day shifts. It is this "social jetlag" that leads to sleep disturbances and chronic health conditions (Hittle & Gillespie, 2018).

Overall, research suggests that eveningness types are not as challenged by circadian misalignment due to shift work, and that organisations should therefore consider chronotype during the development of their work policies, work schedules and interventions (Ritonja et al., 2019). Sallinen and Kecklund (2010) even go so far as to say that the permanent night work may be a good solution for eveningness types who display a willingness to live in a night-oriented rhythm when they work, as well as on days off. It is therefore expected that eveningness types will experience less burnout, and so fewer health symptoms, as opposed to morningness types. Hypothesis 20 is as follows:

Hypothesis 20: Eveningness chronotype has a buffering effect on the relationship between non-standard work schedules and burnout

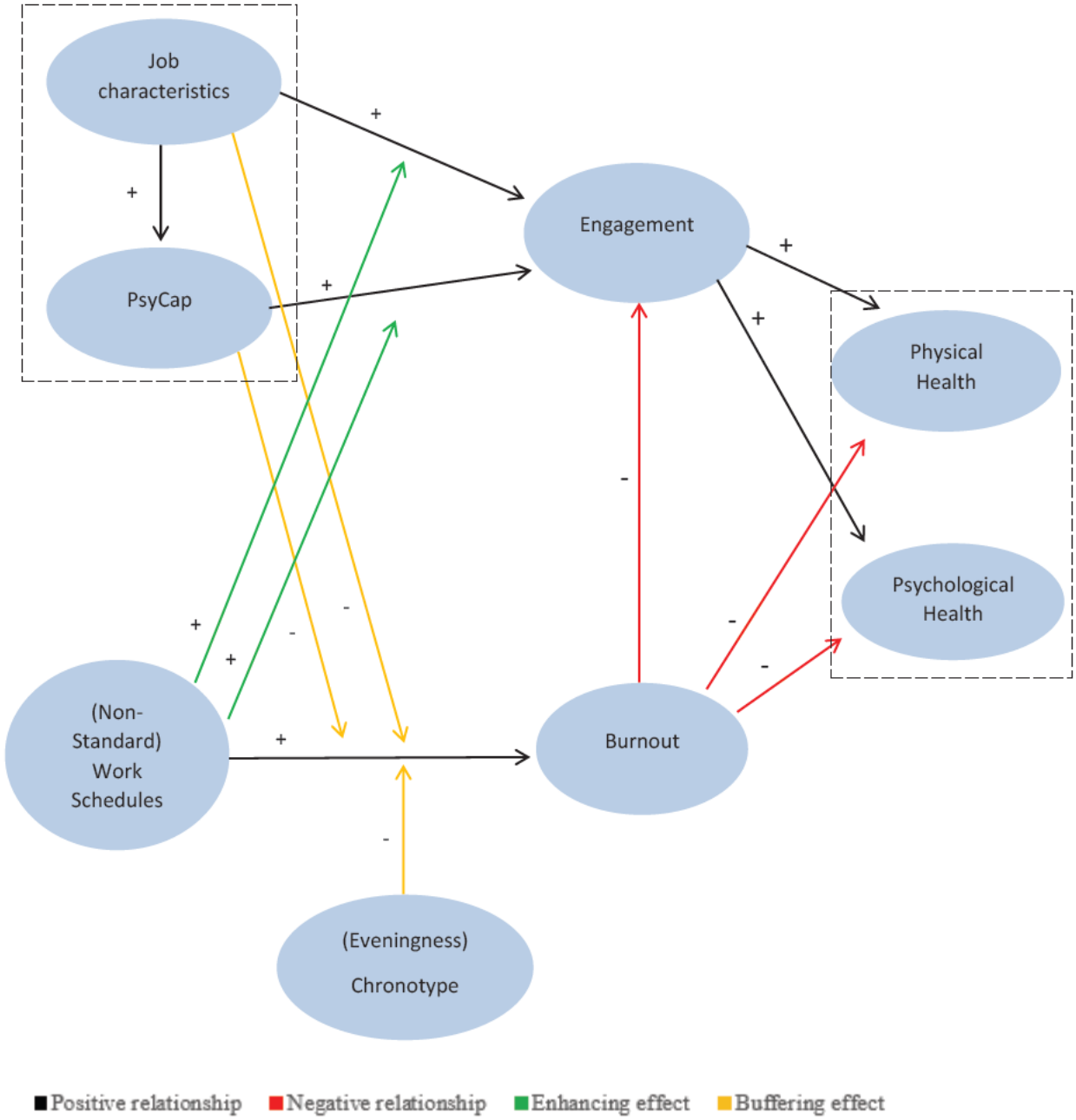
2.5 Conceptual Model

The review of relevant literature to shift work and some of its latent variables as outlined above culminates into a conceptual model. This conceptual model represents a schematic representation of the hypotheses constructed as a speculative answer to the research initiating question. The proposed conceptual model identifies (non-standard) work schedule, job characteristics, and PsyCap and chronotype as latent variables that are related to and influence shift workers' health, burnout and work engagement levels. In addition, this model identifies how these variables are structurally combined with one another as a way to understand the underlying mechanisms of burnout, health and engagement in shift workers. Once operationalised, this conceptual model will enable the hypotheses previously mentioned to be empirically tested. If a close proximity is found between this model and the reality of

burnout, engagement and general health in shift work, it will serve as a useful guide for organisations to design the needed interventions that would help to alleviate the problems associated with the nature of shift work and enhance their organisational performance. The proposed conceptual model on shift work-related burnout, health and work engagement is depicted in Figure 2.

Figure 2:

The Conceptual Model



Chapter 3: Research Methodology

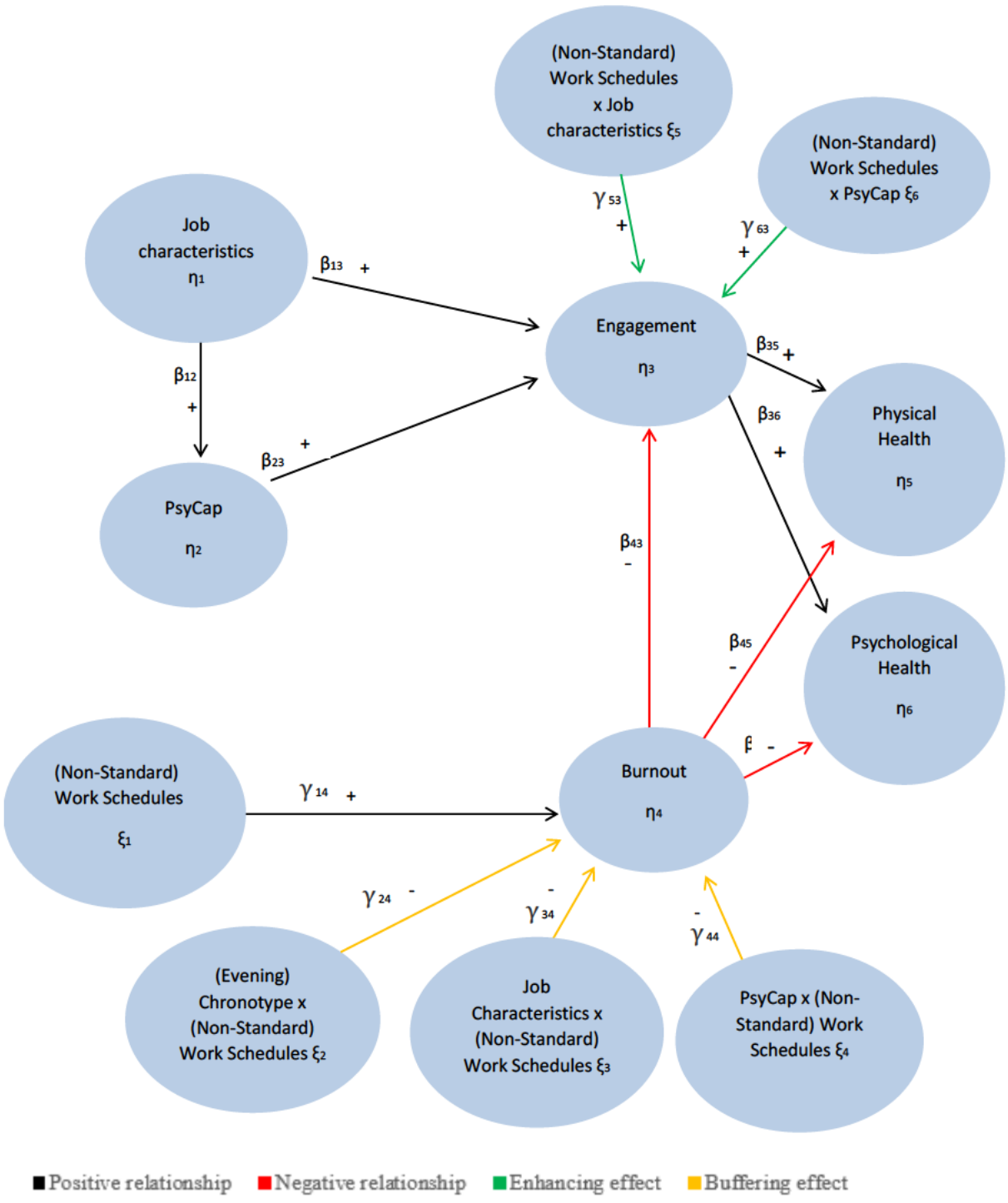
3.1 Introduction

The purpose of this research study was to gain support for the proposed hypotheses. The description and explanation in science depend on the relationship between variables and attributes (Babbie, 2013). As such, this research study aimed to explain the causal relationships between variables and was explanatory in nature. This study was based on quantitative research as a method to verify the relationship between variables, as discussed in the statistical hypotheses. The quantification of information allows for more explicit observations to be made and made it easier to compare and summarise data (Babbie, 2013). This allowed for statistical analyses to take place.

The aim of this research was to gain descriptive information from shift workers. The theoretical approach of this study challenged the notion of the absolute truth of knowledge by recognising that our claims of knowledge when studying human behaviour cannot be "positive" (Creswell, 2003). The deterministic philosophy of post-positivism is reductionistic by reducing an idea into smaller distinct sets of variables to test through the formulation of research questions and hypotheses. The knowledge that derives from this post-positivistic lens is based on numerical measures and behavioural observations of the "objective" reality (Creswell, 2003). It aims to test, verify and refine the laws or theories that govern the world in order to create a greater understanding. For this reason, the data collected was used to either support or to refute the theory as depicted in the conceptual model to enable the necessary adjustments to take place before further additional studies are conducted. Based on the theoretical review of information in the previous chapter, the structural model is thus depicted in Figure 3 as follows:

Figure 3

The Structural Model



3.2 Substantive Research Hypotheses

According to the positivistic interpretation of scientific research, substantive hypotheses should be subjected to empirical testing (Kerlinger & Lee, 2000). The substantive hypotheses represent tentative propositions or beliefs about the relationships between variables. Thus, formulating and stating hypotheses is essential to science as it provides guidance for researchers to empirically test their stated beliefs.

The proposed structural model on shift work-related burnout, engagement and general health presented in Figure 3 schematically displays the substantive hypotheses developed in the theoretical review. Substantive research hypotheses are not testable. To become testable, the substantive hypotheses were translated into operational terms. The substantive hypotheses are as follows:

Hypothesis 1: Engagement is positively related to physical health

Hypothesis 2: Engagement is positively related to psychological health

Hypothesis 3: Burnout is negatively related to Physical health

Hypothesis 4: Burnout is negatively related to psychological health

Hypothesis 5: Burnout is negatively related to engagement

Hypothesis 6: Job characteristics are positively related to engagement

Hypothesis 7: Psychological capital is positively related to engagement

Hypothesis 8: Non-standard work schedules are positively related to burnout

Hypothesis 9: Job characteristics are positively related to psychological capital

Hypothesis 10: Engagement mediates the relationship between job characteristics and physical health

Hypothesis 11: Engagement mediates the relationship between job characteristics and psychological health

Hypothesis 12: Engagement mediates the relationship between psychological capital and physical health

Hypothesis 13: Engagement mediates the relationship between psychological capital and psychological health

Hypothesis 14: Burnout mediates the relationship between non-standard work schedules and physical health

Hypothesis 15: Burnout mediates the relationship between non-standard work schedules and psychological health

Hypothesis 16: Job characteristics have a buffering effect on the relationship between non-standard work schedules and burnout

Hypothesis 17: Psychological capital has a buffering effect on the relationship between non-standard work schedules and burnout

Hypothesis 18: Non-standard work schedules have an enhancing effect on the relationship between job characteristics and engagement

Hypothesis 19: Non-standard work schedules have an enhancing effect on the relationship between psychological capital and engagement

Hypothesis 20: Eveningness chronotype has a buffering effect on the relationship between non-standard work schedules and burnout

3.3 Research Design

This study followed a non-experimental research design. A cross-sectional survey design (ex post facto correlational design) was used as it is considered to be appropriate for research studies where the interrelationships between variables within a population are assessed without the manipulation of variables (Kerlinger & Lee, 2000). A survey methodology is also one of the best methods to use to collect descriptive data from large population groups (Babbie, 2013; Creswell, 2003). The survey questionnaire was carefully constructed through the specific variable measures chosen and was standardised to provide all respondents with the same form of data.

3.4 Statistical Hypotheses

The science of reasoning underlying the proposed research design, together with the nature of the statistical analyses, was used to formulate the statistical hypotheses. Partial Least Squares Structural Equation Modelling (PLS-SEM) was used to evaluate the validity of the proposed structural model on shift work-related burnout, engagement and general health, using the ex post facto correlation design. Specific path coefficient hypotheses were formulated and tested to see whether they fit the data. The statistical hypotheses are as follows:

Hypothesis 1: Engagement is positively related to physical health

$H_{01}: \beta_{35} = 0$

$H_{a1}: \beta_{35} > 0$

Hypothesis 2: Engagement is positively related to psychological health

$H_{02}: \beta_{36} = 0$

$H_{a2}: \beta_{36} > 0$

Hypothesis 3: Burnout is negatively related to physical health

$H_{03}: \beta_{45} = 0$

$H_{a3}: \beta_{45} < 0$

Hypothesis 4: Burnout is negatively related to psychological health

$H_{04}: \beta_{46} = 0$

$H_{a4}: \beta_{46} < 0$

Hypothesis 5: Burnout is negatively related to Engagement

$H_{05}: \beta_{43} = 0$

$H_{a5}: \beta_{43} < 0$

Hypothesis 6: Job characteristics are positively related to engagement

H_{06}: $\beta_{13} = 0$

H_{a6}: $\beta_{13} > 0$

Hypothesis 7: Psychological capital is positively related to engagement

H_{07}: $\beta_{23} = 0$

H_{a7}: $\beta_{23} > 0$

Hypothesis 8: Non-standard work schedules are positively related to burnout

H_{08}: $\gamma_{14} = 0$

H_{a8}: $\gamma_{14} > 0$

Hypothesis 9: Job characteristics are positively related to psychological capital

H_{09}: $\beta_{12} = 0$

H_{a9}: $\beta_{12} > 0$

Hypothesis 10: Engagement mediates the relationship between job characteristics and physical health

H_{010}: Indirect effect = 0

H_{a10}: Indirect effect ≠ 0

Hypothesis 11: Engagement mediates the relationship between job characteristics and psychological health

H_{011}: Indirect effect = 0

H_{a11}: Indirect effect ≠ 0

Hypothesis 12: Engagement mediates the relationship between psychological capital and physical health

H_{012}: Indirect effect = 0

H_{a12}: Indirect effect ≠ 0

Hypothesis 13: Engagement mediates the relationship between psychological capital and psychological health

H_{013}: Indirect effect = 0

H_{a13}: Indirect effect ≠ 0

Hypothesis 14: Burnout mediates the relationship between non-standard work schedules and physical health

H_{014}: Indirect effect = 0

H_{a14}: Indirect effect ≠ 0

Hypothesis 15: Burnout mediates the relationship between non-standard work schedules and psychological health

H_{015}: Indirect effect = 0

H_{a15}: Indirect effect ≠0

Hypothesis 16: Job characteristics have a buffering effect on the relationship between non-standard work schedules and burnout

H_{016}: $\gamma_{34} = 0$

H_{a16}: $\gamma_{34} \neq 0$

Hypothesis 17: Psychological capital has a buffering effect on the relationship between non-standard work schedules and burnout

H_{017}: $\gamma_{44} = 0$

H_{a17}: $\gamma_{44} \neq 0$

Hypothesis 18: Non-standard work schedules have an enhancing effect on the relationship between job characteristics and engagement

H_{018}: $\gamma_{53} = 0$

H_{a18}: $\gamma_{53} \neq 0$

Hypothesis 19: Non-standard work schedules have an enhancing effect on the relationship between psychological capital and engagement

$H_{019}: \gamma_{63} = 0$

$H_{a19}: \gamma_{63} \neq 0$

Hypothesis 20: Eveningness chronotype has buffering effect on the relationship between non-standard work schedules and burnout

$H_{020}: \gamma_{24} = 0$

$H_{a20}: \gamma_{24} \neq 0$

3.5 Sampling

The purpose of this study was to explore and so identify the salient variables that contribute to differences in the burnout, engagement and general health of South African shift workers as a way to contribute constructively towards improved shift worker interventions in future. The target population therefore included all work employees who reside in South Africa. The process of selecting observations, known as sampling (Babbie, 2013), was random as respondents from the population group were chosen based on their immediate availability and easy access, through social media and identifying organisations that make use of non-standard work schedules. Participants were asked to forward the invitation and link of the survey to individuals they thought fit the inclusion criteria for the study. This sampling method is known as snowballing. As snowball sampling is a non-probability sampling method, the participants selected were therefore not representative of the larger shift work population.

The target population included both shift workers and non-shift workers who are South African residents and are employed on a full-time or casual basis. While the 10-times rule method is often preferred by researchers in determining the minimum sample size required for PLS-SEM analysis, it has been shown to lead to inaccurate estimates in the past (Kock & Hadaya, 2018). Based on the recommendation of Kock and Hadaya (2018), the inverse square root method was used to determine the minimum sample size of 160. This

method is known to generate estimates that are fairly precise and safe. The study included 210 complete responses, with 175 of these responses being valid. Thus, the total sample group included 175 individuals (n=175), meeting the requirement of the inverse square method of 160. A total of 35 responses were removed from the sample group due to missing or invalid data. Even though participants were required to be South African residents, it was not a requirement for them to work for a South African organisation as the possibility existed that many shift workers in South Africa work for international organisations. They were required to be employed in their work for a minimum of 4 weeks, given that most of the items in the RAND-12 health measure asked respondents to rate their health within the past four-week period (RAND Corporation, 1994-2021).

The modern-day South Africa is a multi-cultural society which should be taken into consideration when looking at constructs like burnout and engagement (Pienaar & Willemse, 2008). Thus, this study aimed to avoid a homogenous study population. Although heterogeneity could not necessarily be guaranteed given the method of data collection, the sample group was still able to include both male and female participants from various age groups, cultural backgrounds and geographical locations across South Africa. The study welcomed the participation of any individual engaging in any form of work in industries that tend to make use of formal non-standard working hours as part of their daily operations. The jobs that were targeted included bartenders, waiters/waitresses, call centre agents, health practitioners, petrol attendants, police officers, security workers, fire fighters, logistical drivers, aviation, and hotel staff, among others. Invitations were also extended to all employees, regardless of managerial levels, with the requirement of being proficient in the English language and having access to the internet and a computer or mobile device.

3.6 Measurement Instruments and Operationalisation

The independent variables in this research study included job characteristics, PsyCap, work schedule and chronotype. Job characteristics, PsyCap and work schedule are presumed to directly determine the dependent variables of engagement, burnout and general health. In addition, chronotype is also seen to have moderating effects on these relationships. The operationalisation of each of these variables, as seen in Figure 3, was done by specifying how they would be measured. Operationalisation allowed for each concept to be defined with maximum clarity within the context of this study, resulting in empirical observations that are

representative of those concepts within the real world (Babbie, 2013). The measures to be included in this study were the 36-item Health Survey (RAND-36), the Utrecht Work Engagement Scale (UWES-9), the Oldenburg Burnout Inventory (OLBI), the Job Diagnostic Survey-Revised (JDS-R), the Psychological Capital Questionnaire (PCQ-12), and the Horne – Őstber Morningness Eveningness Questionnaire (MEQ). These measures were chosen because they have shown to be valid and reliable measures of the variables included in this study. These measurement instruments are also available in the public domain or free for use for academic research purposes. In addition to these well-known measures, three questions were also asked to determine work schedule.

3.6.1 MOS 36-Item Short-Form Health Survey (RAND-36 or SF-36)

The MOS 36-Item Short-Form Health Survey (RAND-36 or SF-36) was used to measure general health. The RAND-36 is a well-researched and generic self-reported measure of health-related quality of life (HRQoL) which stems from the Medical Outcomes Study (MOS) (Ware, 2000). It therefore measures how an individual's health impacts on their ability to function and on their perceived physical, mental and social well-being (Hays & Morales, 2001). This measure was therefore chosen as it is believed to be the most inclusive and generic measure of health covering all of the domains (physical, mental and social) previously argued to be affected by shift work.

In addition, the RAND-36 was also chosen as it has shown acceptable validity and reliability when measuring HRQoL in various population groups, including people with schizophrenia (Su et al., 2014), stroke (Anderson et al., 1996), long-term survivors of childhood cancer (Reulen et al., 2006), dyspnoea in Chronic Obstructive Pulmonary Disease (Mahler & Mackowiak, 1995), mobility disability in the elderly (Sydall et al., 2009), and community-dwelling older adults (Walters et al., 2020).

Being a profile measure, the RAND-36 is designed to yield scores on multiple aspects of HRQoL. It consists of 36 items which assess eight different health concepts which ultimately produce both physical and psychological health summary scores (Hays & Morales, 2001). The eight health concepts measured include physical functioning (10 items), social functioning (2 items), role limitations that are caused by physical health issues (4 items), role limitations that are caused by emotional issues (3 items), emotional well-being (5 items), energy/fatigue or vitality (4 items), bodily pain (2 items) and general health perceptions (5 items). Additionally, this survey also consists of a single item to assess change in perceived

health in the last 12 months. Twenty of these items were measured using a past 4 weeks' reporting interval (Hays & Morales, 2001; Ware & Sherbourne, 1992).

Lins and Carvalho (2016) state that while some researchers (included in their study were 172 of these research studies published between 1997 and 2015) have converted scores of the RAND-36 into one total/global score, the RAND-36 essentially measures two dimensions – physical and mental – suggesting that a single index of overall HRQoL should not be used. Therefore, using the scoring key provided on the RAND Corporation website, the scores for the eight different domains were generated and then converted to a physical component summary score and a mental component summary score (Laucis et al., 2014). Originally, the composite scores were constructed using the orthogonal principal component analysis with the aim of creating pure physical and psychological component summary scores that have limited overlapping variance (Ware et al., 1994). However, Andersen et al. (2022) argue that the unweighted RAND-36 composite scores demonstrate satisfactory criterion validity and convergent validity and the calculation of these scores can therefore be kept simple. Thus, the simple unweighted method proposed by Andersen et al. (2022) was used to calculate the composite scores. The final scores on the physical health and psychological health composite scores ranged from 0 – 100, with higher scores indicating higher levels of self-perceived health.

3.6.2 Utrecht Work Engagement Scale (UWES-9)

To measure employee engagement, the shortened Utrecht Work Engagement Scale (UWES-9) was used (Schaufeli & Bakker, 2003). The UWES-9 consists of nine items with three scales: vigour (3 items), dedication (3 items) and absorption (3 items). Each item is rated in terms of frequency on a 7-point Likert scale ranging from 0 (never) to 6 (always) (Görgens-Ekermans & Herbert, 2013). Participants were asked to provide a corresponding number that best describes how often they feel about all of the UWES statements. Examples of the UWES-9 statements include "At my work, I feel bursting with energy" and "At my job, I feel strong and vigorous".

The internal consistency of the three sub-scales of different versions of the measure has been proven by international studies, such as Schaufeli and Bakker (2003), and by national studies, such as De Braine and Roodt (2011). Higher scores on the UWES-9 indicate higher employee engagement (Herbert, 2011).

3.6.3 Oldenburg Burnout Inventory (OLBI)

Burnout reflects the individual's prolonged response to chronic job stress (Maslach et al., 2001). Burnout is a form of occupational fatigue that is conceptualised by two inseparable components of exhaustion and depersonalisation (Schaufeli & Taris, 2005). According to this conceptualisation, burnout can either be measured by two of the three measures (exhaustion and depersonalisation) included in the Maslach Burnout Inventory (MBI) or by the Oldenburg Burnout Inventory (OLBI) which only assesses two dimensions – exhaustion and disengagement (or the counter of depersonalisation). In this study, the OLBI was preferred and used to measure burnout.

The OLBI is based on the MBI-GS but excludes the measurement of the lack of personal accomplishment (Cox et al., 2005). The disengagement concept of the OLBI also differs slightly form the depersonalisation concept of the MBI in terms of the amplitude of distancing. OLBI's disengagement concept is broader as it refers to distancing oneself from work in general or from the content and object of work, together with experiencing negative attitudes (Sinval et al., 2019). Furthermore, the OLBI was preferred as it demonstrates convergent validity with the MBI, it is freely available, and it does not include unacceptable questions. The MBI, on the other hand, is not freely available and contains items that may trigger hostile responses from the respondents, e.g. "I feel I treat some recipients as if they were impersonal objects" (Schaufeli & Taris, 2005), which may have raised the level of risk associated with this research study. The OLBI also addressed a major criticism of the MBI, which is the negative phrasing of the items, as it uses both positive and negative wording all while capturing a broader conceptualisation of burnout by measuring both the cognitive and physical components of exhaustion (Cox et al., 2005).

The OLBI was originally developed in Germany by Demerouti and Nachreiner (1998). In the validation study on the English version of the OLBI, Halbesleben and Demerouti (2005) found that this instrument demonstrates acceptable reliability and validity. In terms of reliability, the internal consistency of the OLBI was acceptable, with scores ranging from .74 to .87. All of the Cronbach's Alpha scores were over .70. The OLBI also demonstrated test-retest reliability as the OLBI scores remained stable over time (given the significant correlations between two separate testing occasions). In terms of validity, the OLBI demonstrates factorial, convergent, and discriminant validity (Halbesleben & Demerouti, 2005).

The OLBI includes eight items of the exhaustion sub-scale and eight items on the disengagement sub-scale that are measured on a 4-point Likert-type scale (1 = strongly disagree, 4 = strongly agree). Participants were asked to indicate to what extent they agree with each of the statements by selecting the number that corresponds with the statement. Some examples of the statements include "I always find new and interesting aspects in my work" and "During my work, I often feel emotionally drained".

The items of the exhaustion sub-scale relate to feelings of emptiness, work overload, the need to rest, and exhaustion (physical, cognitive, and emotional). The items of the disengagement sub-scale refer to distancing oneself from the work, and cynical behaviours and attitudes relating to one's job (Demerouti & Bakker, 2008; Demerouti et al., 2003; Sinval et al., 2019). Each of these sub-scales contains four items that are positively worded and four items that are negatively worded. Therefore, both ends of the energy (exhaustion and vigour) and identification (cynicism/disengagement and dedication/engagement) dimensions are included in the OLBI. However, the UWES-9 was still used to measure engagement separately. The Disengagement items are 1, 3(R), 6(R), 7, 9(R), 11(R), 13, 15. The Exhaustion items are 2(R), 4(R), 5, 8(R), 10, 12(R), 14, 16. The (R) indicates that the item must be reversed when scored (Demerouti et al., 2010). Lower scores on energy indicated exhaustion and lower scores on identification indicated disengagement (Demerouti & Bakker, 2008).

3.6.4 Job Diagnostic Survey - Revised

The original Job Diagnostic Survey (JDS) was developed by Hackman and Oldham (1974) and measures the five job characteristics (skill variety, task identity, task significance, autonomy and feedback), three critical psychological states (experienced meaningfulness of the work, experienced responsibility of work outcomes, and knowledge of results) and personal outcomes (high internal work motivation, high general job satisfaction, high growth satisfaction and high work effectiveness) found in the Job Characteristics Model. However, for the sake of this research, the revision of Hackman and Oldham's (1975) original JDS used by Boonzaier et al. (2001) was utilised (the JDS-R) as it supports the five-factor solution proposed by the job characteristic model and is more psychometrically sound in the South African context (Boonzaier & Boonzaier, 1994). The Alpha coefficients for each of the five characteristics in the JDS-R were satisfactory ($\alpha > .7$) (Boonzaier et al. 2001).

The JDS-R is a diagnostic tool based on the Job Characteristics model. It can be used to identify the specific job characteristics in need of enrichment and to identify the current motivating potential of a job (Boonzaier et al., 2001). For this reason, it was chosen as an appropriate measure of the job characteristics variable. Through the use of a questionnaire, this measure assessed the perception of each respondent on the presence of the five job characteristics in their job. It therefore relies on a subjective evaluation on part of the respondent (Boonzaier et al., 2001). The presence of these five job characteristics in a job can be summarised into a single score known as the Motivating Potential Score (MPS). The MPS indicates the extent of job complexity (Boonzaier et al., 2001). Based on the recommendations of Boonzaier et al. (2001), the job characteristics were summarised into a single score (the MPS) using the simple additive index. This score was used to determine whether a respondent has a high or low presence of these five job characteristics in their jobs.

Sections 1 and 2 of the JDS-R measure the job characteristics of skill variety, task identity, task significance, autonomy and feedback. Sections 3, 4 and 5 measure the personal outcomes internal work motivation, general job satisfaction and growth satisfaction. In order to calculate the MPS results from sections 1 and 2 of the JDS-R were required. For this reason, only section 1 (consisting of five items) and section 2 (consisting of 10 items) of the JDS-R were utilised. Section 1 of the JDS-R measures each job characteristic through one, item while section 2 measures each job characteristic through two items. Each item was measured on a 7-point Likert scale, with 1 indicating very little (section 1) or very inaccurate (section 2) and 7 indicating very much (section 1) or very accurate (section 2) (Boonzaier et al., 2001). An example of a question from section 1 is “How much autonomy is there in your job? That is, to what extent does your job permit you to decide on your own how to go about doing the work”. Section 2 contains a number of statements that asked the respondents to respond how accurate the statement is in describing their job. An example of a statement is “the job requires me to use a number of complex or high-level skills”. Lower scores therefore indicated low job complexity while higher scores indicated high job complexity.

3.6.5 Psychological Capital Questionnaire (PCQ-12)

Psychological capital represents an individual’s positive evaluations of their circumstances and likelihood of success given their motivation and perseverance. It is defined as a developed positive psychological state characterised by positive attributions of being able to succeed in current and future situations (optimism); high self-confidence and putting

in the necessary effort to accomplish challenging endeavours successfully (self-efficacy); sustaining and bouncing back to achieve success even in the face of adversity (resiliency); and persevering towards and redirecting goals where necessary towards success (hope) (Luthans et al., 2007).

To measure this construct, the Psychological Capital Questionnaire PCQ-12 was used. The PCQ-12 is the short form version of the PCQ-24, which includes four scales of psychological capital, including self-efficacy, hope, resiliency and optimism. These four scales were chosen based on their considerable psychometric support (Luthans et al., 2007). Each scale of the PCQ-12 has an equal weighting with response options based on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Examples of questions include "I feel confident in representing my work area in meeting with management" and "I usually take stressful things at work in stride". Participants were asked to respond based on their current thoughts of themselves in order to facilitate the state-like framing (Luthans et al., 2007). Higher scores on the PCQ-12 indicated that the respondent possessed more of the psychological resources (Herbert, 2011).

All items were evaluated in terms of their face and content validity for being relevant to the workplace and were drawn from established scales that were previously published and tested in recent workplace studies (Görgens-Ekermans & Herbert, 2013). The optimism items were adapted from Scheier and Carver's (1985) Measure of Optimism; the self-efficacy items from Parker's (1998) Measure of Self-efficacy in the Workplace; the hope items were adapted from Snyder et al.'s (1996) State Hope Scale; and the resilience items from Wagnild and Young's (1993) Resilience Scale.

According to Görgens-Ekermans and Herbert (2013), the internal consistency for the four scales in a South African sample group were .72, .75, .80, .76 for hope; .74, .69, .76, .79 for optimism; .75, .84, .85, .75 for self-efficacy; and .71, .71, .66, .and 72 for resilience. The PCQ-24 has also shown to have higher order factor structure with the results of a series of higher-order confirmatory factor analyses (CFAs). The root mean square error of approximation (RMSEA) was .046; the Comparative fit index (CFI) .93; and the standardised root mean residual (SRMR) .051. Based on the results obtained in Grobler and Joubert's (2018) study, the PCQ can be considered to be a valid and reliable instrument for measuring PsyCap. The PCQ-12 has also shown to be equally valid, and a more efficient measure of psychological capital (Caza et al., 2010), given its shorter length.

3.6.6 Work Schedule

An individual's work schedule was determined from three separate questions. Two of these questions were adapted from the Shift Work Index (Barton et al., 2007), which is a free measurement instrument available in the public domain. The first question asked for the respondent's "usual type of work schedule", providing five different types of options: "morning (or early) shift", "normal day shift", "afternoon (or early evening) shift", "night shift" or "rotating day and night" shifts.

The second and third questions were more open-ended. The second question asked respondents to indicate the number of times that they worked each particular shift in the last four-week period. They were given an example of a response and then provided with optional spaces to fill numbers in next to each particular shift. For example, a possible response could have been "Normal day shift: 10" and "Night shift: 5", and "afternoon (early evening) shift: 5" and "Morning (early) shift: 2". At least one space had to be filled with a number, but they were not required to fill in all the spaces. This question aided in determining the usual number and diversity of shifts normally worked.

The third question asked, "Please indicate your usual start and finish times for each shift you usually work". Respondents were asked to provide their answer using a 24h format (e.g. 22:00) or to clearly indicate "a.m." or "p.m.". They were given spaces to provide start and finish times for all types of work schedules, allowing for those who work rotating day and night shifts to provide usual start and finish times for morning, normal day, afternoon and night shifts. An extra option was provided under "other" in which respondents were asked to specify their work times.

Asking all three of these questions allowed for more explanatory detail from respondents regarding their usual start and finish times and types of shifts worked and to give them more freedom in providing their unique working hours. It also allowed for the different work schedule categories (e.g. morning/early shift) to be explained in more detail in terms of the average starting and finish times (e.g., morning shift being 04:00 to 12:00) which allowed for the type of shifts to be graded more accurately in terms of their severity of consequences on the worker. Work schedule was therefore measured and analysed in terms of the variance in working hours and the extent to which individuals worked atypical hours. The least severe work schedule follows normal day-time hours which allow the individual to work according to their biological clock. The most severe includes those work schedules that involve working

in direct contradiction to the biological clock and which further prevent workers from adapting to their shift schedules. The grading of these shifts was from the least severe (1) to most severe (4) working hours, indicating a variable with low and high scores. The grading was as follows:

- Low Severity: individuals who usually work normal day-time hours (1).
- Low-Medium Severity: individuals who usually work atypical hours that deviate slightly from the normal working hours but still largely overlap with normal working hours (2).
- Medium-High Severity: individuals who typically work night shifts (3).
- High Severity: individuals who typically work a rotation of day and night shifts (4).

3.6.7 Horne – Őstberg Morningness Eveningness Questionnaire (MEQ)

Originally, the Morningness-Eveningness Questionnaire (Horne & Östberg, 1976) was used to distinguish between the two extreme diurnal types - morningness type and eveningness type. Since its first development, it has been modified several times (Urbán et al., 2011). The Self-Report Version (MEQ-REV-SR) from Quality Metric (2021) was used. The morningness-eveningness questionnaire is a self-rated measure of the preference for the morning or the evening hours (Meliska et al., 2010). Exploratory factor analysis shows that the MEQ has four factors including peak time, morning affect, retiring, and rising time (Caci et al., 2009).

The MEQ consists of 19 items assessing the tendency towards a morningness chronotype or eveningness chronotype. Respondents are forced to make a choice as there is no “I do not know” option to choose from (Horne & Östberg, 1976). Examples of questions asked include “Approximately when would you get up if you were entirely free to plan your day?” and “At approximately what time of day do you usually feel your best?” Each item was scored in the range of 0 to 6, depending on the question and on the guidelines provided. A total score between 16 and 86 may be obtained (Bellicoso et al., 2014). According to Bellicoso et al. (2014) and Horne and Östberg (1976), the interpretations of the scores on the MEQ are as follows:

- Definitive evening type: 16 – 30.
- Moderate evening type: 31 – 41.
- Neither type: 42 – 58.

- Moderate morning type: 59 – 69.
- Definite morning type: 70 – 86.

Therefore, lower scores on the MEQ reflected a strong eveningness chronotype, while higher scores reflected a strong morningness chronotype.

3.7 Data Analysis

The units of analysis refer to what or who is being studied (Babbie, 2013), which in this case would be the individual: shift workers. The raw scores of the data retrieved from the questionnaire were captured into a data file on Excel. The data file was imported to R which was used to do the data analyses. R is a statistical computing software program used to manipulate, calculate and graphically display data (The R Foundation, 2019). This analysis program was chosen for its high extensibility and wide variety of statistical and graphical techniques. Descriptive statistics were used to explore the data.

Within research measurement, precision and accuracy are important qualities that need to be considered as they contribute towards the objective aspect of competent inquiry (Babbie, 2013). To ensure the precision and accuracy of this research, two technical considerations were taken into account, namely validity and reliability. Reliability refers to the quality of a measure to produce consistent results if the measure had to be administered at different points in time (Babbie, 2013). To ensure reliability within this study, well-known measures that have shown to be reliable in previous research were used. In addition, item analysis was done to assess the internal consistency reliability (using Cronbach's Alpha coefficients). Validity refers to the degree to which a measure accurately reflects the concept that it is supposed to measure (Babbie, 2013). As all of the instruments used were standardised measures, validity was not measured prior to statistical analysis.

PLS-SEM analysis was conducted to determine the cause-effect relationships between the latent variables and whether there were any significant moderation or mediation effects. The causal modelling approach of PLS-SEM was preferred over the covariance-based SEM (CB-SEM) method as the objective of CB-SEM focusses on reproducing the theoretical covariance matrix based on a specific set of structural equations, rather than on the explained variance (Hair et al., 2011). PLS-SEM, on the other hand, is similar to multiple regression analysis in its application in that it mainly aims to maximise the variance explained in the

dependent variables and further evaluates the quality of the data on the basis of measurement model characteristics (Hair et al., 2011; Hair et al., 2017). PLS-SEM is also able to work more efficiently with the small sample size (N=175) and the model complexity. It therefore places less restrictive assumptions on the data and addresses a broader range of problems when compared to CB-SEM (Hair et al., 2011).

PLS-SEM has two components that were analysed and discussed. The first was the outer model which aimed to evaluate the unidirectional predictive relationships between the indicator variables and their latent constructs. The outer model was analysed first to examine the measurement model's reliability and validity prior to any further interpretations (Hair et al., 2011). This component involved four steps including the evaluation of the composite reliability, the Average Variance Extracted (AVE) scores, the Heterotrait-Monotrait (HTMT) criterion, and the factor loadings using bootstrapping analysis. The second was the inner model, which showed the relationships between the different latent variables. This analysis included a three-step process of evaluating multicollinearity, the coefficients of determination, and the path coefficients of the hypothesised relationships. First, the inner model without any moderating variables was examined to test all hypothesised relationships between the latent variables. Next, the moderating effects were tested by fitting the models with the interaction terms included.

3.8 Procedure

As the research study involved gathering data from human participants, ethical clearance first had to be obtained. The research ethics application process was done by following the Departmental/Faculty Ethics Screening Committee (DESC) process as prescribed by Stellenbosch University. The project was included as an online survey and participants were anonymous. However, the project was still classified as medium risk as it involved burnout and physical/psychological health variables. In an attempt to reduce the risk of burnout and physical/psychological health variables, respondents were provided with information of the South African Depression and Anxiety Group if they wished to seek help (www.sadag.org or 0800 567 567). Alternatively, they were also provided with a link to a website that provided more information on how to prevent and manage burnout. This information was provided to them on the consent form. The project was reviewed by DESC and referred to the REC in order to obtain REC clearance (Appendix A).

Once the ethical clearance letter of approval from REC was obtained, the online survey was developed in collaboration with Stellenbosch University's postgraduate research services. Before the completed survey went public, a test run (pilot) was conducted on approximately five individuals. This ensured that there were no errors contained within the study, that the questions flowed smoothly and the data captured was correct. The target population was identified in various organisations that work in industries that tend to make use of non-standard working schedules and, with permission from organisations, an online invitation link to the survey was sent to a suitable person identified by the organisations (e.g. the Human Resources Manager), who then forwarded this invitation link to their workers using their internal communication systems. This process ensured that their workers remained anonymous.

Organisations were also assured that their company names and details would not be recorded or included in the reports or the final thesis. The online invitation link was also shared on social media platforms including Facebook, WhatsApp and LinkedIn, using an existing network of known contacts. In the posts, the invitation specifically asked individuals who work in industries that often make use of non-standard working hours. This network of known contacts was also asked to share or forward the invitation link to individuals whom they personally knew and believed to fit the sample profile.

Due to the challenges and safety concerns in relation to COVID-19, this study only made use of online surveys, and so hard copies of the questionnaires were not utilised. This brought about many unique challenges and implications for the results of this study. It may have, for one, overlooked an important segment of the shift worker population by not including unskilled or semi-skilled workers or workers from certain geographical locations in South Africa who did not have access to the internet or to the equipment needed to complete the online survey. It also made it more difficult and time consuming to collect data from participants. As the survey was online and likely overlooked a particular segment of the population (lower skilled workers), a requirement to participate in the survey was to have access to the internet and a computer or mobile device.

Within this online survey, informed consent (using the electronic informed consent template as provided by Stellenbosch University) was obtained before participants could move forward (see Appendix C). After informed consent was obtained, a biographical questionnaire was administered to collect and record socio-demographic and biographical

data of the participants. The data obtained in the biographical questionnaire was only used for the purpose of describing the sample and was therefore not used as the basis for any statistical analysis. This biographical questionnaire included questions on gender, age, ethnicity, location (province), highest level of education, marital status, number of dependents, home language (which may explain any possible inexplicabilities in the data), industry of work, work level, and average annual household income. The biographical questionnaire did not contain any identifying information on the participants to ensure anonymity. Once the biographical questionnaire had been completed, the participants were guided through a series of questions contained in the measurement instruments previously mentioned. At the end of the survey, participants were asked to share the survey link with anyone they felt may fit the inclusion criteria. The survey took approximately 25 to 30 minutes to complete.

The data collection procedure took approximately six-months to complete with 175 responses obtained. This sample size meets the minimum requirement of 160, based on the inverse squared root method (Kock & Hadaya, 2018). Once the surveys were completed and collected (using Stellenbosch University's internal survey service, SUNsurveys), the data was downloaded and captured onto a spreadsheet on Excel. Data storage followed the 3-2-1 backup rule, with two copies being saved in password-protected files on two password-protected laptop drives, and with an additional third copy saved on a password-protected off-site location (Microsoft cloud).

3.9 Conclusion

This quantitative research study aimed to explain the causal relationships between variables and followed a cross-sectional survey design (ex post facto correlational design). The survey questionnaire consisted out of seven reliable and valid measurement instruments including the RAND-36, the UWES-9, the OLBI, the JDS-R, the PCQ-12, the MEQ as well as three additional questions to measure work schedule. The target population included all South Africans who work in industries that make use of formal non-standard working hours. An ethical procedure was followed whereby ethical clearance was obtained, informed consent was obtained from all participants and data was captured and stored on password protected locations following the 3-2-1- backup rule. Upon completion of the data collection period, the total sample group consisted out of 175 individuals (n=175). Statistical analysis involved analysing the demographics and socio-graphics of the sample group, descriptive statistics, reliability analysis and PLS-SEM to determine the cause-effect relationships between

variables. This was used to either support or to refute the theoretical relationships depicted in the structural model. The results of the statistical analysis are discussed in more detail in the next section.

Chapter 4: Results

4.1 Introduction

Chapter 3 described and motivated the research methodology used for this study, which allowed for statistical analyses to take place. This chapter aims to report and discuss the various statistical analyses performed which are used to support or to refute each of the hypotheses in this research study. First, the sample is described by looking at the descriptive statistics, demographics, and socio-graphics. The reliability analyses will then be discussed focusing on the Cronbach's Alpha of the variables. Validity analyses were not included as the instruments used in this study were standardised. Results of the PLS-SEM are then discussed. First, the results of outer model will be reported and discussed to examine the measurement model and uncover its reliability and validity. This is followed by the evaluation of the inner path models, which will also evaluate all of the moderating effects that were present.

4.2 Descriptive Statistics

Descriptive statistics involve procedures for organising, summarising, and describing quantitative data in a way that is easy to understand (Aron & Aron, 2002; McCall, 1998). The demographics and socio-graphics of the sample are discussed, followed by the descriptive statistics of the different variables in this study.

4.2.1 Demographics and Socio-graphics of the Sample

In relation to the demographics of the sample, 52% of the respondents were male and 48% were female. The mean age of the sample group was 36 years, with the majority of the sample (51%) falling between the ages of 25 and 34 years. A total of 23% of the sample group were between 35 to 44 years, 15% were between 45 to 54 years, 7% were between 18 and 24 years and the remaining 3% were between 55 and 64 years of age. In looking at the ethnic diversity of the sample group, 44% were white, 35% were African, 12% were coloured, 7% were Indian/Asian, and 1% identified as "other" in their ethnic group selection.

The majority of respondents were located in Gauteng (37%), with 34% residing in the Western Cape, 10% in KwaZulu-Natal, 7% in the Free State, 6% in the Eastern Cape, 3% in

Mpumalanga, 2% in North West, 1% in the Northern Cape and 1% in Limpopo. Regarding the highest level of education, 26% indicated a Grade 12 certificate, 21% indicated a Bachelor's degree, 19% indicated a National Diploma, 13% indicated an Honours degree, 10% indicated a Higher Certificate, 7% indicated a Master's degree, and 1% indicated Grade 10, Grade 11 and a Doctoral degree respectively. The majority of the sample group (46%) indicated English to be their home language, with 20% indicating Afrikaans, 10% Zulu, 9% Xhosa, 5% Sotho, 4% Pedi, 2% Tswana, 2% Tsonga, 1% Venda, and the remaining 2% indicating "other" as their selected home language group.

In looking at the marital status of the sample group, 50% of the respondents indicated their status as single, 47% indicated their status as married or in a domestic partnership, 3% indicated their status as divorced, while the remaining 1% indicated their status as widowed. The majority of the sample (43%) indicated having no dependents, 34% indicated having between 2 and 4 dependents, 21% indicated having 1 dependent, and 1% indicated having more than 4 dependents.

Regarding the different work levels of the sample group, 45% indicated their work level to be at an intermediate/experience level, 18% at a middle management level, 14% at a first level management level, 12% at a senior/top management level and the remaining 10% at an entry level work position. Looking at the average annual household income of the sample group, 30% indicated between R197,001 to R400,000, 17% between R19,001 to R86,000, 16% between R86,001 to R197,000, 16% between R400,001 to R688,000, 7% between R0 to R19,000, and 1% having an annual household income of R1,481,000 or more. Finally, the different industries of the sample group were also investigated and can be seen in Table 1. The most common industry included the health industry, with the least common industry being postal and telecommunications services.

Table 1:

Summary of Work Industry Characteristics

Industry of work	Frequency table	
	Count	*Representation of sample*
	N	*%*
Chemical Industries	3	1.71
Commerce	2	1.14
Construction	3	1.71
Education	5	2.86
Financial services, Professional services	4	2.29
Food, drink, tobacco	6	3.43
Health services	47	26.86
Hotels, tourism, catering	19	10.86
Mining (coal, other mining)	4	2.29
Mechanical and electrical engineering	6	3.43
Media, culture, graphical	9	5.14
Postal and telecommunications services	1	0.57
Public service	7	4
Textiles, clothing, leather, footwear	2	1.14
Transport (including civil aviation, railways, road transport)	22	12.57
Transport equipment manufacturing	2	1.14
Utilities (water, gas, electricity)	3	1.71
Other	30	17.14
Missing	0	0

4.2.2 Descriptive Statistics

Information gathered from the descriptive statistics indicated that 39% of the sample group were normal day-time workers, indicating their start and finish times being somewhere between 08:00 and 18:00. A total of 35% of the sample group indicated having a rotating shift schedule, with a combination of working normal day time hours (between 08:00 and 18:00) and night shifts (19:00 to 07:00). A total of 22% of the sample group indicated working atypical hours that deviate slightly from the normal working hours but still largely overlap with normal working hours. These included early morning shifts (between 03:00 to 15:00), or afternoon/early evening shifts (between 14:00 to 00:30), and 4% of the sample group indicated working night shifts only (between 19:00 to 07:00).

The sample group can be further described in terms of their chronotype. The majority of the sample group identified as neither type (48%). This is to be expected as the majority of the population (60%) are intermediate chronotypes (Hittle & Gillespie, 2018). Morningness

types are more common in this sample group, with 38% identifying as a moderate morning type and 10% identifying as a definite morning type. The least common chronotype found among this sample group was the eveningness chronotype, with only 5% identifying as a moderate evening type and 0% identifying as a definite evening type. An overview of the descriptive statistics for all the variables within this study is provided in Table 2.

Table 2:

Descriptive Statistics

	n	Mean	SD	Median	Min	Max	25th Percentile	75th Percentile
Job Characteristics	175	5.59	1.03	5.80	1.9	7.0	4.86	6.46
Psychological Capital	175	4.78	0.93	4.97	1.06	6.0	4.19	5.50
Shift Schedule	175	2.34	1.31	2.0	1.0	4.0	1.0	4.0
Chronotype	175	57.41	9.24	58.0	31.0	77.0	52.0	64.0
Engagement	175	5.21	1.26	5.56	1.22	7.0	4.33	6.22
Burnout	175	2.31	0.60	2.25	1.0	3.63	1.81	2.69
Physical Health	175	0.81	0.17	0.86	0.03	1.0	0.71	0.94
Psychological Health	175	0.63	0.24	0.69	0.06	0.99	0.42	0.84

Note. n = Sample Size, SD = Standard Deviation, Min = minimum values, Max = maximum values

4.3 Reliability Analysis

Item analysis was conducted to determine the internal consistency reliability of the measures using Cronbach's Alpha coefficients. The Cronbach's Alpha coefficients were calculated for each of the latent variables and their sub-scales included in each of the measurement instruments. The reliability of the shift schedule variable could not be calculated as it only consisted of one score. The purpose of calculating the Cronbach's Alpha coefficient for the other measurement instruments was to determine whether there were any problematic items that required investigation before any further statistical analyses could be performed. The item analysis, including Cronbach's Alpha coefficients, is summarised in Table 3.

Table 3:

Summary of Item Analysis Results

Construct/sub-scale	Number of items in sub-scale	Cronbach's Alpha (95% confidence interval)	Standardized Alpha	Average Inter-Item correlation	Item-Total Correlation range
Job Characteristics	n/a	0.84 (0.78, 0.88)	0.84	0.51	0.54-0.67
Skills variety	3	0.77 (0.69, 0.83)	0.8	0.52	0.45-0.72
Task identity	3	0.71 (0.62, 0.79)	0.72	0.48	0.41-0.62
Task significance	3	0.76 (0.67, 0.82)	0.76	0.52	0.48- 0.66
Autonomy	3	0.71 (0.62, 0.79)	0.75	0.50	0.47-0.62
Feedback	3	0.79 (0.72, 0.85)	0.8	0.58	0.57-0.69
Psychological Capital	n/a	0.87 (0.82, 0.91)	0.88	0.65	0.70 – 0.83
Hope	4	0.87 (0.83, 0.91)	0.87	0.64	0.63- 0.8
Self-efficacy	3	0.90 (0.84, 0.94)	0.9	0.75	0.77- 0.83
Optimism	2	0.86 (0.77, 0.92)	0.86	0.75	0.75-0.75
Resilience	3	0.77 (0.68, 0.84)	0.78	0.54	0.55 – 0.67
Chronotype	19	0.79 (0.74, 0.83)	0.80	0.18	0.15 – 0.6
Engagement	n/a	0.90 (0.86, 0.93)	0.9	0.76	0.74 – 0.85
Vigour	3	0.89 (0.85, 0.92)	0.9	0.77	0.75-0.83
Dedication	3	0.86 (0.80, 0.90)	0.86	0.68	0.65-0.81
Absorption	3	0.78 (0.69, 0.84)	0.78	0.54	0.57-0.67
Burnout	16	0.90 (0.87, 0.92)	0.9	0.37	0.27-0.72
Physical Health	n/a	0.71 (0.60, 0.80)	0.72	0.40	0.44 – 0.59
General Health	5	0.86 (0.82, 0.90)	0.86	0.57	0.63-0.79
Physical functioning	10	0.93 (0.90, 0.95)	0.94	0.61	0.52-0.85
Role limitations due to physical health	4	0.80 (0.70, 0.86)	0.80	0.51	0.60-0.63
Bodily pain	2	0.88 (0.83, 0.92)	0.88	0.79	0.79-0.79
Psychological Health	n/a	0.85 (0.81, 0.88)	0.9	0.70	0.67 – 0.82
Role limitations due to emotional health	3	0.88 (0.83, 0.92)	0.88	0.71	0.73-0.80
Social functioning	2	0.78 (0.69, 0.85)	0.78	0.64	0.64-0.64
Vitality	4	0.87 (0.83, 0.90)	0.87	0.64	0.67-0.78
Emotional Well-being	5	0.86 (0.82, 0.90)	0.86	0.57	0.63 – 0.75

Table 3 indicates that the Cronbach's Alpha coefficients for all the scales and sub-scales were above the critical cut-off value of .7. Thus, all the sub-scales of all of the latent variables measured in this study showed reliability. All the item-total correlations obtained for the Job Characteristics, Psychological Capital, Engagement, Physical Health and Psychological Health sub-scales were above .4, which indicated that the items reflected the same underlying factor. With Burnout, there were three items that showed an item-total correlation of below .4, namely item 6 (.39), item 13 (.27) and item 14 (.37). These low correlations might be an indication that these three items do not reflect the same underlying

factor of Burnout as the other items. Chronotype also showed eight items with a lower item-total correlation of below .4, including item 3 (.27), item 4 (.36), item 8 (.18), item 10 (0.35), item 12 (.19), item 13 (.34), item 14 (.21), and item 16 (.15). Thus, these items may also not reflect the same underlying factor of chronotype as the other remaining items. Given that the Cronbach's Alpha coefficients for burnout (α = .90) and chronotype (α = .79) were satisfactory and that removing these items would not make a difference in the statistical analyses to follow, they were retained.

4.4 PLS-SEM Analysis

PLS-SEM analysis was conducted to determine the cause-effect relationships between the latent variables and the moderation and mediation effects. PLS-SEM has two components that are reported and discussed. The first is the outer model which was done to examine the measurement model's reliability and validity before further interpretations (Hair et al., 2011). The second is the inner model which showed the relationships between the different variables. First, the inner model without any moderating variables was examined to investigate all the postulated relationships between the latent variables. After this, the models were fitted where the interaction terms were included to test the postulated moderations.

4.4.1 The Outer Model

The purpose of evaluating the outer model is to determine the reliability and validity of the measurement model. First, the internal consistency of the PLS-SEM outer model (Appendix F) was evaluated through composite reliability. The convergent validity was then determined by examining the AVE scores. The third step was to investigate the divergent validity of the model by looking at the HTMT criterion. As the final step in evaluating reliability, the factor loadings were examined using bootstrapping analysis. It should be noted that chronotype was not included in the outer model evaluation as it is a formative measurement model. Thus, unlike the other constructs which were reflective, chronotype is influenced by its items. For formative constructs, the items do not necessarily have to be correlated, and for that reason reliability analysis was not deemed appropriate.

When evaluating the latent variable scales for internal consistency reliability, the composite reliability values should ideally be equal to or greater than .7 (Hair et al., 2017). However, values that fall below .6 would indicate a lack of reliability (Hair et al., 2011). As

indicated in Table 4, all composite reliability scores were above .7, showing that all the six scales measured the latent variables that they were supposed to measure. Table 3 also indicates the AVE values which were used to determine whether these six measures show convergent validity. A measure is seen to show adequate convergent validity if the AVE values are equal to or above .5 (Hair et al., 2011; Hair et al., 2017). This would indicate that the latent variable explains more than half of its indicator's variance. All of the measures showed AVE values above the .5 cut-off point, except for the burnout measure (.42). Burnout therefore only explained 42% of the variance within its measurement items which, in failing to meet the cut-off point of .5, is not indicative of convergent validity. The remaining five measures of job characteristics (.6), PsyCap (.73), engagement (.83), physical health (.82) and psychological health (.93) showed convergent validity.

Table 4:

Composite Reliabilities and AVE Values of Measures

Measure	Composite Reliability	AVE value
Job Characteristics	0.88	0.60
Psychological Capital	0.92	0.73
Engagement	0.94	0.83
Burnout	0.92	0.42
Physical Health	0.82	0.54
Psychological Health	0.93	0.77

The HTMT ratio method was used to determine the degree to which the constructs differ from each other (discriminant validity). A construct shows discriminant validity if the HTMT value falls below 1. For a construct to show discriminant validity from another, an HTMT threshold point of between .85 and .90 is suggested (Ab Hamid et al., 2017). As can be seen in Table 5, all of the HTMT values for all of the constructs fell below .85. Therefore, all of the pathways were found to have satisfactory HTMT values and displayed discriminant validity.

Table 5:

HTMT Ratios of Measures

Pathway	HTMT Ratio	95% Lower	95% Upper	Discriminant
Job Characteristics → Psychological Capital	0.44	0.26	0.63	yes
Job Characteristics → Burnout	0.47	0.35	0.61	yes
Job Characteristics → Work Schedule	0.06	0.05	0.21	yes
Job Characteristics → Engagement	0.42	0.26	0.57	yes
Job Characteristics → Physical Health	0.26	0.18	0.45	yes
Job Characteristics → Psychological Health	0.25	0.12	0.42	yes
Psychological Capital → Burnout	0.53	0.38	0.67	yes
Psychological Capital → Work Schedule	0.05	0.03	0.20	yes
Psychological Capital → Engagement	0.59	0.41	0.76	yes
Psychological Capital → Physical Health	0.34	0.23	0.50	yes
Psychological Capital → Psychological Health	0.51	0.37	0.64	yes
Burnout → Work Schedule	0.11	0.08	0.23	yes
Burnout → Engagement	0.73	0.61	0.82	yes
Burnout → Physical Health	0.59	0.49	0.71	yes
Burnout → Psychological Health	0.67	0.55	0.77	yes
Work Schedule → Engagement	0.03	0.02	0.19	yes
Work Schedule → Physical Health	0.10	0.05	0.23	yes
Work Schedule → Psychological Health	0.02	0.02	0.18	yes
Engagement → Physical Health	0.42	0.29	0.60	yes
Engagement → Psychological Health	0.66	0.54	0.78	yes
Physical Health → Psychological Health	0.83	0.73	0.95	yes

In the final step of evaluating reliability, the outer loadings were examined using PLS bootstrapping analysis and a 95% confidence interval. The p-values for the t-test were also examined with values below .5 showing statistical significance (Kock, 2015). Ideally, the manifest variables should have a loading of .707 or more to accept them as a constituent of a latent construct (Carmines & Zeller, 1979), which would imply that there is more shared variance between the constructs and their measures than there is error variance. However, Roldán and Sánchez-Franco (2012) state that this rule of thumb is too rigid and that items with weaker indicators should still be retained based on their content validity. Only when items have very low loadings (≤ 0.4), should they be considered for removal and only if it would lead to increased composite reliability of the latent construct that is above .7 (Hair et al., 2011).

The results in Table 6 indicate that all of the loadings for the items of job characteristics, PsyCap, engagement and psychological health fell above the cut-off point of

.707. In the examination of physical health, the sub-scale of physical functioning has an outer loading of .55. However, based on its content validity, it was retained in the model. The burnout construct showed multiple items below the rigid cut-off score of .707. However, only two items fell below .4, including item 6 (.4) “Lately, I tend to think less at work and do my job almost mechanically” and item 13 (.32) “This is the only type of work that I can imagine myself doing”. Looking at the content of these items, it may be that respondents did not view or answer these questions in relation to burnout or engagement. For example, doing their work mechanically may not be indicative of experiencing burnout and even though they may be experiencing burnout, they may still view their current job as the only type of work that they can imagine themselves doing. Thus, the content of these items may not be indicative of the burnout construct. While ideally these items should be removed, it was noted that their removal would not have an impact on the composite reliability or statistical analyses moving forward. These items are also part of a standardised instrument that has undergone extensive theory-driven conceptualisation which supports the inclusion of these indicators by experts based on content validity. For these reasons, these two items were retained. In the case of statistical significance, all paths had a p-value below .5 and were therefore regarded as statistically significant.

Table 6:

Outer Loadings of Measures

Latent Variable	Manifest Variable	Loading	95% Lower	95% Upper	T-Statistics	P-Value
Job Characteristics	Autonomy	0.83	0.76	0.87	28.12	<0.001
Job Characteristics	Task identity	0.74	0.62	0.83	14.25	<0.001
Job Characteristics	Skills variety	0.83	0.75	0.88	24.33	<0.001
Job Characteristics	Task significance	0.66	0.52	0.77	10.06	<0.001
Job Characteristics	Feedback	0.82	0.75	0.87	24.83	<0.001
Psychological Capital	Self-efficacy	0.84	0.77	0.89	27.23	<0.001
Psychological Capital	Hope	0.91	0.87	0.94	52.23	<0.001
Psychological Capital	Resilience	0.81	0.71	0.88	18.51	<0.001
Psychological Capital	Optimism	0.86	0.81	0.90	35.60	<0.001
Burnout	Item 1	0.62	0.48	0.73	9.67	<0.001
Burnout	Item 2	0.59	0.47	0.70	9.99	<0.001
Burnout	Item 3	0.78	0.72	0.82	27.96	<0.001
Burnout	Item 4	0.67	0.56	0.76	12.80	<0.001
Burnout	Item 5	0.53	0.38	0.66	7.51	<0.001
Burnout	Item 6	0.40	0.22	0.57	4.43	<0.001
Burnout	Item 7	0.70	0.60	0.77	15.95	<0.001
Burnout	Item 8	0.78	0.70	0.84	22.38	<0.001
Burnout	Item 9	0.69	0.59	0.78	14.27	<0.001
Burnout	Item 10	0.64	0.50	0.73	10.99	<0.001
Burnout	Item 11	0.65	0.54	0.75	11.39	<0.001
Burnout	Item 12	0.76	0.68	0.83	19.25	<0.001
Burnout	Item 13	0.32	0.15	0.47	3.88	<0.001
Burnout	Item 14	0.45	0.28	0.59	5.67	<0.001
Burnout	Item 15	0.76	0.67	0.83	18.24	<0.001
Burnout	Item 16	0.77	0.69	0.83	20.89	<0.001
Engagement	Vigour	0.93	0.92	0.95	99.05	<0.001
Engagement	Dedication	0.94	0.93	0.96	113.94	<0.001
Engagement	Absorption	0.86	0.78	0.91	26.42	<0.001
Physical Health	General health	0.83	0.75	0.89	24.26	<0.001
Physical Health	Physical functioning	0.55	0.28	0.74	4.66	<0.001
Physical Health	Role limitations due to physical health issues	0.71	0.58	0.79	12.74	<0.001
Physical Health	Bodily pain	0.82	0.74	0.87	24.19	<0.001
Psychological Health	Role limitations due to emotional health issues	0.78	0.70	0.85	20.00	<0.001
Psychological Health	Social functioning	0.87	0.82	0.90	40.14	<0.001
Psychological Health	Vitality	0.92	0.90	0.94	92.93	<0.001
Psychological Health	Emotional well-being	0.93	0.91	0.95	84.16	<0.001

After taking the composite reliability, AVE values, HTMT ratios and outer loadings into careful consideration, the outer model with the latent variables were found to show satisfactory reliability and validity, thus allowing the PLS-SEM analysis to move to the next stage in evaluating the inner models.

4.4.2 The Inner Models

To investigate the quality of relationship between variables in the structural model, the inner models path coefficients were inspected. First, the main effects between variables were investigated without the inclusion of any moderating variables. Thereafter, each interaction effect was investigating by including each moderating variable in a separate inner model diagram. This included a three-step process of testing for multicollinearity, the coefficients of determination, and the path coefficients of the hypothesised relationships.

4.4.2.1 Inner Model without Moderators

The test for multicollinearity indicates the extent to which the effects of one variable can be explained by another variable. Thus, when multicollinearity is high, it is likely that the effects of one variable on another may be due to interrelationships. The test for multicollinearity includes the evaluation of the variance inflation factor (VIF) coefficients. The cut-off scores for VIF values should be below 5, or preferably below 3 (Hair et al., 2019). Any VIF values above 5 would thus indicate collinearity issues. As can be seen in Table 7, all VIF values fell between 1.29 and 1.86, indicating an absence of multicollinearity among the variables.

Table 7:

VIF Values of the Measures

	Variance Inflation Factor (VIF)		
	Engagement	Physical Health	Psychological Health
Job Characteristics	1.29		
Psychological Capital	1.40		
Burnout	1.43	1.86	1.86
Engagement		1.86	1.86

The coefficients of determination (R^2) range between 0 – 1 with greater values indicating increased explanatory power of the regression equation and its predictive accuracy. Essentially, the R^2 indicates the proportion of variance of the dependent variable that can be explained by the indicator variables in the model (Hair et al., 2014). As the goal of PLS-SEM is to explain the latent variables' variance, the R^2 values should be high (Hair et al., 2011). As can be seen in Table 8, the adjusted R^2 values indicate that 52% of the engagement construct (R^2 = .52) can be explained by the combination of job characteristics, psychological capital and burnout. Burnout had an R^2 value of <1%, indicating that none of the variance of burnout was explained by shift schedule. It is important to take note that burnout is only described by one variable in this study, namely shift schedule. This result therefore indicated that shift schedule does not predict any variance on the burnout construct, and that it is better explained by other variables not included in this model. With regard to physical health, approximately 29% of this construct (R^2 = .29) was explained by burnout and engagement. A total of 46% of psychological health (R^2 = .46) was explained by burnout engagement. Finally, 15% of psychological capital (PsyCap) (R^2 = .15) was explained by job characteristics. While this value is considered weak, this may be explained in that only one variable is considered to have an effect on PsyCap in this study. This result therefore indicated that 85% of the variance in PsyCap is influenced by other variables not included in this model.

Table 8:

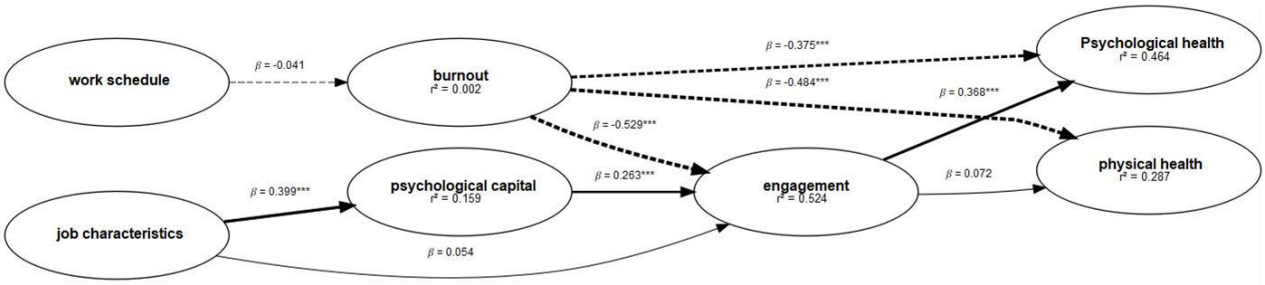
The Coefficients of Determination of the Measures

Construct	R^2	Adjusted R^2
Engagement	0.52	0.52
Burnout	<0.01	<0.01
Physical Health	0.29	0.28
Psychological Health	0.46	0.46
Psychological Capital	0.16	0.15

The path coefficients determine whether the collected data of this study supports or refutes the proposed hypotheses. Paths that are significant and show a trend as stipulated in the hypotheses would empirically support the proposed causal relationships. On the other hand, paths that are nonsignificant or do not show the same directional trends as specified do not support the proposed hypothesis (Hair et al., 2011). The path coefficients for the inner model without moderators can be seen in Figure 4.

Figure 4:

The Inner Model Diagram without Moderators



Source: Author's own construct

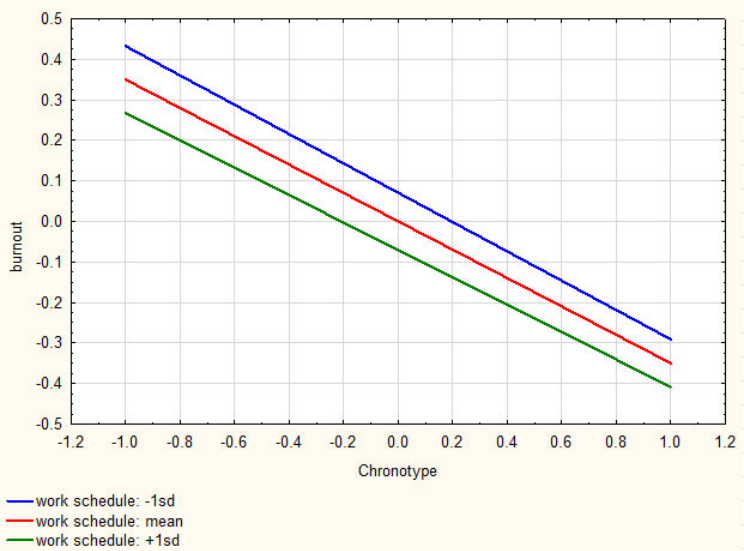
The results indicate that some of the relationships in the structural model were statistically significant while others were not. The relationships that were found not to be statistically significant also had low path coefficients. The inner model diagram therefore illustrates that there is not a significant causal relationship between work schedule and burnout, job characteristics and engagement, and engagement and physical health. As there is not a causal relationship between work schedule and burnout, it can also be concluded that burnout does not have a mediating effect between work schedule and general health. In addition, the mediating effect of engagement on job characteristics and general health is also not supported by the data.

4.4.2.2 Inner Model with Chronotype as a Moderator

The first moderator that was tested for was chronotype (see Appendix F). The test for multicollinearity indicated a VIF value of 1, indicating satisfactory results and an absence of multicollinearity among the chronotype variable. The coefficients of determination also indicate that 11% of the burnout variable (R^2 =.11) can be explained by the chronotype variable. This result indicates a weak value, with 89% of variance in burnout being explained by other variables not included in the study. Finally, the path coefficient was evaluated to determine whether chronotype had any moderating effect on burnout. The results indicate that the moderating effect of chronotype on non-standard work schedules and burnout is not significant and has a positive, albeit very low path coefficient (0.01), as seen in Figure 5. Thus, the buffering effect of chronotype on the relationship between non-standard work schedule and burnout is not supported by the data.

Figure 5:

The Moderating Effect of Chronotype on the Relationship between Work Schedule and Burnout

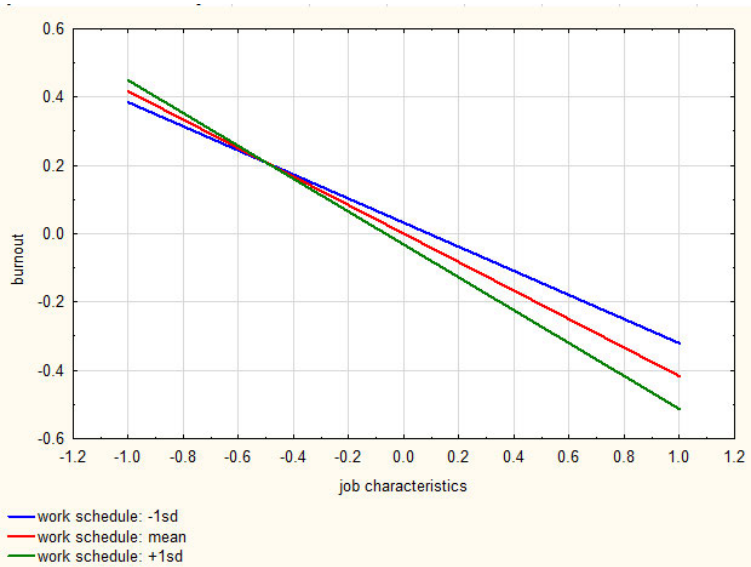


4.4.2.3 Inner Model with Job Characteristics as a Moderator

The second moderator that was tested for was job characteristics (see Appendix F). The results in the test for multicollinearity indicated a satisfactory VIF value of 1.01, indicating an absence of multicollinearity for the job characteristics variable. The coefficients of determination results indicated an adjusted R^2 of 0.17. This value further indicates that 17% of the burnout variable can be explained by the work schedule and job characteristics variables. Although this variance is higher than that of chronotype, it is still considered a weak value. The path coefficient evaluated indicates that the moderating effect of job characteristics on non-standard work schedules and burnout is not significant although it still has a slight positive trend, as seen in Figure 6, with a path coefficient value of -0.06. However, given that the results are not significant, the data does not support the buffering effect of job characteristics on the relationship between non-standard work schedule and burnout.

Figure 6:

The Moderating Effect of Job Characteristics on the Relationship between Work Schedule and Burnout

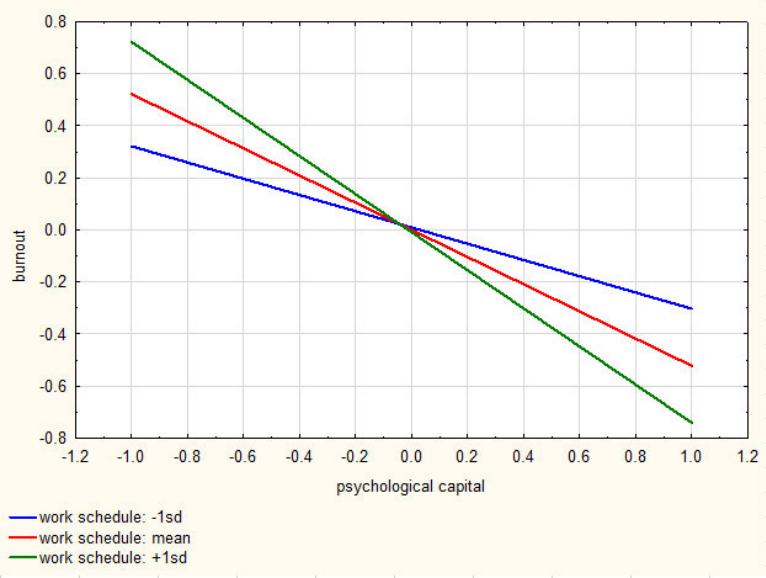


4.4.2.4 Inner Model with Psychological Capital as a Moderator

The third moderator that was tested for was PsyCap (see Appendix F). The results indicated a satisfactory VIF value of 1.02 in the test for multicollinearity. Thus, the PsyCap variable does not show any signs of multicollinearity. In evaluating the coefficients of determination, the results indicate that 28% of burnout ($R^2 = 0.28$) can be explained by the work schedule and PsyCap variables. The evaluation of the path coefficients indicated a significant negative relationship of PsyCap on work schedule and burnout. As seen in Figure 7, the data therefore supports the buffering effects of PsyCap on the burnout of shift workers.

Figure 7:

The Moderating Effect of Psychological Capital on the Relationship between Work Schedule and Burnout



4.4.2.5 Inner Model with Non-standard Work Schedule as a Moderator

The final moderator that was tested for was non-standard work schedule. This moderating relationship was tested on both job characteristics and psychological capital with their relationship with engagement (see Appendix F). The test for multicollinearity indicated satisfactory VIF values of 1.1 (regarding PsyCap) and 1.02 (regarding job characteristics) which indicate an absence of multicollinearity of these variables. The evaluation of the coefficients of determination indicated that there was no additional variance explained by the moderating effect of non-standard work schedule on the relationships between PsyCap or job characteristics and engagement, as the adjusted R^2 values remained the same as found in the inner model without moderators (0.51 and 0.52 respectively). The evaluation of the path coefficients indicated that there was a slight positive trend of work schedule on the relationship between PsyCap and engagement (0.08) and a slight negative trend of work schedule on the relationship between job characteristics and engagement (-0.04). These moderating relationships can be seen in Figures 8 and 9, respectively. However, both results were not statistically significant, and it can therefore be said that the moderating effects of non-standard work schedules are not supported by the data.

Figure 8:

The Moderating Effect of Work Schedule on the Relationship between Psychological Capital and Engagement

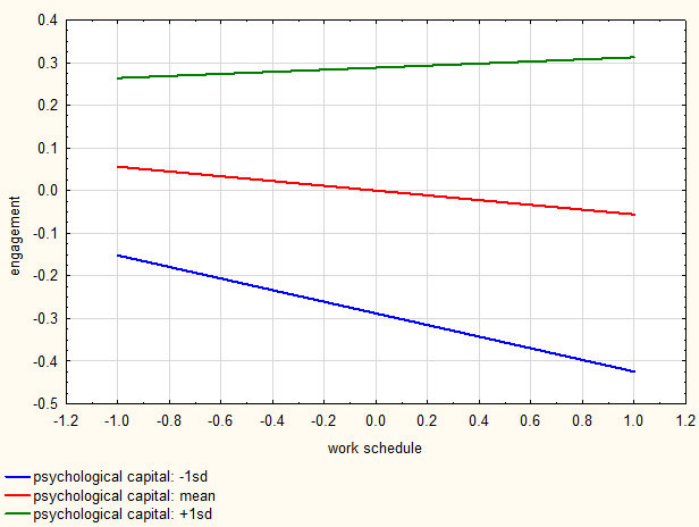
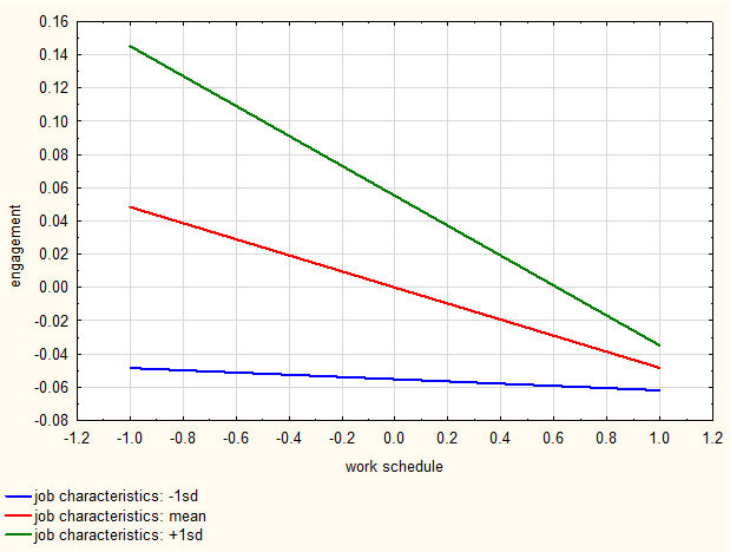


Figure 9:

The Moderating Effect of Work Schedule on the Relationship between Job Characteristics and Engagement



4.5 Interpretation and Discussion on the Hypothesised Relationships between Variables

The results indicate that some of the variables in the structural model explain the variance in the engagement, burnout, and general health of shift workers, while others do not. Thus, some hypotheses were supported by the data, and some were not. Table 9 provides a summary of all the hypotheses in terms of their path coefficients and their statistical significance and stating whether they were supported by the data of this sample group.

Table 9:

Summary of the Outcomes of the Proposed Hypotheses

Hypothesis	Pathway	Path coefficient	P-value	Supported by the data
Hypothesis 1	Engagement → Physical Health	0.07	0.51	No
Hypothesis 2	Engagement → Psychological Health	0.37	<0.001	Yes
Hypothesis 3	Burnout → Physical Health	-0.48	<0.001	Yes
Hypothesis 4	Burnout → Psychological Health	-0.38	<0.001	Yes
Hypothesis 5	Burnout → Engagement	-0.53	<0.001	Yes
Hypothesis 6	Job Characteristics → Engagement	0.05	0.37	No
Hypothesis 7	Psychological Capital → Engagement	0.26	0.001	Yes
Hypothesis 8	Work Schedule → Burnout	-0.04	0.58	No
Hypothesis 9	Job Characteristics → Psychological Capital	0.4	0.001	Yes
Hypothesis 10	Job Characteristics → Engagement → Physical Health	0.05, 0.07	0.37, 0.51	No
Hypothesis 11	Job Characteristics → Engagement → Psychological Health	0.05, 0.37	0.37, <0.001	No
Hypothesis 12	Psychological Capital → Engagement → Physical Health	0.26, 0.07	0.001, 0.51	No
Hypothesis 13	Psychological Capital → Engagement → Psychological Health	0.26, 0.37	0.001, <0.001	Yes
Hypothesis 14	Work Schedule → Burnout→ Physical Health	-0.04, -0.48	0.58, <0.001	No
Hypothesis 15	Work Schedule → Burnout→ Psychological Health	-0.04, -0.38	0.58, <0.001	No
Hypothesis 16	Job Characteristics*Work Schedule → Burnout	-0.06	0.396	No
Hypothesis 17	Psychological Capital*Work Schedule → Burnout	-0.21	0.014	Yes
Hypothesis 18	Work Schedule*Job Characteristics → Engagement	-0.04	0.425	No
Hypothesis 19	Work Schedule*Psychological Capital → Engagement	0.08	0.205	No
Hypothesis 20	Chronotype * Work Schedule → Burnout	0.01	0.89	No

These hypothesised relationships are interpreted and discussed in more detail in the following section.

4.5.1 Main Effects

Hypothesis 1: Engagement is positively related to physical health

The hypothesised positive relationship between engagement and physical health, although showing a small positive path coefficient, was not found to be statistically significant. Since the results produced a positive trend that was not significant, the null statistical hypothesis cannot be rejected. Thus, the result of hypothesis 1 can be summarised as follows:

$H_{01}: \beta_{35} = 0$

These results contradict the findings in the literature which emphasise that higher levels of employee engagement is associated with improved physical health (Amano et al., 2020; Bakker, 2009; Shimazu & Schaufeli, 2009; Shimazu et al., 2015; Shimazu et al., 2012). While these findings are surprising given the extensive support in favour of this relationship, the systematic review conducted by Cortés-Denia et al. (2021) emphasises that engagement is more strongly related to psychological health, while physical health is more strongly related to vigour. Vigour in this case is defined as "a positive affective response to the continuous interactions of different significant elements in the work environment" (Cortés-Denia et al., 2021) and consists of physical strength, emotional energy, and cognitive liveliness. This is distinct from engagement because people can still experience vigour at work despite their lack of motivation or resilience (Cortés-Denia et al., 2021). Cortés-Denia et al. (2021) further argue that the construction of engagement is similar to that of psychological health, while vigour is more focused on an energetic feeling, which may explain why physical health does not show a strong significant relationship with engagement.

Hypothesis 2: Engagement is positively related to psychological health

The hypothesised positive relationship between engagement and psychological health was found to be statistically significant. The data provides support for the alternative hypotheses and the results of hypothesis 2 can therefore be summarised as follows:

$H_{a2}: \beta_{36} > 0$

Unlike the hypothesised positive relationship between engagement and physical health, the findings of this study support the positive association between engagement and psychological health, which further supports the findings in the literature (Allan et al., 2019; Bakker, 2009; Roemer & Harris, 2018; Shimazu & Schaufeli, 2009; Shimazu et al., 2015; Shimazu et al., 2012). Workers in this sample group therefore perceived higher levels of psychological health when they felt more engaged in their work. These results build on the findings of the systematic review conducted by Cortés-Denia et al. (2021), which concluded that engagement is more strongly related to psychological health than physical health. Workers with high levels of engagement are therefore likely to have higher levels of well-being and have a lower risk of developing depressive symptoms, anxiety, fatigue, emotional symptoms, and psychological strain (Cortés-Denia et al., 2021).

Hypothesis 3: Burnout is negatively related to physical health

The hypothesised negative relationship between burnout and physical health was found to be statistically significant. The data supports the alternative hypotheses and the results for hypothesis 3 can be summarised as follows:

$H_{a3}: \beta_{45} < 0$

The findings of this study coincide with that found within literature indicating that a higher prevalence of burnout leads to a greater decline in physical health (Kim & Kao, 2011; Schaufeli & Bakker, 2004). These findings indicate that workers with higher levels of perceived burnout in this sample group also perceived their physical health to be worse off. This result is consistent with findings of other studies that explored the relationship between burnout and physical health in shift workers. For example, Peterson et al. (2008) found that Swedish healthcare staff who experienced burnout reported poorer self-rated health and sleep disturbances. Galaiya et al. (2020), in their systematic review, also found that burnout was generally associated with decreased physical quality of life and increased sickness amongst surgeons.

Hypothesis 4: Burnout is negatively related to psychological health

As with physical health, the hypothesised negative relationship between burnout and psychological health was also found to be statistically significant. Thus, the data provides support for the alternative hypotheses and the results for hypothesis 4 can be summarised as follows:

$H_{a4}: \beta_{46} < 0$

The results of this study further support the findings in the literature (Ahola et al., 2005; Kim & Kao, 2011; Koutsimani et al., 2019; Schaufeli & Bakker, 2004), indicating that in addition to decreased physical health, burnout also leads to a decline in psychological health amongst this sample group. This builds on the findings of other researchers who found similar results in other shift worker sample groups. For example, Peterson et al. (2008) also found that Swedish healthcare staff who experienced burnout were twice as likely to have depression and were even more likely to experience anxiety compared to those who did not experience burnout. A systematic review conducted by Galaiya et al. (2020) further found strong associations between burnout and depression, anxiety, post-traumatic stress disorder and suicidal ideation amongst surgeons.

Hypothesis 5: Burnout is negatively related to engagement

The hypothesised negative relationship between burnout and engagement was found to be statistically significant. The data provides support for the alternative hypotheses and the results can be summarised as follows:

$H_{a5}: \beta_{43} < 0$

These findings support what was found in the literature, with various research studies indicating a strong significant negative relationship between burnout and engagement (Demerouti et al., 2010; Poulsen et al., 2011; Schaufeli et al., 2008). Thus, individuals in this sample group who experienced higher levels of burnout also showed lower levels of engagement compared to those who perceived themselves not to be experiencing burnout. This suggests that the negative association between burnout and engagement is significantly strong regardless of an individual's work schedule.

Hypothesis 6: Job characteristics are positively related to engagement

The hypothesised positive relationship between job characteristics and engagement was not found to be statistically significant. While there was a slight positive trend found, the non-significance of the relationship still indicated that the null statistical hypothesis cannot be rejected. Hypothesis 6 can therefore be summarised as follows:

$H_{06}: \beta_{13} = 0$

Contrary to the vast amounts of research stating otherwise, the results of this study indicate that a higher presence of the five core job characteristics (skills variety, task identity, task significance, autonomy and feedback) does not lead to higher levels of engagement. This result is surprising as the consensus in the literature emphasises the motivational process involved in jobs with more of these job characteristics, which leads employees to be more engaged with their work (Allan et al., 2019; Bakker & Demerouti, 2008; Robbins et al., 2016; Schaufeli et al., 2009; Zahari & Kaliannan, 2022). Even though the results were not significant, we can still see a slight positive trend which indicates that job characteristics may still play a small role in the engagement of the workers in this sample group. This slight positive trend would be consistent with the results of Othman and Nasurdin (2019), who found that job characteristics were also slightly related to the engagement among nurses in Malaysia. Their study also indicated that some job characteristics played a more important role in predicting work engagement (i.e. job autonomy) while others did not predict engagement whatsoever (i.e. skill variety). Thus, another possible explanation for this result may be that looking at the combination of all five job characteristics (i.e. job complexity or the motivating potential score of a job) is less indicative of work engagement of shift workers and that looking at each of the job characteristics individually may lead to more significant results. Lastly, the possibility also exists that variables that are not included in this study, other than job characteristics, may play a more important role in determining what engages shift workers in this sample group.

Hypothesis 7: Psychological capital is positively related to engagement

The hypothesised positive relationship between PsyCap and engagement was found to be statistically significant, providing support for the alternative hypotheses. The results for hypothesis 7 can therefore be summarised as follows:

$H_{a7}: \beta_{23} > 0$

The result of this hypothesis is aligned to the findings of the literature, where higher levels of PsyCap in this sample group were also associated with higher levels of engagement (Bakker & Demerouti, 2008; Bakker & Van Wingerden, 2020 Garg & Singh, 2020; Hakanen et al., 2008; Langelaan et al., 2006; Xanthopoulou et al., 2009a). This finding suggests that PsyCap has predictive value when it comes to engagement, even amongst shift workers. It further builds on other studies which also indicate PsyCap as an antecedent of engagement, even in the context of shift work (Alessandri et al., 2018; Alkahtani et al., 2020; Ferreira,

2015; Grover et al., 2018; Syam & Arifin, 2021). The results of this study therefore indicate that a positive psychological state of mind in terms of resilience, self-efficacy, hope and optimism has strong motivational effects on shift workers which lead them to be engaged in their work.

Hypothesis 8: Non-standard work schedules are positively related to burnout

The hypothesised positive relationship between non-standard work schedule and burnout was not found to be statistically significant. Thus, the null statistical hypothesis cannot be rejected. The result of hypothesis 8 can be summarised as follows:

$H_{08}: \gamma_{14} = 0$

The results suggest that the level of burnout experienced by individuals in this sample group is not at all dependent on their type of shift. This contradicts the findings found in the literature where shift work leads to higher levels of burnout (Ayachit & Chitta, 2022; Poulsen et al., 2011; Sartang et al., 2018). While there have been some studies that did not find significant negative effects of working non-standard hours on burnout or general health (Hulsegge et al., 2020; O'Leary et al., 2006), one possible explanation of the small and non-significant results to support this hypothesis may be due to how work schedule was measured. While the aim was to provide respondents with flexibility in answering the questions of their work schedule by allowing them to provide their shift times, the final severity score did not take into account the number of shifts or hours they worked per week. This resulted in some respondents' work schedule being classified on the same level of severity where that may not have been the case. For example, one respondent indicated working eight day shifts, eight afternoon shifts and eight night shifts during the last four weeks, while another indicated working two day shifts and two night shifts in the last four weeks. However, both individuals were classified as "rotating day and night" shift workers because a limit was not set on the minimum number of hours that should be considered when classifying the severity of the work schedule. Thus, the work schedule classifications may not be a true reflection of their severity. The incorporation of the number of hours worked was an oversight important to consider in these results, as Kleiner and Pavalko (2010) emphasise that both the amount and timing of work may affect health. Poulsen et al. (2011) also indicate that individuals who worked longer hours also experienced higher levels of burnout and that those working part-time have a lower risk of experiencing burnout because they likely have more

recovery strategies to compensate for their job demands. Thus, longer working hours also play an important role when it comes to the physical stress and burnout that shift workers experience.

Another explanation may be that there were other variables that had a strong influence on the relationship between different work schedules and burnout. Kleiner and Pavalko (2010) state that a possible reason why there are inconsistencies in the findings of work time and health is that several confounding influences, such as family and work environments, are not taken into consideration. Hulsegge et al. (2020) further found that while there were no observed differences in burnout between shift workers and non-shift workers, when shift workers perceived their schedules to have a high impact on their private life, it did have a negative influence on their burnout levels. This finding suggests that working non-standard hours may lead to burnout if the workers who are dissatisfied with or perceive their schedule to have a negative effect on their personal lives. The relationship between work schedules and burnout may therefore be more complex than anticipated with other variables likely to influence the relationship between work schedules and burnout.

Hypothesis 9: Job characteristics are positively related to psychological capital

The hypothesised positive relationship between job characteristics and PsyCap was found to be statistically significant. As the data provides support for the alternative hypotheses, the result for hypothesis 9 can be summarised as follows:

$H_{a9}: \beta_{12} > 0$

The results of this study are in accordance with what was found in the literature (Bakker & Demerouti 2016; Roemer & Harris, 2018). This result indicated that shift workers in this sample group who perceive their jobs as having more skill variety, task identity, task significance, autonomy, and feedback (job characteristics) also showed higher levels of hope, resilience, self-efficacy and optimism (PsyCap). These results are similar to that found by Sameer et al. (2019), who also found that job characteristics preceded psychological capital amongst Egyptian employees. These authors concluded that the five core job characteristics could serve as significant predictors of PsyCap.

4.5.2 Interaction Effects

Hypothesis 10: Engagement mediates the relationship between job characteristics and physical health

The hypothesised mediating effect of engagement on the relationship between job characteristics and physical health was not found to be statistically significant. As a result, the null statistical hypothesis cannot be rejected. The result of hypothesis 10 is therefore as follows:

$H0_{10a}$: Indirect effect = 0

The results indicate that the engagement of the workers within this sample group is not related to their job characteristics and that their perceived physical health is not dependent on their levels of engagement. Since there is not a significant positive relationship between job characteristics and engagement or between engagement and physical health, there cannot be a mediating relationship between these three variables. Thus, despite what the JD-R theory may suggest, engagement does not have a mediating effect on the relationship between job characteristics and physical health, at least not in this sample group. These results are not surprising given the non-significant results between job characteristics and engagement, as well as engagement and physical health, as discussed in the results of the main effects.

Hypothesis 11: Engagement mediates the relationship between job characteristics and psychological health

The hypothesised mediating effect of engagement on the relationship between job characteristics and psychological health was also not found to be statistically significant, which indicates that the null statistical hypothesis cannot be rejected. The result of hypothesis 11 can be summarised as follows:

$H0_{11}$: Indirect effect = 0

While the results indicate that the psychological health of the workers in this study was in part dependent on their levels of engagement, their level of engagement was not dependent on the presence of the five core job characteristics. Since a significant positive relationship between job characteristics and engagement does not exist, the mediating effect of engagement on the relationship between job characteristics and psychological health was

not found. This finding is again contradictory to what the JD--R theory would suggest. However, these results are not generalisable beyond this sample group.

Hypothesis 12: Engagement mediates the relationship between psychological capital and physical health

The hypothesised mediating effect of engagement on the relationship between PsyCap and physical health was not found to be statistically significant. Thus, the results in favour of the null statistical hypothesis cannot be rejected. The result of hypothesis 12 is summarised as follows:

H_{012}: Indirect effect = 0

The results indicate that while the workers who have more PsyCap within this study show higher levels of engagement, their levels of engagement do not lead to improved physical health. Since the relationship between engagement and physical health is non-significant, in theory the mediating effect of engagement on the relationship between PsyCap and physical health is also not significant. These results contradict the general findings in literature. For example, Garg and Singh (2020) found that engagement mediates the relationship between personal resources (a positive psychological mind state) and physical health outcomes. However, after controlling for work engagement, their results indicated that partial mediation took place. This finding may provide an explanation why there was still a slight positive trend between engagement and physical health even though it was not found to be significant. As previously discussed, it could be that the relationship between engagement and physical health is not significant when it comes to workers' perceptions of their own physical health rather than the objective evaluation of it. Thus, a possible explanation for these results may lie in the lack of objectivity when measuring physical health. Alternatively, it could just be that engagement does not serve as a mediator because there is no relationship between engagement and physical health, which again would suggest that the causes behind the physical health of shift workers are more complex.

Hypothesis 13: Engagement mediates the relationship between psychological capital and psychological health

The hypothesised mediating effect of engagement on the relationship between PsyCap and psychological health was found to be statistically significant. The results are therefore in

favour of the alternative statistical hypothesis. The result of hypothesis 13 can be summarised as follows:

H_{a13}: Indirect effect $\neq 0$

The results indicate that in this study, workers are more engaged when they have more PsyCap and that those who are more engaged also have more positive perceptions of their psychological health. Since the positive relationship between PsyCap and engagement and engagement and psychological health is significant, further reasoning would also support that engagement mediates the positive relationship between PsyCap and psychological health. These results are therefore in line with the literature and provide further support for the body of knowledge on the positive associations between PsyCap, engagement and psychological health. While studies on PsyCap as a facilitator of engagement on general well-being is more common (Amano et al., 2020; Gupta & Shaheen, 2018), this study provides an alternative explanation in that engagement facilitates the positive relationship between PsyCap and general health, as suggested by the JD-R model (Bakker & Demerouti, 2017). This finding is consistent with the findings of Garg and Singh (2020) who found that engagement fully mediates the relationship between personal resources and positive psychological health outcomes. These findings once again support the assumption that PsyCap is an antecedent of engagement in that experiencing a positive psychological state of mind motivates workers towards attaining their goals and thereby leads to increased levels of engagement, which in turn lead to improved psychological health outcomes.

Hypothesis 14: Burnout mediates the relationship between non-standard work schedules and physical health

The hypothesised mediating effect of burnout on the relationship between non-standard work schedules and physical health was not found to be statistically significant. As the null statistical hypothesis cannot be rejected, the result of hypothesis 14 can be summarised as follows:

H_{014}: Indirect effect $= 0$

These results are not surprising given that the relationship between non-standard work schedules and burnout was not significant. Even though there is a negative relationship between burnout and physical health, the lack of a relationship between non-standard work schedules and burnout indicates that burnout does not have any mediating effect. These

results indicate that the workers in this study do have more negative perceptions of their physical health when they have increased levels of burnout, although these may not necessarily be caused by working non-standard working hours. It is also important to note that the way in which work schedule was measured may once again have had an influence on these results. Kleiner and Pavalko (2010) also suggest that focusing on a single type of health outcome, like burnout, limits the ability to assess the broad health effects of non-standard work time. The relationship between non-standard work schedules and health may therefore be more complex than anticipated, with the focus of burnout as an underlying mechanism being too limited. Understanding the determinants of health outcomes for shift workers therefore requires attention to a broader range of health outcomes and processes. This focus will allow for comparison which would result in a better understanding of the underlying mechanisms involved in physical health outcomes.

Hypothesis 15: Burnout mediates the relationship between non-standard work schedules and psychological health

The hypothesised mediating effect of burnout on the relationship between non-standard work schedules and psychological health was also not found to be statistically significant. The null statistical hypothesis can therefore not be rejected, with the result of hypothesis 15 summarised as follows:

H_{015}: Indirect effect = 0

The same argument is made here as with hypothesis 14. Since there is not a significant relationship between non-standard work schedules and burnout, there cannot be a mediating effect of burnout on the relationship of non-standard work schedules and psychological health. As there is a significant relationship between burnout and psychological health, the results indicate that burnout still plays an important role when it comes to the psychological health of the workers in this sample group, but that the causes thereof are not related to working non-standard working hours. However, these results may also once again be due to the measurement of work schedules, and given the study design, the results cannot be generalised beyond this sample group.

Hypothesis 16: Job characteristics have a buffering effect on the relationship between non-standard work schedules and burnout

The hypothesised moderating effect of job characteristics on the relationship between non-standard work schedules and burnout was not found to be statistically significant. The null statistical hypothesis can therefore not be rejected. The result of hypothesis 16 can be summarised as follows:

$H_{016}: \gamma_{34} = 0$

While there is a slight negative trend in the effects of job characteristics on the relationship between non-standard work schedules and burnout, the fact that the results came back as non-significant would still indicate that there is not a real observable relationship for this sample group. Despite what the JD-R theory may suggest, the result of this study indicates that regardless of their job complexity (i.e. presence of the five core job characteristics), the impact of working non-standard working hours on the workers' level of burnout remained the same. While the measurement of work schedule remains a possible explanation for this outcome, another explanation may be that job characteristics do not play an important role when it comes to reducing the level of burnout of shift workers. There may therefore be other more pertinent variables not included in this study which may be more relevant when it comes to reducing the extent of burnout experienced amongst these workers. However, it is also still important to note that these results are only applicable to the workers of this sample group and not to the general working population. While research in the shift work population on the effects of the five job characteristics is limited, there are some studies that suggest that some of the job characteristics may have an effect on the burnout and health of workers who work non-standard hours. For example, the findings of Pisanti et al. (2011) and Zurlo et al. (2018) suggest that low skill discretion led to higher levels of strain amongst Italian and Dutch nurses. A theoretical review conducted by Dall'Ora et al. (2020) also found that job characteristics, including low task variety and low autonomy, were consistently associated with burnout in nursing. This suggests that job characteristics may still be worthy of further exploration as a moderating variable amongst other groups of shift workers, especially given the slight negative trend initially observed.

Hypothesis 17: Psychological capital has a buffering effect on the relationship between non-standard work schedules and burnout

The results indicate that the hypothesised buffering effect of PsyCap on the relationship between non-standard work schedule and burnout was found to be statistically

significant, which provides support for the alternative hypotheses. The result of hypothesis 17 can be summarised as follows:

$H_{a17}: \gamma_{44} \neq 0$

This result suggests that a non-standard work schedule has a lesser negative impact in terms of its influence on burnout when workers perceive themselves as having more self-efficacy, hope, resilience and optimism (PsyCap). This result corroborates the findings in the literature (Bakker & Demerouti, 2018; Grover et al., 2018; Harms et al., 2017; Roemer & Harris, 2018; Tims et al., 2012) and is consistent with other studies which found that shift workers with high PsyCap have lower levels of burnout. For example, Almeida and Miclos (2022) and Li et al. (2019) found that nurses with more PsyCap also had significantly lower rates of burnout. While there is limited research on the buffering effect of PsyCap on the relationship between non-standard work schedules and burnout specifically, a study conducted by Shah et al. (2021) has found that PsyCap has a buffering effect on the relationship between occupational stress and burnout amongst medical staff. This emphasises the important role that PsyCap plays in coping with the negative effects of job demands, such as working non-standard working hours, and that having more PsyCap may serve as a protective factor for shift workers.

Hypothesis 18: Non-standard work schedules have an enhancing effect on the relationship between job characteristics and engagement

The results indicate that the hypothesised enhancing effect of non-standard work schedules on the relationship between job characteristics and engagement was not statistically significant. Therefore, the null statistical hypothesis cannot be rejected. The result of hypothesis 18 can be summarised as follows:

$H_{018}: \gamma_{53} = 0$

While the result was insignificant, there was a slight negative trend found with non-standard work schedules on the relationship between job characteristics and engagement. This slight negative trend is worthy of further consideration as it is the direct opposite to what was hypothesised according to the JD-R theory. This slight negative trend may suggest that working more severe non-standard work schedules may have a buffering effect on the relationship between job characteristics and engagement rather than an enhancing effect. In

other words, a more severe non-standard work schedule, like night shift work or rotating shift work, is seen as a hindrance demand rather than a challenge job demand and would therefore weaken the positive relationship between job characteristics and engagement. Bakker and Demerouti (2017) mention that the nature of shift work as a job demand is not motivational because an individual has no choice but to deal with it, suggesting that non-standard work schedules may be best categorised as a hindrance demand. Working non-standard hours would then be seen as involving undesirable or excessive constraints on individuals, which would interfere with their motivational processes involved in achieving their desired goals (Li et al., 2020).

Hypothesis 19: Non-standard work schedules have an enhancing effect on the relationship between psychological capital and engagement

The hypothesised enhancing effect of non-standard work schedules on the relationship between PsyCap and engagement was not found to be statistically significant. This finding indicates that the null statistical hypothesis cannot be rejected. The result of hypothesis 19 can be summarised as follows:

$H_{019}: \gamma_{63} = 0$

While this result was not significant, there was a small positive trend found in the data. So even though the data cannot prove that this is an actual trend, the possibility still exist that non-standard work schedules may increase the positive effects of PsyCap on engagement. This is a noteworthy trend as it may suggest that more severe non-standard work schedules may still be considered as a challenge demand in the JD-R model when it comes to personal resources. In other words, working non-standard hours, although requiring effort, may have the potential for personal growth amongst shift workers. When considering the result of the negative trend found in hypothesis 18, this brings to question whether non-standard work schedules are seen as a hindrance demand or a challenge demand. Li et al. (2020) further note that job demands are not always consistently categorised as either hindrances or challenges. These authors further suggest that this categorisation may also depend on the individual as their subjective evaluation of the demand may determine whether they experience the demand either challenging or hindering. The possibility therefore also exists that individuals who have more PsyCap may view their unusual working hours as challenging rather than as a hindrance. On the other hand, there may be other individual

factors that may influence whether non-standard work schedules are seen as a challenge demand or not. Further research will be required to explore the moderating effect of non-standard work schedules on these relationships to reject the null hypotheses and to gain a clearer understanding of the type of job demand that working non-standard hours can be considered.

Hypothesis 20: Eveningness chronotype has a buffering effect on the relationship between non-standard work schedules and burnout

The hypothesised buffering effect of eveningness chronotype on the relationship between non-standard work schedules and burnout, while showing a very small positive trend, was not found to be statistically significant. As the null statistical hypothesis cannot be rejected, the result of hypothesis 20 can be summarised as follows:

$H_{020}: \gamma_{24} = 0$

The expected result was that eveningness chronotypes would be better equipped to adapt to shift work and so experience less burnout than morningness types. While the literature strongly advocates for the important role that chronotype plays in the burnout and general health of shift workers (Juda, 2010; Mokros et al., 2018), the results found in this study suggest that chronotype does not moderate the negative effects that working non-standard hours have on workers' burnout levels. While there are few studies that confirm these results, there was a study conducted by Gohar et al. (2021) that also did not find a significant relationship between chronotype and burnout amongst shift workers. However, there are a few limitations in this study which may have contributed to this unexpected result.

A possible reason why this expected result was not supported by the data may be the lack of representation of eveningness types in this sample group. Only 5% of the sample group perceived themselves to be moderate evening types, while none of the sample group perceived themselves as definite evening types. However, 38% and 10% of the sample group respectively saw themselves as moderate morning types and definite morning types. Despite what was found in literature stating that morningness types have a lower tolerance for shift work (Wickwire et al., 2017), these individuals did not show higher levels of burnout compared to the 5% of moderate evening types.

While the underrepresentation of definite evening types may have affected these results, another possible explanation may be due to the measurement of work schedules. As previously mentioned, the severity classifications may not have been as true for certain workers in the sample group as they were for others in terms of the number of hours worked in a four-week period week. An important argument made by Boivin et al. (2021) was that eveningness types were not as negatively affected by the consequences of night work because they have more flexible sleeping arrangements. However, a number of respondents indicated that they either did not work a lot of shifts in the last week (for example, two day shifts and two night shifts in the last four weeks) or that they worked a majority of day shifts with very few night shifts in between (for example 12 day shifts, four early morning shifts, four afternoon/early evening shifts and two night shifts in the last four weeks). The possibility then exists that even though these individuals were classified as "rotating day and night" shift workers, they did not experience circadian misalignment because they had more flexible schedules that allowed for longer sleep durations.

4.6 Conclusion

The aim of this chapter was to report and discuss the statistical analyses performed and to use the results to support or refute each of the hypotheses in this research study. According to the demographics, socio-graphics and descriptive statistics of the sample group, data was collected from a heterogeneous study population. Item analysis revealed that all scales and sub scales included in the study were reliable. PLS-SEM analysis further revealed that the outer model with the latent variables were found to show satisfactory reliability and validity. Upon investigation of the quality of relationship between variables in the structural model, the results indicated that hypotheses 2, 3, 4, 5, 7, 9, 13, and 17 were supported by the data, while hypotheses 1, 6, 8, 10, 11, 12, 14, 15, 16, 18, 19 and 20 were not supported by the data. While the data did not support 12 of the 20 hypotheses in this study, the findings in literature still provides strong support for all the aforementioned hypotheses in this research study. It is also important to consider the limitations of this study, including the measurement of work schedules and the under-representation of eveningness chronotypes, and their possible adverse effects on the results. Overall, the results of this study provide important implications for theory and practice which will be discussed in the next section.

Chapter 5: Implications, Ethical Considerations, Limitations and Recommendations for Future Research

5.1 Introduction

The results of this research study have contributed to theory and practice in various ways. These findings have many implications for the workplace and provide many useful insights into the understanding of the South African shift worker population. The knowledge and insights of this study further enables more contextually appropriate and successful organisational interventions to be developed. The managerial implications of the findings will be discussed followed by ethical considerations, identified limitations of this study and recommendations for future research.

5.2 Managerial Implications

High levels of burnout have many dysfunctional consequences for shift workers and their organisations (Bolino et al., 2021; Cordes & Dougherty, 1993; Kim & Kao, 2011; Koutsimani et al., 2019; Schaufeli et al., 2008). While combating the negative effects of burnout has become increasingly important, the present world of work requires employees who are engaged, happy and psychologically strong to be able to face the multiple challenges of this turbulent work environment (Alkahtani et al., 2020). For this reason, it has become extremely important for managers and practitioners to identify and understand the underlying factors that cause and buffer against burnout and enhance engagement and general health. A rich knowledge base has been created over the years about the different factors in the work environment responsible for worker burnout and well-being (Bakker & Demerouti, 2018). The use of the JD-R theory has been particularly useful for managers and practitioners in recognising factors related to well-being in the workplace. The findings of this study provide further directions to social scientists, researchers and employers in this regard.

The job characteristics model is currently one of the most widely used conceptual tools that addresses dissatisfaction, demotivation and under-performance of employees in organisations. It is often used in practice to redesign jobs in order to address key human resource issues that human resource practitioners and managers are currently facing

(Boonzaier et al., 2001). The current review of literature in Chapter 2 suggests that jobs that contain more skill variety, task identity, task significance, autonomy and feedback result in higher levels of job satisfaction and internal work motivation. While the results of this study indicate that job characteristics do not lead to higher levels of engagement in this sample group, they do suggest that job redesign efforts increasing the prevalence of these job characteristics may increase the PsyCap (resilience, optimism, self-efficacy and hope) of workers. Job resources therefore foster employees' personal growth by contributing to their self-efficacy, hope, optimism and resilience. An increase in PsyCap, in turn, will buffer against the negative experiences of burnout amongst these workers working non-standard hours. As a result, redesigning jobs may then indirectly increase the general health and well-being of workers. Thus, business practices should be tailored towards improving PsyCap by focusing on the activities or training that enhances these capacities, such as job characteristics. Organisations should aim to evaluate the jobs of their employees in terms of the five core job characteristics, pay attention to how jobs are designed and possibly redesign them to gain a higher level of autonomy, feedback, skills variety, task significance and task identity, as this will impact directly on employees' PsyCap.

The results of this study suggest that job characteristics are antecedents to PsyCap, which further contributes to the job characteristics theory. Job characteristics may lead to the experience of other state-like capacities offered by PsyCap, which in turn result in other positive outcomes such as higher levels of engagement and improved psychological health of workers (Sameer et al., 2019). The job characteristics theory therefore provides a meaningful theoretical basis for understanding PsyCap. However, since job characteristics were only found to be positively related to PsyCap and not to engagement, this study is seen to extend the findings of Garg and Singh (2020), who support the view that more focus should be placed on personal resources rather than job resources when aiming to enhance engagement. This is because personal resources provide a more sustainable approach to increasing work engagement. This study therefore provides further support to the relevance of PsyCap in the South African shift work population, especially when it comes to its positive effects on engagement and psychological health and its buffering effects on burnout.

The literature emphasises that individuals who have more PsyCap are able to cope better with their job demands and show lower levels of strain and ill health (Bakker & Demerouti, 2018; Roemer & Harris, 2018). The findings of this study coincide with the JD-R theory, suggesting that when the demands of a job increase (working non-standard work

schedules), workers' personal resources (PsyCap) become critical to avoiding burnout and remaining engaged. This finding is important because it means that workers who are engaged are likely to experience more positive emotions and better psychological health (Poulsen et al., 2011). These results suggest that the shift work tolerance amongst employees can indeed be enhanced through the development of appropriate coping strategies for minimising harm (Ritonja et al., 2019).

Findings of this study further establish a relationship between PsyCap, engagement and psychological health. This study therefore also extends the findings of Choi and Lee (2014) and Alkahtani et al. (2020) who emphasise that developing PsyCap in organisations could transform organisations to a significant source of happiness, satisfaction, and general well-being. The findings of this research have therefore contributed to the field by emphasising the contextual relevance of the complex interplay between PsyCap, engagement, burnout and psychological health, thereby contributing to knowledge about transforming the workplace into a more meaningful and thriving environment, adding to business practices in various ways.

While the results of this study cannot be generalised to the general shift work population, it does promote PsyCap as a novel approach to aid management practices in enhancing their employees' levels of engagement and to make their work environments more meaningful (Alkahtani et al., 2020). As PsyCap is adaptable and can be developed in workers, managers can implement interventions that focus on developing these personal resources among their work force. Implementing such interventions would also likely improve the psychological well-being of employees, which is an ever-increasing problem in today's turbulent working environment. This is especially relevant in today's post-COVID-19 context. Assessing PsyCap in an organisation's workforce could be used to identify training needs, training interventions or other specific interventions to improve well-being.

The findings may also be useful in identifying workers who may be better suited to handle the stressors inherent in shift work. While interventions should be focused on job redesign efforts or other methods to improve PsyCap with their current workforce, business practices may also focus on recruitment and selection processes to individuals who already have a high level of PsyCap. This study therefore provides managers and practitioners with a useful preventative and risk management tool when it comes to recruitment efforts and current employees who show low signs of personal resources and ill health. Thus, managers

and practitioners could introduce the concept of PsyCap into their intervention efforts to assist them in nurturing a positive, meaningful, and thriving workplace which decreases burnout and promotes psychological health (Garg & Singh, 2020; Roemer & Harris, 2018).

All in all, the outcomes of this study emphasise that enhancing PsyCap of employees by increasing job characteristics, or through the use of other intervention methods, will assist in improving engagement, decreasing burnout and in doing so, improving the psychological well-being of employees. These findings provide additional insights and guidance for researchers, industry representatives, labour representatives, policy makers, workers, and other stakeholders on the management of the negative outcomes associated with non-standard working hours while ensuring the health and safety of all workers (Ritonja et al., 2019).

5.3 Ethical Considerations

Ethics in conducting research ranges from the fair and ethical treatment of participants during data collection to the forthrightness and honesty in analysing and reporting the results (McCall, 1998). The first ethical concern involved gaining ethical clearance by Stellenbosch University to conduct this research study. Even though this project made use of an online survey which ensured the anonymity of all participants, it still asked questions about individuals' level of burnout and psychological symptoms that they may have experienced at the time. The project was therefore classified as medium risk. Measures were introduced to avoid harm to participants, including the provision of information for participants who wished to seek further help on burnout and psychological health symptoms.

Ethical safeguards were put in place in order to protect the rights of all participants in this study and included informed consent, anonymity and their protection from harm (Bloomberg & Volpe, 2008). Schreuder and Coetzee (2016) state that the privacy of participants may not be invaded without their awareness. Thus, privacy was also an important ethical consideration in this study. Privacy involves the participant's interest in controlling access to their personal information (Stellenbosch University, 2020). For this reason, participants were required to give their informed consent before they were able to complete the survey and served as a prerequisite for their data to be included in the analyses. In the consent form, participants were informed of what the study entailed, the time expectancy to complete the survey and how their completion of the survey contributed towards the

objectives of the study. They were also informed that their participation was voluntary and anonymous, that no identifying information was collected, and other details pertaining to their rights to informed consent.

In addition, participants were given the option to provide their e-mail addresses for those who wanted to be included in the lucky draw to win a R1,000 Takealot voucher. Respondents who indicated that they wanted to participate in the lucky draw were redirected to a second "lucky draw" survey. However, to ensure their privacy, the e-mail addresses of the participants were not linked to their survey responses. Thus, participants were only redirected to the lucky draw survey once they had already completed the main survey. The procedures for the lucky draw were compliant with Section 36 of The Consumer Protection Act and the procedure was discussed in the informed consent documentation as per the REC:SBE terms of reference and standard operating procedures (Stellenbosch University, 2020). These e-mail addresses were permanently deleted once the winner was chosen and the voucher successfully accepted.

Additional consideration was given to data security. Part of the data collection procedure was to recruit participants on various social media platforms including LinkedIn, Facebook and WhatsApp. This data collection was done in order to reach as many random participants as possible around South Africa in the easiest manner possible. The recruitment method was passive, as the link to the online survey was provided and followed at the discretion of the participants. The purpose of the study was stated upfront on all social media platforms and all ethical norms regarding this recruitment method were respected. The data was captured into Excel spreadsheets and saved in password-protected files on two password-protected laptop computers. This included the informed consent obtained. Access to this data was only available to the primary researcher of the study and Professor Martin Kidd, the director in the Centre for Statistical Consultation at the Stellenbosch University. As per the Research Ethics Policy Document (Stellenbosch University, 2013), the original research data belongs to Stellenbosch University, and so will remain in the department or research site where it was created.

Consideration was given to the figures included directly from previously published and copyrighted material and copyrighted measurement instruments. Permission to use these materials and measurement instruments was obtained prior to the submission of the thesis. Finally, since this study used non-probability sampling methods, the findings from this

research may not be representative of the general population (Babbie, 2013). Thus, it is important for readers to note that the findings obtained in this study are not intended to describe what is typical in the shift work general population. Rather the data from this study was intended to explore salient factors that cause variance in burnout, engagement and general health in this sample group of shift workers and to use the results to suggest interventions to manage these variables, along with recommendations for future research that will further refine research in this field.

5.4 Limitations of the Study

Although this study contributed to theory and practice through the relational conclusions drawn, the design of the study hinders any causal conclusions to be made. In addition, the use of an online-based survey also means that this study did not include certain population groups, for example those who have limited access to the internet. Thus, this study was not representative of the general shift work population. The sample size also presents another limitation to this study. Due to the difficulty of reaching participants who met the inclusion criteria and the time limit, the sample size was smaller than expected.

In addition, the self-report measures used mean that the relationships found between variables may be due to common method variance, such as response biases or social desirability (Görgens-Ekermans & Herbert, 2013;). Measures were put in place to try and minimise this risk and included informing participants of their anonymity attached to their participation in the study. However, the use of self-report measures may still have impacted negatively on the study in some ways. For example, a meta-analysis conducted in the United States by Goh et al. (2015), found that shift work was associated with an increase in physician-diagnosed health conditions but showed no relationship with self-reported physical health. Thus, a more objective measure of physical health may have yielded more significant results in this study.

While the measuring instruments to be used have been found to be valid and reliable in the South African context, none of these instruments have been specifically designed for the South African population. A particular limitation is the use of an unstandardised method to measure different work schedules and analysing them in the hypothesised level of severeness. It seems that using three separate questions to determine work schedule caused

confusion amongst the participants as there were a few responses that were inconsistent with each other and therefore removed. While the responses used within this study were still deemed valid, there were various responses that were still inconsistent with specific times of the different shift types. For instance, some responses indicated that they worked a night shift while the times that they indicated (e.g. 18:00 to 23:00) indicated a late afternoon/evening shift and were therefore adjusted to the more appropriate shift times. These responses indicated that these questions were not phrased or constructed appropriately and that providing the approximate times of each work schedule may have been more appropriate than asking them to provide their own start and finish times. In addition, the number of hours worked per week was not taken into consideration in the inclusion criteria or in the categorisation of the severity of each shift type. This also proved to be a big limitation in this study.

The burnout measure also presented a few issues. Firstly, the scale was reversed in comparison with the other scales, like PsyCap and Engagement. These reversed items may have caused confusion amongst some of the respondents and caused them to answer in the opposite direction than they had meant to. A further limitation to the measurement of burnout was the lack of discriminant validity among some of its items included in the data analysis.

There were also limitations in analysing the PsyCap variable in terms of an overall score and not observing the differences in its four underlying facets. While previous studies have shown support for the positive relationship between self-efficacy and work engagement, support for the optimism facet of PsyCap and its positive effects on engagement has not been as widely found among researchers (Bakker & Demerouti, 2017). Thus, it may be useful to determine the relationships between the individual facets of PsyCap on variables rather than the influence of PsyCap as a whole. In addition, the lack of representation of eveningness chronotype also presented this study with a limitation. As there were no definite eveningness types included in this study and only 5% of moderate eveningness types, the data lacked the appropriate quantity of responses from eveningness types that may have assisted this study in getting more significant results.

Furthermore, there are a number of intervening variables that were not taken into account but would influence the effects of individual levels of health, burnout and engagement. These include but are not limited to: (1) additional person characteristics like personality; (2) other factors relating to the job including environmental and ergonomic

conditions in the workplace; (3) social and domestic factors like marital status, housing conditions, community status and number of children; (4) other possible mediating variables such as sleep quality; and (5) the adverse effects of COVID-19 (and the post-COVID-19) context which includes high levels of anxiety and stress, and lower physical activity (Oved et al., 2021). While it was desirable to account for all of these limitations and control for all of the possible intervening variables, it was not plausible to do so in one study, especially given the complex nature of shift work.

Another possible limitation of this study, given our culturally and linguistically rich nation, is the use of English as the sole language for the questionnaires. Using English as only language in this survey could have had a negative effect on the results of the study, as 54% of the participants did not have English as their first language and may have misunderstood or misinterpreted some of the questions (Demerouti et al., 2010). However, this study did aim to minimise this risk by making the proficiency in the English language a requirement to participate in this study.

Finally, as this research was predominantly quantitative in nature, the results lacked a richness in meaning that can only be gathered through more qualitative methods (Babbie, 2013). However, this study did not focus on the experiences of workers but rather on the most salient determinants of well-being among them.

5.5 Recommendations for Future Research

As this study was cross-sectional and not longitudinal or an experiment, the exact direction of causality between variables cannot be determined. Thus, for every two variables that are correlated, there are three possible directions of causality (x causing y, y causing x, or a third factor causing x and y) (Aron & Aron, 2002). Future studies should therefore aim to develop more complex theoretical models that explain how, when and for whom certain effects occur (Bolino et al., 2021). Furthermore, it may be useful to determine the relationships between the individual facets of variables, such as PsyCap and engagement, on dependent variables rather than the influence of these as a single construct. Other factors that may contribute to the applicability of the results in the workplace should also be considered. These include factors such as the physical working environment and ergonomics of the working space (lighting, noise levels, among others), additional worker characteristics

(personality, sex, age psychological states, among others), culture and socio-economic conditions, additional job resources, for example co-worker and supervisor relationships, and additional demands that place strain on the worker, for example family roles. Sex-specific differences should also be explored with respect to the relationship between domestic duties and shift work tolerance. Cultural and socio-economic class differences are also possible influencing variables that may influence shift work tolerance amongst workers and should therefore also be addressed in future studies (Ritonja et al., 2019).

To move the theoretical understanding of burnout and general health amongst the shift working population forward, research should also aim to prioritise the use of empirical data (e.g. absenteeism, sick leave, or medical history) when measuring physical health rather than self-reported data (Dall'Ora et al., 2020). As this study may indicate that the relationship between non-standard work schedules, chronotype and burnout is more complex, with various possible intervening variables, future research should also focus on exploring the complexity behind these relationships on health and well-being outcomes. For instance, various studies have indicated the importance of sleep quality in the development of burnout and negative health outcomes amongst shift workers, especially for eveningness types. (Garbarino et al., 2019; Klösch et al., 2010). However, Kervezee et al. (2021) also indicate that workers reported longer sleep durations when they worked in shifts that matched their chronotype. Cappadona et al. (2021), on the other hand, found that sleep deprivation and sleep disturbances were most common amongst workers who worked rotational and night shifts. Further research on the moderation effects of chronotype on other mediating variables, such as sleep quality, and its effects on health outcomes would therefore also assist in explaining further variance in the negative outcomes of shift work.

Future quantitative studies should focus on longitudinal designs, of about 20 to 30 years, when studying variables related to shift work tolerance (Pienaar & Willemse, 2008). This research design could contribute towards a greater understanding of the complex relationships influencing shift worker engagement, burnout and health. It will also assist in overcoming risk stratification issues by, for example, sex, age or chronotype, which to date are still under debate (Ritonja et al., 2019).

Future studies should also take the multi-cultural nature of South Africa into consideration (Pienaar & Willemse, 2008). Larger sample sizes are required across different provinces and geographical locations in South Africa and across the globe. Standardised

measuring instruments that have shown to have a high reliability and validity in the South African context should be used. This is particularly relevant when measuring work schedules. It is recommended that work schedules be measured in a single item to avoid any confusion on the part of the respondents. Respondents should be asked to indicate their usual type of shift with the approximate times provided, for example "Night Shift (between 20:00 to 07:00)". Future research studies should also include the inclusion criteria for respondents to work at least four full shifts of approximately eight hours within the last four weeks. This requirement would ensure that the shift type as well as the number of hours worked is considered when determining the severity of the shift.

Future research should further focus on a more qualitative research method. During data collection, there were a number of participants who willingly contacted me to try and provide more detailed information of their experiences with shift work. While these responses were not relevant to this study, it did emphasise the complexity of the effects of shift work on workers and that qualitative research would be helpful in uncovering the richness of data that lies in these workers' experiences. Subjective well-being is an important aspect to consider when trying to understand well-being as a whole. Subjective well-being asserts that individuals react differently to the same conditions based on differences in values, expectations and experiences (Schreuder & Coetzee, 2016). An individual's well-being is therefore dependent on how well they perceive themselves to be. Multiple explanations on the effects of shift work can be found based on multiple "realities" of work. Future research could harness these different subjective truths in the experiences of shift work, contributing to a deeper and more meaningful understanding of shift worker realities across the globe. Bolino et al. (2021) also emphasise the need for more qualitative studies of non-standard work schedules, stating that these methods have the capacity to deepen the meaning, interpretation and understanding of the complexity behind the effects of shift work.

Chapter 6: Conclusions

The problems related to shift work have been increasing as more organisations across the globe make use of unorthodox hours as a way to reap economic, technical and social benefits in business. For workers, working non-standard hours is often associated with financial benefits, while on a macro-economic level, shift work aids in the decrease of unemployment. However, these benefits are in conflict with the health and social costs that arise as a result of working unorthodox hours. Shift workers are especially prone to many unique job demands that could have serious effects on the general health and well-being. In today's turbulent working environment, it has therefore become increasingly important for these workers to be engaged and psychologically strong to face multiple challenges at work. Likewise, it has also become important for organisations to combat burnout and the negative health consequences associated with these increased job demands, while implementing contextually appropriate interventions that also increase the work well-being and general health of their workers. It is therefore extremely important for practitioners and organisations to identify and understand the salient variables that cause and buffer against burnout and enhance engagement and general health among shift workers.

The consensus in the literature is that the nature of work taking place at night and rotating night and day shifts also works against the human biological clock, causing circadian disruption. This disruption may cause serious physical and psychological health issues, such as poor sleep cycles, burnout, gastrointestinal problems, cardiovascular diseases, depression and anxiety. In addition, many social and domestic problems are also experienced by these workers. Night-shift workers are especially prone to feelings of isolation and marginalisation. These feelings are exceptionally relevant in areas where shift work is not common and for workers who have conflicting roles outside of work. These risks associated with the very nature of shift work on human functioning and well-being make it of increasing importance for organisations to consider interventions that could prevent, eliminate or manage such negative consequences.

This study contributed to theory and practice in the understanding of the salient variables associated with engagement, burnout and the general health of shift workers. Intervention strategies such as technological performance aids, physical stimulation, additional resting periods and education programmes have already shown slight

improvements in reducing the negative consequences of working unorthodox hours. While the relationship between non-standard work schedules and burnout was not found to be statistically significant, this study highlighted the complexity behind shift work and its health consequences and that there are possibly a lot more intervening variables that need to be explored. This study further highlighted the importance and applicability of the interplay between job characteristics, PsyCap, engagement, burnout and general health across various cultural milieus in the South African working population. The results of this study indicated that burnout led to decreased physical and psychological health. In addition, while job characteristics did not lead to higher levels of engagement, they were seen as antecedents of PsyCap. These personal resources, in turn, buffered against burnout and led to higher levels of engagement which fostered the psychological health of workers.

The results of this study emphasise that more focus should be placed on developing the personal resources of the workforce as a sustainable way to enhance shift-worker engagement. Thus, shift-work tolerance amongst employees can be enhanced through the development of appropriate coping strategies found in PsyCap that may minimise the harm experienced by these workers. In addition, these findings may also prove useful in identifying workers better suited to handle the stressors inherent in shift work through appropriate recruitment and selection processes that focus on individuals with high levels of PsyCap. Interventions aimed at developing and improving PsyCap among employees could also assist in transforming organisations to significant sources of happiness, satisfaction, meaningfulness and general well-being. While these constructs were investigated extensively in the western world, this study is one of the few to be conducted in the South African context, thus bridging a gap in the literature.

While chronotype was not found to have a moderating effect in this study, this area has become an emerging topic of importance for all organisations. It is seen as a personal attribute that explains additional variances in workplace behaviours, including performance. Since morningness and eveningness-chronotype differ in terms of the time of day that they feel more optimal, they may have profound implications for intervention efforts aimed at shift workers. Thus, chronotypes are an important characteristic to consider when matching employees to different working schedules and should therefore still be considered in future research.

To conclude, the results from this study contribute to the further understanding of underlying mechanisms causing many of the negative consequences related to shift work. It also provides organisations with a useful guide on the implementation of unique intervention methods that incorporate job redesign and psychological capital development as a mechanism for preventing and/or managing these negative consequences and enhancing the engagement and psychological health of their employees. This study therefore provides organisations and practitioners with a useful preventative and risk management tool when it comes to recruitment efforts and current employees who work in the shift work industry.

References

Ab Hamid, M. R., Sami, W., & Mohmad Sidek, M. H. (2017). Discriminant Validity Assessment : Use of Fornell & Larcker criterion versus HTMT criterion. *Journal of Physics: Conference Series, 890*, 1–5. https://doi.org/10.1088/1742-6596/890/1/012163

Adler, T. (1991). *Sleep for Sale: A Study of Shift Work in South Africa.* Witwatersrand University Press.

Ahola, K., Honkonen, T., Isometsä, E., Kalimo, R., Nykyri, E., Aromaa, A., & Lönnqvist, J. (2005). The relationship between job-related burnout and depressive disorders-results from the Finnish Health 2000 Study. *Journal of Affective Disorders, 88*(1), 55-62. https://doi.org/10.1016/j.jad.2005.06.004 PMID: 16038984

Alessandri, G., Consiglio, C., Luthans, F., & Borgogni, L. (2018). Testing a dynamic model of the impact of psychological capital on work engagement and job performance. *Career Development International*, *23*(1), 33–47. https://doi.org/10.1108/CDI-11-2016-0210

Alkahtani, N. S. M. S., Delany, K., & Elneel Adow, A. H. (2020). The influence of psychological capital on workplace wellbeing and employee engagement among Saudi workforce. *Humanities & Social Sciences Reviews, 8*(5), 233–245. https://doi.org/10.18510/hssr.2020.8522

Allan, B. A., Batz-Barbarich, C., Sterling, H. M., & Tay, L. (2019). Outcomes of meaningful work: A meta-analysis. *Journal of Management Studies, 56*(3), 500–528. https://doi.org/10.1111/joms.12406

Almeida, D. P. da S., & Miclos, P. V. (2022). Nursing in primary health care: Association between leadership, psychological capital, and burnout implications. *Revista Brasileira de Enfermagem (Brazilian Journal of Nursing)*, *75*(Suppl 3). https://doi.org/10.1590/0034-7167-2021-0942

Amano, H., Fukuda, Y., & Kawachi, I. (2020). Is higher work engagement associated with healthy behaviors? A longitudinal study. *Journal of Occupational and Environmental Medicine, 62*(3), 87–93. https://doi.org/10.1097/JOM.0000000000001804

Andersen, J. R., Breivik, K., Engelund, I. E., Iversen, M. M., Kirkeleit, J., Norekvål, T. M., Oterhals, K., & Storesund, A. (2022). Correlated physical and mental health composite scores for the RAND-36 and RAND-12 health surveys: Can we keep them

simple? *Health and Quality of Life Outcomes, 20*(1), 1–8. https://doi.org/10.1186/s12955-022-01992-0

Anderson, C., Laubscher, S., & Burns, R. (1996). Validation of the Short Form 36 (SF-36) Health Survey questionnaire among stroke patients. *Stroke*, *27*(10), 1812-1816. https://doi.org/10.1161/01.STR.27.10.1812

Aron, A., & Aron, E. N. (2002). *Statistics for the Behavioural and Social Sciences: A Brief Course* (2nd ed.). Prentice Hall.

Ayachit, M., & Chitta, S. (2022). A systematic review of burnout studies from the hospitality literature. *Journal of Hospitality Marketing and Management, 31*(2), 125–144. https://doi.org/10.1080/19368623.2021.1957743

Baba, V. V., & Jamal, M. (1991). Routinization of job context and job con- tent as related to employees' quality of working life: A study of Canadian nurses. *Journal of Organizational Behavior, 12,* 379–386.

Babbie, E. R. (2013). *The Practice of Social Research* (13th ed.).Wadsworth Cengage Learning.

Bakker, A. B. (2009). "Building engagement in the workplace", in Cooper, C., & Burke, R., (Eds.), *The Peak Performing Organization,* Routledge.

Bakker, A. B., & Demerouti, E. (2008). Towards a model of work engagement. *Career Development International, 13*(3), 209–223. https://doi.org/10.1108/13620430810870476

Bakker, A. B., & Demerouti, E. (2018). Multiple levels in job demands-resources theory: implications for employee well-being and performance. In E. Diener, S. Oishi, & L. Tay, (Eds.), *Handbook of Well-being*. DEF Publishers.

Bakker, A. B., & Demerouti. E. (2017). Job demands-resources theory: Taking stock and looking forward. *Journal of Occupational Health Psychology, 22*(3), 273-285.

Bakker, A. B., & Heuven, E. (2006). Emotional dissonance, burnout, and in-role performance among nurses and police officers. *International Journal Stress Management*, 13, 423-440.

Bakker, A. B., & Sanz-Vergel, A. I. (2013). Weekly work engagement and flourishing: The role of hindrance and challenge demands. *Journal of Vocational Behavior*, 83, 397–409. http://dx.doi.org/10.1016/j.jvb.2013 .06.008

Bakker, A. B., & Van Wingerden, J. (2020). Do personal resources and strengths use increase work engagement? The effects of a training intervention. *Journal of Occupational Health Psychology, 26*(1), 20–30. https://doi.org/10.1037/ocp0000266

Bakker, A. B., Hakanen, J. J., Demerouti, E., & Xanthopoulou, D. (2007). Job resources boost work engagement, particularly when job demands are high. *Journal of Educational Psychology*, 99, 274-284.

Barnes, D. C., & Collier, J. E. (2013). Investigating work engagement in the service environment. *Journal of Services Marketing, 27*(6), 485–499. https://doi.org/10.1108/JSM-01-2012-0021

Barton, J., Folkard, S., Smith, L., & Spelten, E. T. P. (2007). Standard shift work index manual. *Journal of Applied Psychology*, 60, 159-170. https://www.researchgate.net/publication/292754272_Standard_Shift_work_index_manual

Bekker, M. H. J., Croon, M. A., & Bressers, B. (2005). Child care involvement, job characteristics, gender and work attitudes as predictors of emotional exhaustion and sickness absences. *Work & Stress*, 19, 221-237.

Bellicoso, D., Ralph, M. R., & Trudeau, M. E. (2014). Burnout among oncology nurses: Influence of chronotype on sleep quality. *Journal of Nursing Education and Practice, 4*(8).

Bloomberg, L., & Volpe, M. (2008). *Completing your Qualitative Dissertation; A Roadmap from Beginning to End* (pp.65-93). SAGE Publications.

Blyton, P. (1985). *Changes in Working Time: An International Review*. St Martins Press.

Boivin, D. B., Boudreau, P., & Kosmadopoulos, A. (2021). Disturbance of the circadian system in shift work and its health impact. *Journal of Biological Rhythms, 37*(1), 3-28. https://doi.org/10.1177/07487304211064218

Bolino, M. C., Kelemen, T. K., & Matthews, S. H. (2021). Working 9-to-5? A review of research on nonstandard work schedules. *Journal of Organizational Behavior, 42*(2), 188-211. https://doi.org/10.1002/job.2440

Booker, L. A., Sletten, T. L., Alvaro, P. K., Barnes, M., Collins, A., Chai-Coetzer, C. L., Naqvi, A., McMahon, M., Lockley, S. W., Rajaratnam, S. M. W., & Howard, M. E. (2020). Exploring the associations between shift work disorder, depression, anxiety and sick leave taken amongst nurses. *Journal of Sleep Research*, 29(3), 1–9. https://doi.org/10.1111/jsr.12872

Boonzaier, B., & Boonzaier, M. (1994). The job diagnostic survey: A functional tool for South African managers. *South African Journal of Business Management, 25*(3), 101-109.

Boonzaier, B., Ficker, B., & Rust, B. (2001). A review of the research on the job characteristics model and the attendant job diagnostic survey. *South African Journal of Business Management, 32*(1).

Brown, J. P., Martin, D., Nagaria, Z., Verceles, A. C., Jobe, S. L., & Wickwire, E. M. (2020). Mental health consequences of shift work: An updated review. *Current Psychiatry Reports, 22*(2), 1–7. https://doi.org/10.1007/s11920-020-1131-z

Caci, H., Deschaux, O., Adan, A., & Natale, V. (2009). Comparing three morningness scales: Age and gender effects, structure and cut-off criteria. *Sleep Medicine, 10*(2), 240–245. https://doi.org/10.1016/j.sleep.2008.01.007

Canadian Centre for Occupational Health & Safety (CCOHS). (2017). *Rotational Shiftwork: OSH Answers Fact Sheets.* CCOHS. https://www.ccohs.ca/oshanswers/ergonomics/shiftwrk.html

Cappadona, R., De Giorgi, A., Boari, B., Tiseo, R., Lopez-Soto, P. J., Fabbian, F., & Manfredini, R. (2021). Nurses, sleep disturbances, desynchronization of circadian rhythms, and performance: A dangerous liaison? A narrative mini-review. *European Review for Medical and Pharmacological Sciences, 25*(22), 6924–6933. https://doi.org/10.26355/eurrev_202111_27241

Carmines, E. G., & Zeller, R. A. (1979). Reliability and validity assessment. *Quantitative Applications in the Social Sciences*. SAGE Publications. https://dx.doi.org/10.4135/9781412985642

Çavuş, M., & Gökçen, A. (2015). Psychological capital: Definition, components and effects. *British Journal of Education, Society & Behavioural Science, 5*(3), 244–255. https://doi.org/10.9734/bjesbs/2015/12574

Caza, A., Bagozzi, R. P., Woolley, L., Levy, L., & Caza, B. B. (2010). Psychological capital and authentic leadership. Measurement, gender, and cultural extension. *Asia-Pacific Journal of Business Administration, 2*(1), 53-70. https://doi.org/10.1108/17574321011028972

Chandni, S., & Rahman, Z. (2020). Customer engagement and employee engagement: Systematic review and future directions. *Service Industries Journal, 40*(13–14), 932–959. https://doi.org/10.1080/02642069.2020.1733534

Chang, W. P., & Peng, Y. X. (2021). Influence of rotating shifts and fixed night shifts on sleep quality of nurses of different ages: a systematic literature review and meta-analysis. *Chronobiology International., 38*(10), 1384-1396. https://doi.org/10.1080/07420528.2021.1931273

Chellappa, S. L. (2020). Circadian misalignment: A biological basis for mood vulnerability in shift work. *European Journal of Neuroscience*, *52*(8), 3846–3850. https://doi.org/10.1111/ejn.14871

Choi, Y., & Lee, D. (2014), Psychological capital, Big Five traits, and employee outcomes. *Journal of Managerial Psychology, 29*(2), 122-140. https://doi.org/10.1108/JMP-06-2012-0193

Christian, M. S., Garza, A. S., & Slaughter, J. E. (2011). Work engagement: A quantitative review and test of its relations with task and contextual performance. *Personnel Psychology,* 64, 89 –136. http://dx.doi.org/10.1111/j.1744-6570.2010.01203.x

Cordes, C. L., & Dougherty, T. W. (1993). A review and an integration of research on job burnout source. *The Academy of Management Review, 18*(4), 621-656.

Cortés-Denia, D., Lopez-Zafra, E., & Pulido-Martos, M. (2021). Physical and psychological health relations to engagement and vigor at work: A PRISMA-compliant systematic review. *Current Psychology*. https://doi.org/10.1007/s12144-021-01450-y

Cox, T., Tisserand, M., & Taris, T. (2005). The conceptualization and measurement of burnout: Questions and directions. *Work and Stress*, *19*(3), 187–191. https://doi.org/10.1080/02678370500387109

Creswell, J. W. (2003). *Research Design: Qualitative, Quantitative and Mixed Methods Approaches* (2nd ed.). SAGE Publications.

Dall'Ora, C., Ball, J., Reinius, M., & Griffiths, P. (2020). Burnout in nursing: A theoretical review. *Human Resources for Health*, *18*(1), 1–17. https://human-resources-health.biomedcentral.com/articles/10.1186/s12960-020-00469-9

Davy, J. (2011). An introductory overview of the 20th International Symposium on Shift work and Working time: research opportunities for South Africa. *Ergonomics South Africa, 23*(1).

Davy, J. (2014). Good sleep, good health, good performance. It's obvious, or is it? The importance of education programmes in general fatigue management. *Ergonomics South Africa, 26*(1).

De Braine, R., & Roodt, G. (2011). The Job Demands-Resources model as predictor of work identity and work engagement: A comparative analysis. *South African Journal of Industrial Psychology*, *37*(2), 1-11.

De Carlo, N. A., Falco, A., Pierro, A., Dugas, M., Kruglanski, A. W., & Higgins, E. T. (2014). Regulatory mode orientations and well-being in an organizational setting: The

differential mediating roles of workaholism and work engagement. *Journal of Applied Social Psychology, 44*(11), 725–738. https://doi.org/10.1111/jasp.12263

Demerouti, E., & Bakker, A. B. (2008). "The Oldenburg Burnout Inventory: A good alternative to measure burnout and engagement". In J. R. B. Halbesleben, (ed.), *Handbook of Stress and Burnout in Health Care* (pp. 65-78). Nova Science. https://pdfs.semanticscholar.org/ 7cb5/c694cb9ad8c38e63db5d6458e34cd4fef5ce.pdf

Demerouti, E., & Nachreiner, F. (1998). Zur spezifität von burnout für dienstleistungsberufe: Fakt oder artefakt? (The specificity of burnout in human services: Fact or artifact?) *Zeitschrift für Arbeitswissenschaft (Labor Science Journal)*. 52, 82–89.

Demerouti, E., Bakker, A. B., Nachreiner, F., & Schaufeli, W. B. (2001). The job demands-resources model of burnout. *Journal of Applied Psychology,* 86, 499–512. http://dx.doi.org/10.1037/0021-9010.86.3.499

Demerouti, E., Bakker, A. B., Vardakou, I., & Kantas, A. (2003). The convergent validity of two burnout instruments: a multitrait-multimethod analysis. *European Journal of Psychological Assessment*. 19, 12–23. https://doi.org/10.1027//1015-5759.19.1.12

Demerouti, E., Mostert, K., & Bakker, A. B. (2010). Burnout and work engagement: A thorough investigation of the independency of both constructs. *Journal of Occupational Health Psychology, 15*(3), 209–222. https://doi.org/10.1037/a0019408

Dickerman, B. A., Markt, S. C., Koskenvuo, M., Hublin, C., Pukkala, E., Mucci, L. A., & Kaprio, J. (2016). Sleep disruption, chronotype, shift work, and prostate cancer risk and mortality: A 30-year prospective cohort study of Finnish twins. *Cancer Causes and Control, 27*(11), 1361–1370. https://doi.org/10.1007/s10552-016-0815-5

Ferreira, T. (2015). *The relationship between psychological capital and work engagement amongst correctional officers at a correctional facility in the Western Cape*. [Master's thesis, University of the Western Cape]. UWCScholar – ETD Repository.http://hdl.handle.net/11394/4877

Folkard, S. (2008). Do permanent night workers show circadian adjustment? A review based on the endogenous melatonin rhythm. *Chronobiology International, 25*(2–3), 215–224. https://doi.org/10.1080/07420520802106835

Folkard, S., & Monk, T. M. (Eds.). (1985). *Hours of Work: Temporal Factors in Work-Scheduling*. John Wiley & Sons.

Galaiya, R., Kinross, J., & Arulampalam, T. (2020). Factors associated with burnout syndrome in surgeons: A systematic review. *Annals of the Royal College of Surgeons of England, 102*(6), 401–407. https://doi.org/10.1308/rcsann.2020.0040

Garbarino, S., Guglielmi, O., Puntoni, M., Bragazzi, N. L., & Magnavita, N. (2019). Sleep quality among police officers: Implications and insights from a systematic review and meta-analysis of the literature. *International Journal of Environmental Research and Public Health, 16*(5), 1–15. https://doi.org/10.3390/ijerph16050885

Garg, N., & Singh, P. (2020). Work engagement as a mediator between subjective well-being and work-and-health outcomes. *Management Research Review, 43*(6), 735–752. https://doi.org/10.1108/MRR-03-2019-0143

Geiger-Brown, J., Trinkoff, A., & Rogers, V. E. (2011). The impact of work schedules, home, and work demands on self-reported sleep in registered nurses. *Journal of Occupational and Environmental Medicine, 53*(3), 303–307. https://doi.org/10.1097/JOM.0b013e31820c3f87

Gerstner, G. R., Mota, J. A., Giuliani, H. K., Weaver, M. A., Shea, N. W., & Ryan, E. D. (2022). The impact of repeated bouts of shiftwork on rapid strength and reaction time in career firefighters. *Ergonomics*, 1–9. https://doi.org/10.1080/00140139.2021.2016997

Gibson, M. (2022). A systematic review of the relationship between night shift work and oxidative stress. *Chronobiology International*, *39*(2), 285–298. https://doi.org/10.1080/07420528.2021.1989446

Goh, J., Pfeffer, J. M., & Zenios, S. A. (2015). The relationship between workplace stressors and mortality and health costs in the United States. *Management Science, 62*, 608-628.

Gohar, A. A., Knauert, M., Kalot, M. A., Khan, A., Sider, D., Javed, M. A., Wooldridge, D., Eck, L., Buckhold, F., Colaco, B., Bhat, A., Castillo, D. M., Newman, R., & Mustafa, R. A. (2021). Influence of medical trainee sleep pattern (chronotype) on burn-out and satisfaction with work schedules: A multicentre observational study. *Postgraduate Medical Journal, 0*, 1-6. https://doi.org/10.1136/postgradmedj-2021-140975

Görgens-Ekermans, G., & Herbert, M. (2013). Psychological capital: Internal and external validity of the Psychological Capital Questionnaire (PCQ-24) on a South African sample. *South African Journal of Industrial Psychology*, *39*(2), 1-12.

Grobler, A., & Joubert, Y. T. (2018). Psychological Capital: Convergent and discriminant validity of a reconfigured measure. *South African Journal of Economic and Management Sciences, 21*(1).

Grover, S. L., Teo, S. T. T., Pick, D., Roche, M., & Newton, C. J. (2018). Psychological capital as a personal resource in the JD-R model. *Personnel Review, 47*(4), 968–984. https://doi.org/10.1108/PR-08-2016-0213

Gupta, M., & Shaheen, M. (2018). Does work engagement enhance general well-being and control at work? Mediating role of psychological capital. *Evidence-Based HRM*, *6*(3), 272–286. https://doi.org/10.1108/EBHRM-05-2017-0027

Hackman, J. R., & Oldham, G. R. (1974). *The Job Diagnostic Survey: An Instrument for diagnosing the Motivational Potential of Jobs*. Technical Report no.4. Department of Administrative Sciences. Yale University.

Hackman, R., & Oldham, G. R. (1976). Hackman_Oldham_1976 - Motivation through the Design of Work: Test of a Theory. *Organizational Behavior and Human Performance, 16*(170), 250–279. http://dx.doi.org/10.1016/0030-5073(76)90016-7

Hair Jr., J. F., Matthews, L. M., Matthews, R. L., & Sarstedt, M. (2017). PLS-SEM or CB-SEM: Updated guidelines on which method to use. *International Journal of Multivariate Data Analysis*, *1*(2), 107. https://doi.org/10.1504/ijmda.2017.10008574

Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2014). *Multivariate Data Analysis* (7th ed.). Pearson Prentice Hall.

Hair, J. F., Ringle, C. M., & Sarstedt, M. (2011). PLS-SEM: Indeed a silver bullet. *Journal of Marketing Theory and Practice, 19*(2), 139–152. https://doi.org/10.2753/MTP1069-6679190202

Hair, J. F., Risher, J. J., Sarstedt, M., & Ringle, C. M. (2019). When to use and how to report the results of PLS-SEM. *European Business Review*, *31*(1), 2-24.

Hakanen, J. J., & Lindbohm, M. L. (2008). Work engagement among breast cancer survivors and the referents: The importance of optimism and social resources at work. *Journal of Cancer Survivorship, 2,* 283–295. https://doi.org/10.1007/s11764-008-0071-0

Hakanen, J. J., Bakker, A. B., & Demerouti, E. (2005). How dentist scope with their job demands and stay engaged: The moderating role of job resources. *European Journal of Oral Sciences*, 113, 479-487.

Hakanen, J. J., Bakker, A. B., & Schaufeli, W. B. (2006). Burnout and work engagement among teachers. *Journal of School Psychology, 43*(6), 495–513. https://doi.org/10.1016/j.jsp.2005.11.001

Hakanen, J., Perhoniemi, R., & Toppinen-Tanner, S. (2008). Positive gainspirals at work: From job resources to work engagement, personal initiative and work-unit

innovativeness. *Journal of Vocational Behavior,* 73, 78-91. http://dx.doi.org/10.1016/j.jvb.2008.01.003

Halbesleben, J. R. B., & Demerouti, E. (2005). The construct validity of an alternative measure of burnout: Investigating the English translation of the Oldenburg Burnout Inventory. *Work and Stress*, *19*(3), 208–220. https://doi.org/10.1080/02678370500340728

Hansen, J., & Lassen, C. F. (2012). Nested case-control study of night shift work and breast cancer risk among women in the Danish military. *Occupational and Environmental Medicine, 69*(8), 551–556. https://doi.org/10.1136/oemed-2011-100240

Harma, M. I., Hakola, T., Akerstedt, T., & Laitinen, J. T. (1994). Age and adjustment to night work. *Occupational and Environmental Medicine, 51*(8), 568-573.

Harms, P. D., Vanhove, A., & Luthans, F. (2017). Positive projections and health: An initial validation of the implicit psychological capital health measure. *Applied Psychology*, *66*(1), 78–102. https://doi.org/10.1111/apps.12077

Hays, R. D., Marshall, G. N., Wang, E. Y. I., & Sherbourne, C. D. (1994). Four-year **cross-**lagged associations between physical and mental health in the medical outcomes study. *Journal of Consulting and Clinical Psychology*, *62*(3), 441–449.

Hays, R., & Morales, L. (2001). The RAND-36 Measure of health-related quality of life. *Annals of Medicine,* 33, 350-357. http://dx.doi.org/10.3109/07853890109002089

Herbert, M. (2011). *An exploration of the relationships between psychological capital (hope, optimism, self-efficacy, resilience), occupational stress, burnout and employee engagement.* [Master's thesis, Stellenbosch University].

Hittle, B. M., & Gillespie, G. L. (2018). Identifying shift worker chronotype: Implications for health. *Industrial Health, 56*(6), 512–523. https://doi.org/10.2486/indhealth.2018-0018

Horne, J. A., & Östberg, O. (1976). A self-assessment questionnaire to determine morningness-eveningness in human circadian rhythms. *International Journal of Chronobiology*, 4, 97-110.

Hulsegge, G., van Mechelen, W., Proper, K. I., Paagman, H., & Anema, J. R. (2020). Shift work, and burnout and distress among 7798 blue-collar workers. *International Archives of Occupational and Environmental Health, 93*(8), 955–963. https://doi.org/10.1007/s00420-020-01536-3

Itani, O., & Kaneita, Y. (2016). The association between shift work and health: A review. *Sleep and Biological Rhythms, 14*(3), 231–239. https://doi.org/10.1007/s41105-016-0055-9

Jamal, M., & Baba, V. V. (1992). Shiftwork and department-type related to job stress, work attitudes and behavioral intentions: A study of nurses. *Journal of Organizational Behavior,* 13, 449–464.

Jørgensen, J. T., Hansen, J., Westendorp, R. G. J., Nabe-Nielsen, K., Stayner, L. T., Simonsen, M. K., & Andersen, Z. J. (2020). Shift work and incidence of dementia: A Danish Nurse Cohort study. *Alzheimers Dementia*, *16*(9), 1268–1279.

Juda, M. (2010). *The importance of chronotype in shift work research.* [Doctoral Dissertation, Ludwig-Maximilians-University of Munich]. https://edoc.ub.uni-muenchen.de/11814/1/Juda_Myriam.pdf

Juda, M., Vetter, C., & Roenneberg, T. (2013). Chronotype modulates sleep duration, sleep quality, and social jet lag in shift-workers. *Journal of Biological Rhythms, 28*(2), 141–151. https://doi.org/10.1177/0748730412475042

Keith, T. Z. (2019). *Multiple Regression and Beyond: An Introduction to Multiple Regression and Structural Equation Modeling* (3rd ed.). Routledge.

Kerlinger, F. N., & Lee, H. B. (2000). *Foundations of Behavioral Research* (4th ed.). Harcourt College Publishers.

Kervezee, L., Gonzales-Aste, F., Boudreau, P., & Boivin, D. B. (2021). The relationship between chronotype and sleep behavior during rotating shift work: A field study. *Sleep, 44*(4). https://doi.org/10.1093/sleep/zsaa225

Kim, H., Ji, J., & Kao, D. (2011). Burnout and physical health among social workers: A three-year longitudinal study. *Social Work, 56*(3), 258–268. https://doi.org/10.1093/sw/56.3.258

Kleiner, S., & Pavalko, E. K. (2010). Clocking in: The organization of work time and health in the United States. *Social Forces*, *88*(3), 1463–1486.

Klösch, G., Baldinger, B., & Bolitschek, J. (2010). Chronotyp und nachtdienst – Vorläufige ergebnisse einer feldstudie (Chronotype and night shift - Preliminary results of a field study, in German). *Somnologie (Somnology), 14*. https://doi.org/10.1007/s11818-010-0489-2

Kock, N. (2015). One-tailed or two-tailed P values in PLS-SEM? *International Journal of eCollaboration, 11*(2), 1-7.

Kock, N., & Hadaya, P. (2018). Minimum sample size estimation in PLS-SEM: The inverse square root and gamma-exponential methods. *Information Systems Journal*, *28*(1), 227–261. https://doi.org/10.1111/isj.12131

Kokt, D., & Ramarumo, R. (2014). Impact of organisational culture on job stress and burnout in graded accommodation establishments in the Free State province, South Africa. *International Journal of Contemporary Hospitality Management, 27*(6), 1198-1213.

Koutsimani, P., Montgomery, A., & Georganta, K. (2019). The relationship between burnout, depression, and anxiety: A systematic review and meta-analysis. *Frontiers in Psychology, 10*(MAR), 1–19. https://doi.org/10.3389/fpsyg.2019.00284

Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*, 19, 192-207.

Lam, C., & Chung, M. H. (2021). Dose-response effects of light therapy on sleepiness and circadian phase shift in shift workers: a meta-analysis and moderator analysis. *Scientific Reports*, 11, 11976.

Langelaan, S., Bakker, A. B., van Doornen, L. J. P., & Schaufeli, W. B. (2006). Burnout and work engagement: Do individual differences make a difference? *Personality and Individual Differences,* 40, 521–532.

Langenhoven, A., & Boonzaier, M. (2015). *How job demands and resources predict burnout, engagement and intention to quit in call centres*. [Thesis Mcom, Stellenbosch University].

Laucis, N. C., Hays, R. D., & Bhattacharyya, T. (2014). Scoring the SF-36 in orthopaedics: A brief guide. *Journal of Bone and Joint Surgery - American Volume*, *97*(19), 1628–1634. https://doi.org/10.2106/JBJS.O.00030

Li, P., Taris, T. W., & Peeters, M. C. W. (2020). Challenge and hindrance appraisals of job demands: One man's meat, another man's poison? *Anxiety, Stress and Coping*, *33*, 31–34. https://doi.org/10.1080/10615806.2019.1673133

Li, Y., Wu, Q., Li, N. Y., Chen, L., & Wang, D. X. (2019). Relationships among psychological capital, creative tendency, and job burnout among Chinese nurses. *Journal of Advanced Nursing, 75*, 3495–3503. https://doi.org/10.1111/jan.14141

Lins, L., & Carvalho, F. M. (2016). SF-36 total score as a single measure of health-related quality of life: Scoping review. *SAGE Open Medicine*, 4, 1-12. https://doi.org/10.1177/2050312116671725

Loef, B., Dollé, M. E. T., Proper, K. I., Van Baarle, D., & Van Kerkhof, L. W. (2022). Night-shift work is associated with increased susceptibility to SARS-CoV-2 infection. *Chronobiology International*, 1–10. https://doi.org/10.1080/07420528.2022.2069031

Luthans, F., Avolio, B. J., & Youssef, C. M. (2015). *Psychological Capital and Beyond*. Oxford University Press.

Luthans, F., Avolio, B. J., Avey, J. B., & Norman, S. M. (2007). Positive psychological capital: Measurement and relationship with performance and satisfaction. *Personnel Psychology, 60*(3), 541–572.

Luthans, F., Youssef, C., Sweetman, D., & Harms, P. D. (2013). Meeting the leadership challenge of employee well-being through relationship PsyCap and health PsyCap. *Journal of Leadership and Organizational Studies*, 20, 114–129.

Mahler, D., & Mackowiak, J. (1995). Evaluation of the Short-Form 36-Item Questionnaire to measure health-related quality of life in patients with COPD. *Chest*, *107*(6), 1585-1589.

Maslach, C., & Jackson, P. (1986). The measurement of experienced burnout: the Maslach Burnout Inventory. *Journal of Occupational Behavior*, 2, 99-113.

Maslach, C., Schaufeli, W. B., & Leiter, M.P. (2001). Job burnout. *Annual Review of Psychology, 52*, 397–422.

Matthews, R. W., Ferguson, S. A., Paech, G. M., Heath, G., Zhou, X., Sargent, C., Darwent, D., Kennaway, D. J., & Roach, G. (2011). Simulated driving under prior wake, circadian, sleep dose and sleep debt influences. *Accident Analysis & Prevention*, 45, 55-61.

Maume, D. J., & Sebastian, R. A. (2012). Gender, nonstandard work schedules, and marital quality. *Journal of Family and Economic Issues, 33*(4), 477–490. https://doi.org/10.1007/s10834-012-9308-1

McCall, R. B. (1998). *Fundamental Statistics for Behavioural Sciences* (7th ed.). Brook/Cole Publishing Company.

McMenanin, T. (2007). A time to work: Recent trends in shift work and flexible schedules. *Monthly Labor Review*, *130*(12), 2–15. https://www.bls.gov/opub/mlr/2007/12/art1full.pdf

Meliska, C. J., Martínez, L. F., López, A. M., Sorenson, D. L., Nowakowski, S., & Parry, B. L. (2010). Relationship of morningness–eveningness questionnaire score to melatonin and sleep timing, body mass index and atypical depressive symptoms in peri- and post-menopausal women. *Psychiatry Research, 188*, 88–95.

Mokros, Ł., Koprowicz, J., Nowakowska-Domagała, K., Rodak, J., & Pietras, T. (2018). Eveningness and its possibility of predicting burnout symptoms among physicians and nurses – preliminary results. *Current Problems of Psychiatry, 19*(1), 23–29. https://doi.org/10.1515/cpp-2018-0003

Natale, V., & Cicogna, P. (1996). Circadian regulation of subjective alertness in morning and evening "types". *Personality and Individual Differences, 20*(4), 491–497. https://doi.org/10.1016/0191-8869(95)00213-8

Natale, V., & Cicogna, P. C. (2002). Morningness-eveningness dimension: Is it really a continuum? *Personality and Individual Differences, 32*(5), 809–816. https://doi.org/10.1016/S0191-8869(01)00085-X

Niedhammer, I., Coutrot, T., Geoffroy-Perez, B., & Chastang, J. (2022). Shift and night work and all-cause and cause-specific mortality: Prospective Results from the STRESSJEM Study. *Journal of Biological Rhythms*, *37*(3), 249–259. https://doi.org/10.1177/07487304221092103

O'Leary, E. S., Schoenfeld, E. R., Stevens, R. G., Kabat, G. C., Henderson, K., Grimson, R., Gammon, M. D., & Leske, M. C. (2006). Shift work, light at night, and breast cancer on Long Island, New York. *American Journal of Epidemiology*, *164*(4), 358-66.

Othman, N., & Nasurdin, A. M. (2019). Job characteristics and staying engaged in work of nurses: Empirical evidence from Malaysia. *International Journal of Nursing Sciences, 6*(4), 432–438. https://doi.org/10.1016/j.ijnss.2019.09.010

Oved, S., Mofaz, M., Lan, A., Einat, H., Kronfeld-Schor, N., Yamin, D., & Shmueli, E. (2021). Differential effects of COVID-19 lockdowns on well-being: Interaction between age, gender and chronotype. *Research Square,* 12–14.

Parker, S. (1998). Enhancing role-breath self efficacy: The roles of job enrichment and other organizational interventions. *Journal of Applied Psychology, 83*, 835–852.

Partonen, T. (2018). Unhealthy shift work. *European Journal of Preventive Cardiology, 25*(12), 1291–1292.

Parzefall, M., & Hakanen, J. (2010). Psychological contract and its motivational and health-enhancing properties. *Journal of Managerial Psychology, 25,* 4–21. https://doi.org/10.1108/02683941011013849

Peltzer, K. (2000). Trauma symptom correlates of criminal victimization in an urban community sample, South Africa. *Journal of Psychology in Africa; South of the Sahara, the Caribbean, and Afro-Latin America*, *10*(1), 49–62. https://doi.org/10.1080/14330237.2014.906076.Job

Peterson, U., Demerouti, E., Bergström, G., Samuelsson, M., Åsberg, M., & Nygren, Å. (2008). Burnout and physical and mental health among Swedish healthcare workers. *Journal of Advanced Nursing, 62*(1), 84–95. https://doi.org/10.1111/j.1365-2648.2007.04580.x

Pienaar, J., & Willemse, S. A. (2008). Burnout, engagement, coping and general health of service employees in the hospitality industry. *Tourism Management, 29*(6), 1053–1063. https://doi.org/10.1016/j.tourman.2008.01.006

Pisanti, R., van der Doef, M., Maes, S., Lazzari, D., & Bertini, M. (2011). Job characteristics, organizational conditions, and distress/well-being among Italian and Dutch nurses: A cross-national comparison. *International Journal of Nursing Studies, 48*(7), 829–837. https://doi.org/10.1016/j.ijnurstu.2010.12.006

Poulsen, M. G., Poulsen, A. A., Khan, A., Poulsen, E. E., & Khan, S. R. (2011). Work engagement in cancer workers in Queensland: The flip side of burnout. *Journal of Medical Imaging and Radiation Oncology, 55*(4), 425–432. https://doi.org/10.1111/j.1754-9485.2011.02281.x

Preckel, F., Lipnevich, A. A., Schneider, S., & Roberts, R. D. (2011). Chronotype, cognitive abilities, and academic achievement: A meta-analytic investigation. *Learning and Individual Differences, 21*, 483-492.

Quality Metric. (2021). *The SF-12v2® Health Survey.* Quality Metric. https://www.qualitymetric.com/health-surveys/the-sf-12v2-health-survey/

RAND Corporation. (1994-2021). *36-Item Short Form Survey Instrument (SF-36)*. Rand Corporation. https://www.rand.org/health-care/surveys_tools/mos/36-item-short-form/survey-instrument.html

Reulen, R. C., Zeegers, M. P., Jenkinson, C., Lancashire, E. R., Winter, D. L., Jenney, M. E., & Hawkins, M. M. (2006). The use of the SF-36 questionnaire in adult survivors of childhood cancer: Evaluation of data quality, score reliability, and scaling assumptions. *Health and Quality of Life Outcomes*, 4, 1–8. https://doi.org/10.1186/1477-7525-4-77

Ritonja, J., Aronson, K. J., Matthews, R. W., Boivin, D. B., & Kantermann, T. (2019). Working time society consensus statements: Individual differences in shift work tolerance and recommendations for research and practice. *Industrial Health, 57*(2), 201–212. https://doi.org/10.2486/indhealth.SW-5

Robbins, S. P., Judge, T. A., Odendaal, A., & Roodt, G. (2016). *Organisational Behaviour: Global and Southern African Perspectives* (3rd ed.). Pearson.

Roemer, A., & Harris, C. (2018). Perceived organisational support and well-being: The role of psychological capital as a mediator. *South African Journal of Industrial Psychology, 44*(0).

Roeser, K., Riepl, K., Randler, C., & Kübler, A. (2015). Effects of chronotype and synchrony/asynchrony on creativity: An experimental study. *Journal of Individual Differences, 36*(3), 131-137.

Roldán, J. L., & Sánchez-Franco, M. J. (2012). Variance-based structural equation modeling: Guidelines for using partial least squares in information systems research. In M. Mora, O. Gelman, A. Steenkamp, & M. Raisinghani, (Eds*.), Research Methodologies, Innovations and Philosophies in Software Systems Engineering and Information Systems* (pp. 193-221). IGI Global. https://doi.org/10.4018/97821246662017926.ch010

Rothmann, S., Mostert, K., & Strydom, M. (2006). A psychometric evaluation of the Job Demands-Resources scale in South Africa. *South African Journal of Industrial Psychology, 32*(4), 76-86.

Russo, P. M., Leone, L., Penolazzi, B., & Natale, V. (2012). Circadian preference and the Big Five: The role of impulsivity and sensation seeking. *Chronobiology International, 29*, 1121-1126.

Sack, R. L., Auckley, D., Auger, R. R., Carskadon, M. A., Wright, K. P., Vitiello, M. V., & Zhdanova, I. V. (2007). Circadian rhythm sleep disorders: Part I, basic principles, shift work and jet lag disorders. An American Academy of Sleep Medicine review. *Sleep, 30*(11), 1460-1483.

Sadeghniiat-Haghighi, K., Mehrabinejad, M. M., Hajighaderi, A., Najafi, A., Rahimi-Golkhandan, A., & Zahabi, A. (2021). Shift work disorder, insomnia, and depression among offshore oil rig workers. *Iranian Journal of Psychiatry*, *16*(2), 162–167. https://doi.org/10.18502/ijps.v16i2.5817

Salanova, M., Agut, S., & Peiró, J. M. (2005). Linking organizational facilitators and work engagement to employee performance and customer loyalty: The mediation of service climate. *Journal of Applied Psychology*, 90, 1217–1227. https://doi.org/10.1037/0021-9010.90.6.1217

Sallinen, M., & Kecklund, G. (2010). Shift work, sleep, and sleepiness — differences between shift schedules and systems. *Scandinavian Journal of Work, Environment & Health, 36*(2), 121–133. https://www.jstor.org/stable/40967838

Sameer, Y. M., Mohamed, A. A., & Mohamad, M. S. (2019). Antecedents of psychological capital: The role of work design. *Journal of Economics and Management, 35*(1), 124–149. https://doi.org/10.22367/jem.2019.35.07

Sartang, A. G., Ashnagar, M., Habibi, E., & Sadeghi, S. (2018). Investigation effect of shift work on job burnout and depression, anxiety, stress scale in military personnel. *Iranian Journal of Health, Safety & Environment, 5*(3), 1077–1081. http://ijhse.ir/index.php/IJHSE/article/view/326%0Ahttp://ijhse.ir/index.php/IJHSE/article/download/326/333

Schaufeli, W. B. (2003). Past performance and future perspectives of burnout research. *South African Journal of Industrial Psychology, 29*(4), 1-15.

Schaufeli, W. B., & Bakker, A. B. (2003). *Utrecht Work Engagement Scale. Preliminary Manual*. The Netherlands: Occupational Health Psychology Unit, Utrecht University.

Schaufeli, W. B., & Bakker, A. B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior, 25*(3), 293–315. https://doi.org/10.1002/job.248

Schaufeli, W. B., & Taris, T. W. (2005). Commentary: The conceptualisation and measurement of burnout: Common ground and worlds apart. *Work & Stress*, 19, 256-262.

Schaufeli, W. B., Bakker, A. B., & Van Rhenen, W. (2009). How changes in job demands and resources predict burnout, work engagement, and sickness absenteeism. *Journal of Organizational Behavior,* 30, 893–917. http://dx.doi.org/10.1002/job.595

Schaufeli, W. B., Martinez, I., Pinto, A. M., Salanova, M., & Bakker, A. B. (2002). Burnout and engagement in university students: A cross national study. *Journal of Cross-Cultural Psychology,* 33, 464–481.

Schaufeli, W. B., Salanova, M., González-Romá, V., & Bakker, A. B. (2002). The measurement of engagement and burnout: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies, 3*(1), 71–92. https://doi.org/10.1023/A:1015630930326

Schaufeli, W. B., Taris, T. W., & Van Rhenen, W. (2008). Workaholism, burnout, and work engagement: Three of a kind or three different kinds of employee well-being? *Applied Psychology, 57*(2), 173–203. https://doi.org/10.1111/j.1464-0597.2007.00285.x

Scheier, M. F., & Carver, C. S. (1985). Optimism, coping, and health: Assessment and implications of generalized outcome expectancies. *Health Psychology, 4*, 219–247.

Schreuder, A. M. G., & Coetzee, M. (2016). *Careers: An Organisational Perspective* (5th ed.). Juta.

Shah, A., Munir, S., & Zaheer, M. (2021). Occupational stress and job burnout of female medical staff: The moderating role of psychological capital and social support. *Journal of Management and Research, 8*(1), 2519–2705. https://doi.org/https://doi.org/10.29145/jmr/81/080109

Shimazu, A., & Schaufeli, W. B. (2009). Is workaholism good or bad for employee well-being? The distinctiveness of workaholism and work engagement among Japanese employees. *Industrial Health, 47*(5), 495–502. https://doi.org/10.2486/indhealth.47.495

Shimazu, A., Schaufeli, W. B., Kamiyama, K., & Kawakami, N. (2015). Workaholism vs. Work Engagement: The two different predictors of future well-being and performance. *International Journal of Behavioral Medicine, 22*(1), 18–23. https://doi.org/10.1007/s12529-014-9410-x

Shimazu, A., Schaufeli, W. B., Kubota, K., & Kawakami, N. (2012). Do workaholism and work engagement predict employee well-being and performance in opposite directions? *Industrial Health, 50*(4), 316–321. https://doi.org/10.2486/indhealth.MS1355

Sinval, J., Queirós, C., Pasian, S., & Marôco, J. (2019). Transcultural adaptation of the Oldenburg Burnout Inventory (OLBI) for Brazil and Portugal. *Frontiers in Psychology*, *10*(338). https://doi.org/10.3389/fpsyg.2019.00338

Smith, L., & Mason, C. (2001). Reducing night shift exposure: A pilot study of rota, night shift and age effects on sleepiness and fatigue. *Journal of Human Ergology, 30*(1-2), 83-87. https://doi.org/10.11183/jhe1972.30.83

Snyder, C. R. (2002). Target article: Hope Theory: Rainbows in the mind. *Psychological Inquiry, 13*(4), 249-275.

Snyder, C. R., Sympson, S., Ybasco, F., Borders, T., Babyak, M., & Higgins, R. (1996). Development and validation of the state hope scale. *Journal of Personality and Social Psychology, 70*, 321–335.

Stellenbosch University. (2013). Policy for Responsible Research Conduct at Stellenbosch University. *Research Development: Research Integrity and Ethics.* http://www.sun.ac.za/english/research-innovation/Research-Development/Documents/Integrity%20and%20Ethics/SU%20Research%20Ethics%20policy%20approved%20by%20Council_24%20June%202013.pdf

Stellenbosch University. (2020). Terms of Reference and Standard Operating Procedures. *Research Development: Research Ethics Committee: Social, Behavioural and Education Research*. http://www.sun.ac.za/english/research-innovation/Research-Development/integrity-ethics/human-research-(humanities)-ethics

Su, C. T., Ng, H. S., Yang, A. L., & Lin, C. Y. (2014). Psychometric evaluation of the Short Form 36 Health Survey (SF-36) and the World Health Organization Quality of Life Scale Brief Version (WHOQOL-BREF) for patients with schizophrenia. *Psychological Assessment*, *26*(3), 980–989. https://doi.org/10.1037/a0036764

Syam, R., & Arifin, N. A. I. (2021). The effect of psychological capital on work engagement of nurses at Pertiwi Hospital in Makassar City. *Jurnal Ilmiah Ilmu Administrasi Publik (Scientific Journal of Public Administration), 11*(1), 215. https://doi.org/10.26858/jiap.v11i1.21104

Syddall, H., Martin, H., Harwood, R., Cooper, C., & Aihie Sayer, A. (2009). The SF-36: A simple, effective measure of mobility-disability for epidemiological studies. *The Journal of Nutrition, Health and Aging*, 13, 57-62.

Tankova, I., Adan, A., & Buela-Casals, G. (1994). Circadian typology and individual differences: A review. *Personality and Individual differences, 16*, 671-684.

Taris, T. W., Le Blanc, P. M., Schaufeli, W. B., & Schreurs, P. J. G. (2005). Are there causal relationships between the dimensions of the Maslach Burnout Inventory? A review and two longitudinal tests. *Work & Stress*, 19, 238 -255.

Taylor, B. J., & Hasler, B. P. (2018). Chronotype and mental health: Recent advances. *Current Psychiatry Reports, 20*(8), 1-10.

TEDx Talks. (2019, 21 March). Learn the perfect hormonal time to sleep, eat, and have sex | Michael Breus | TEDxManhattanBeach [Video]. YouTube. https://www.youtube.com/watch?v=rmbv7yZ2buE

The R Foundation. (2019). *What is R*? The R Foundation. https://www.r-project.org/about.html

Theorell, T. (2020). COVID-19 and working conditions in health care. *Psychotherapy and Psychosomatics, 89*(4), 193–194. https://doi.org/10.1159/000507765

Tims, M., Bakker, A. B., & Derks, D. (2012). Development and validation of the job crafting scale. *Journal of Vocational Behavior, 80*, 173 -186.

Togo, F., Yoshizaki, T., & Komatsu, T. (2017). Association between depressive symptoms and morningness-eveningness, sleep duration and rotating shift work in Japanese nurses. *Chronobiology International*, *34*, 349–59.

Tonetti, L., Fabbri, M., & Natale, V. (2009). Relationship between circadian typology and Big Five personality domains. *Chronobiology International, 2*, 337-347.

Tsaousis, I. (2010). Circadian preferences and personality traits: A meta-analysis. *European Journal of Personality, 24*, 35-373.

Urbán, R., Magyaródi, T., & Rigó, A. (2011). Morningness-eveningness, chronotypes and health-impairing behaviors in adolescents. *Chronobiology International, 28*(3), 1–17. https://doi.org/10.3109/07420528.2010.549599.Morningness-Eveningness

Vetter, C., Fischer, D., Matera, J. L., & Roenneberg, T. (2015). Aligning work and circadian time in shift workers improves sleep and reduces circadian disruption. *Current Biology*, *25*(7), 907–911. https://doi.org/10.1016/j.cub.2015.01.064

Volk, S., Pearsall, M. J., Christian, M. S., & Becker, W. J. (2017). Chronotype diversity in teams: Toward a theory of team energetic asynchrony. *Academy of Management Review, 42*(4), 683–702. https://doi.org/10.5465/amr.2015.0185

Wagnild, G. M., & Young, H. M. (1993). Development and psychometric evaluation of the resiliency scale. *Journal of Nursing Management, 1*(2), 165–178.

Walters, S., Munro, J., & Brazier, J. (2020). Using the SF-36 with older adults: a cross-sectional community-based survey. *Age and Ageing*, 30, 337-343.

Ware Jr., J. E., & Sherbourne, C. D. (1992). The MOS 36-Item Short-Form Health Survey (SF-36). I. Conceptual Framework and Item Selection. *Medical Care*, 30, 473-483.

Ware, J. E. (2000). SF-36 Health Survey Update. *Spine*, *25*(24), 3130-3139.

Ware, J. E., Kosinski, M. A., & Keller, S. D. (1994). SF-36 physical and mental health summary scales. *A User's Manual,* January 1993, 1–147. https://www.researchgate.net/profile/John_Ware/publication/292390260_SF-36_Physical_and_Mental_Health_Summary_Scales_a_User's_Manual/links/5af5802645851571 36caee31/SF-36-Physical-and-Mental-Health-Summary-Scales-a-Users-Manual.pdf

Weitzman, E. D., Moline, M. L., Czeiler, C. A., & Zimmerman, J. C. (1982). Chronobiology of aging, temperature, sleep/wake rhythms and entrainment. *Neurobiology of Aging, 3*, 299-309.

Wickwire, E. M., Geiger-Brown, J., Scharf, S. M., & Drake, C. L. (2017). Shift work and shift work sleep disorder: Clinical and organizational perspectives. *Chest, 151*(5), 1156–1172. https://doi.org/10.1016/j.chest.2016.12.007

Wieth, M. B., & Zacks, R. T. (2011). Time of day effects on problem solving: When the non-optimal is optimal. *Thinking & Reasoning, 17*, 387-401.

Wirth, M. D., Shivappa, N., Burch, J. B., Hurley, T. G., & Hébert, J. R. (2017). The dietary inflammatory index, shift work, and depression: Results from NHANES. *Health Psychology*, *36*(8), 760–769. https://doi.org/10.1037/hea0000514

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009a). Reciprocal relationships between job resources, personal resources, and work engagement. *Journal of Vocational Behavior,* 74, 235–244. http://dx.doi.org/10.1016/j.jvb.2008.11.003

Xanthopoulou, D., Bakker, A. B., Demerouti, E., & Schaufeli, W. B. (2009b). Work engagement and financial returns: A diary study on the role of job and personal resources. *Journal of Occupational and Organizational Psychology,* 82, 183–200.

Zahari, N., & Kaliannan, M. (2022). Antecedents of work engagement in the public sector: A systematic literature review. *Review of Public Personnel Administration,* 1–26. https://doi.org/10.1177/0734371X221106792

Zurlo, M. C., Vallone, F., & Smith, A. P. (2018). Effects of individual differences and job characteristics on the psychological health of Italian nurses. *Europe's Journal of Psychology*, *14*(1), 159–175.

Appendix A: Ethical Clearance

UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

NOTICE OF APPROVAL

REC: Social, Behavioural and Education Research (SBER) - Initial Application Form

20 September 2021

Project number: 23372

Project Title: The Influence of Job Characteristics, Psychological Capital, Work Schedule and Chronotype on the Engagement, Burnout and General Health of Shift Workers

Dear Miss S Smith

Co-investigators:

Your REC: Social, Behavioural and Education Research (SBER) - Initial Application Form submitted on 26/08/2021 11:49 was reviewed and approved by the REC: Social, Behavioural and Education Research (REC: SBE).

Please note below expiration date of this approved submission:

Ethics approval period:

Protocol approval date (Humanities)	Protocol expiration date (Humanities)
16 September 2021	15 September 2022

GENERAL REC COMMENTS PERTAINING TO THIS PROJECT:

The researcher is reminded to obtain permission from the participating organisation(s) before recruitment and/or data collection may commence. Proof of permission should be uploaded to the REC online application once received [ACTION REQUIRED]

INVESTIGATOR RESPONSIBILITIES

Please take note of the General Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

If the researcher deviates in any way from the proposal approved by the REC: SBE, the researcher must notify the REC of these changes.

modifications, or monitor the conduct of your research and the consent process.

CONTINUATION OF PROJECTS AFTER REC APPROVAL PERIOD

You are required to submit a progress report to the REC: SBE before the approval period has expired if a continuation of ethics approval is required. The Committee will then consider the continuation of the project for a further year (if necessary).

Once you have completed your research, you are required to submit a final report to the REC: SBE for review.

Included Documents:

Document Type	File Name	Date	Version
Proof of permission	Oldenburg Burnout Inventory items	05/08/2021	1
Proof of permission	Job Diagnostic Survey-Revised Permissions	05/08/2021	1
Proof of permission	Utrecht Work Engagement Scale permissions	05/08/2021	1
Data collection tool	BIOGRAPHICAL QUESTIONNAIRE	05/08/2021	1
Data collection tool	Job Diagnostic Survey Revised Items	05/08/2021	1

Proof of permission	SF12	18/08/2021	1
Proof of permission	Psychological Capital Questionnaire Permissions	18/08/2021	1
Proof of permission	General License Agreement MEQ	18/08/2021	1
Proof of permission	special agreement terms MEQ	18/08/2021	1
Data collection tool	Work Schedule Items	18/08/2021	1
Data collection tool	Psychological Capital Questionnaire Items	18/08/2021	1
Data collection tool	MEQ-REV-SR items	18/08/2021	1
Data collection tool	Oldenburg Burnout Inventory items	18/08/2021	1
Data collection tool	Utrech Work Engagement Scale items	18/08/2021	1
Data collection tool	South Africa (English) SF-12v2 Standard	18/08/2021	1
Default	remoteonlineuseagreement	18/08/2021	1
Budget	Budget	23/08/2021	1
Request for permission	organisational invitation letter	23/08/2021	1
Default	JDS-R Items - Boonzaier et al., 2001	23/08/2021	1
Default	OLBI items - received from Demerouti	23/08/2021	1
Default	UWES-9 Items - Schaufeli and Bakker 2006	23/08/2021	1
Default	American Psychological Association Licence	23/08/2021	1
Recruitment material	Invitation letter socials	23/08/2021	1
Recruitment material	organisational invitation letter	23/08/2021	1
Informed Consent Form	consent form	26/08/2021	1
Research Protocol/Proposal	RES871 Sophia Smith - Final Research Proposal for REC	26/08/2021	1

If you have any questions or need further help, please contact the REC office at cgraham@sun.ac.za.

Sincerely,

Clarissa Graham

REC Coordinator: Research Ethics Committee: Social, Behavioral and Education Research

National Health Research Ethics Committee (NHREC) registration number: REC-050411-032.
The Research Ethics Committee: Social, Behavioural and Education Research complies with the SA National Health Act No.61 2003 as it pertains to health research. In addition, this committee abides by the ethical norms and principles for research established by the Declaration of Helsinki (2013) and the Department of Health Guidelines for Ethical Research: Principles Structures and Processes (2nd Ed.) 2015. Annually a number of projects may be selected randomly for an external audit.

Principal Investigator Responsibilities

Protection of Human Research Participants

As soon as Research Ethics Committee approval is confirmed by the REC, the principal investigator (PI) is responsible for the following:

Conducting the Research: The PI is responsible for making sure that the research is conducted according to the REC-approved research protocol. The PI is jointly responsible for the conduct of co-investigators and any research staff involved with this research. The PI must ensure that the research is conducted according to the recognised standards of their research field/discipline and according to the principles and standards of ethical research and responsible research conduct.

Participant Enrolment: The PI may not recruit or enrol participants unless the protocol for recruitment is approved by the REC. Recruitment and data collection activities must cease after the expiration date of REC approval. All recruitment materials must be approved by the REC prior to their use.

Informed Consent: The PI is responsible for obtaining and documenting affirmative informed consent using **only** the REC-approved consent documents/process, and for ensuring that no participants are involved in research prior to obtaining their affirmative informed consent. The PI must give all participants copies of the signed informed consent documents, where required. The PI must keep the originals in a secured, REC-approved location for at least five (5) years after the research is complete.

Continuing Review: The REC must review and approve all REC-approved research proposals at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period.** Prior to the date on which the REC approval of the research expires, **it is the PI's responsibility to submit the progress report in a timely fashion to ensure a lapse in REC approval does not occur.** Once REC approval of your research lapses, all research activities must cease, and contact must be made with the REC immediately.

Amendments and Changes: Any planned changes to any aspect of the research (such as research design, procedures, participant population, informed consent document, instruments, surveys or recruiting material, etc.), must be submitted to the REC for review and approval before implementation. Amendments may not be initiated without first obtaining written REC approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the REC should be immediately informed of this necessity.

Adverse or Unanticipated Events: Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research-related injuries, occurring at this institution or at other performance sites must be reported to the REC within **five (5) days** of discovery of the incident. The PI must also report any instances of serious or continuing problems, or non-compliance with the RECs requirements for protecting human research participants.

Research Record Keeping: The PI must keep the following research-related records, at a minimum, in a secure location for a minimum of five years: the REC approved research proposal and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence and approvals from the REC.

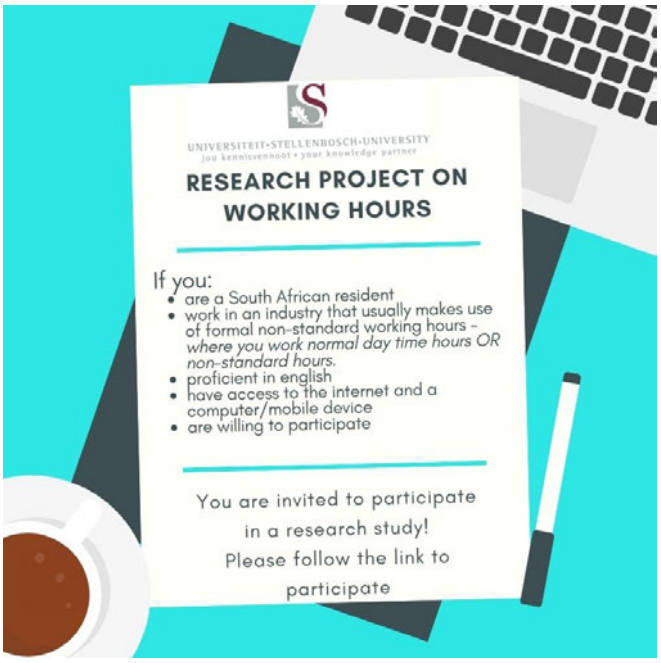
Provision of Counselling or emergency support: When a dedicated counsellor or a psychologist provides support to a participant without prior REC review and approval, to the extent permitted by law, such activities will not be recognised as research nor the data used in support of research. Such cases should be indicated in the progress report or final report.

Final reports: When the research is completed (no further participant enrolment, interactions or interventions), the PI must submit a Final Report to the REC to close the study.

On-Site Evaluations, Inspections, or Audits: If the researcher is notified that the research will be reviewed or audited by the sponsor or any other external agency or any internal group, the PI must inform the REC immediately of the impending audit/evaluation.

Appendix B: Invitation Letters

1. *Invitation Letter for Social Media*



DO YOU WORK IN AN INDUSTRY THAT MAKES USE OF NON-STANDARD HOURS?

My name is Sophia Smith, a Master's student in the Department of Industrial Psychology at Stellenbosch University. If you are a currently working in an industry that usually makes use of formal, non-standard working hours (where you work either **normal hours** or **non-standard hours**), I would like to invite you to participate in an online survey as part of my research study. The purpose of this study is to look at the role of your preference for morning or evening and how this interacts with your work schedules and relates to your work and health outcomes. The results of this survey will contribute to a research project required to complete my Master's degree in Industrial Psychology. By participating in this 35-minute survey, you stand a chance to **WIN** a Takealot voucher to the *value of R1000!*

To participate, you are required to be a South African resident and have access to the internet and a computer/mobile device. As the survey is in English, you will also be required to be proficient in the English language. Alternatively, if you know of anyone who may fit these criteria, I ask that you please share this link with them to help me reach a wider audience.

Your participation is voluntary and you may withdraw from the study at any time. The study is completely anonymous, and therefore will not require you to provide your name or any other identifying information.

If you would like to participate in the study please click on the following link:

[insert link] Your participation will be highly appreciated.

2. Invitation Letter for Organisational Permission

UNIVERSITEIT • STELLENBOSCH • UNIVERSITY

[Addressed to the Organisational Manager]

Dear _____

My name is Sophia Smith, a Master's student in the Department of Industrial Psychology at the University of Stellenbosch. Your company has been identified to be working in an industry that makes use of formal non-standard working hours. I would therefore like to request permission to invite your workers in your organisation to participate in my research.

While there are economic, technical and social benefits for organisations in the use of non-standard work schedules, these benefits are conflicted by the social and health impairments for workers. These social and health issues also impact organisations as absenteeism and turnover rates climb and the prevalence of workplace accidents become higher. This is because workers often experience burnout as the nature of shift work becomes too taxing. Since the use of non-standard work schedules is on the rise, it is increasingly important for organisations to understand what the impact of working these atypical hours are on their workers and to implement interventions that aim to eliminate, or at least mitigate, the challenges associated thereto. The purpose of this research study is therefore to explore the salient variables that cause variance in burnout, engagement and general health in South African shift workers to inform such appropriate organisational interventions. Specifically, I would like to look at the role that these workers' preferences for morning or evening plays in these work outcomes. To do this, I will require to conduct an online survey on your workers (including both shift workers and non-shift workers).

If you grant consent for me to conduct research at your organisation, I will forward the invitation link to the online survey and consent form to your Human Resources Manager (or whomever you deem suitable). The Human Resources Manager may then forward this invitation link to any/all workers within your organisation using an internal communication system. By following this procedure, anonymity of your workers will be ensured. The only requirements for workers to participate in this survey is to be a South African resident, to be working for at least four weeks, to be proficient in the English language and to have access to the internet and a computer/mobile device. These requirements will be communicated to the workers in the survey link and so will not require effort on part of the organisation.

Participation on part of the organisation would be confidential, as the name of your company and other details will not be recorded or mentioned in any reports. The email address to contact the organisation will only be kept if the organisation wishes to receive the findings of this study. This email address will be stored in a password protected file on a password protected laptop. Participation on part of workers will be voluntary, anonymous and at their convenience. The survey will take approximately 35 minutes to complete. Participants will be able to complete the online survey at any time within a specified period (approximately two months). All information recorded through this

online survey will be anonymous and stored on a password protected file on a password protected laptop.

A link to this online survey is included for your information: [insert link to survey].

If you grant consent, could you please inform me as to whom to contact so that I may send them the invitation link that can be directly forwarded to your workers. Your permission to conduct this research study will be highly appreciated and it is with high hope that the study will add value to your organisation.

Yours sincerely,

Appendix C: Consent Form

CONSENT TO PARTICIPATE IN RESEARCH

Dear prospective participant

My name is Sophia Smith, a Master's student in the Department of Industrial Psychology at Stellenbosch University, and I would like to invite you to take part in a survey, the results of which will contribute to a research project in order to complete my Master's degree in Industrial Psychology.

Please take some time to read the information presented here, which will explain the details of this project.
Your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part. You can decline or withdraw your participation by exiting the browser.

The purpose of this study is to look at the role of your preference for morning or evening and how this interacts with your work schedules and relates to your work and health outcomes. In order to participate in this research project, you are required to be a South African resident, to work in an industry that tends to make use of non-standard formal working hours (note: this does not require you, specifically, to formally work non-standard hours), to have access to the internet on a computer or mobile device, and to be proficient in the English language.

The questionnaire will take approximately 35 minutes to complete and will contain a combination of questions covering characteristics of your job, work context, personal characteristics and your physical and mental health. Please answer all of the questions. By doing so you are helping to ensure that the findings of this study are more accurate.

It is not expected that this research should cause you any harm or discomfort. However, if at any time you feel distressed, you have the right to withdraw. If you should feel any psychological discomfort, you can visit the South African Depression and Anxiety Group website on www.sadag.org or contact them directly on 0800 567 567. Alternatively, you can visit the following site on how to prevent and manage burnout: https://www.helpguide.org/articles/stress/burnout-prevention-and-recovery.htm
Participants that complete the survey will be given the choice to enter into a Prize Draw to win a Takealot voucher to the value of R1000. You will be asked to provide a valid email address where you might be contacted in the event that you are the winner. The prize draw will be undertaken once all the data has been collected.

RIGHTS OF RESEARCH PARTICIPANTS:
You have the right to decline answering any questions and you can exit the survey at any time without reason. You are not waiving any legal claims, rights or remedies because of your participation in this re study. If you have questions regarding your rights as a research participant, contact Mrs Maléne Fouch [mfouche@sun.ac.za; 021 808 4622] at the Division for Research Development.

Your information and response to the survey will be protected by storing the fully anonymized data provided in password protected files on two separate password protected laptops, thereby ensuring confidentiality.

If you have any questions or concerns about the research, please feel free to contact the researcher Sophia Smith and/or the Supervisor, Michele Boonzaier

I confirm that I have read and understood the information provided for the current study.	YES	NO
	☐	☐
I confirm that I am a South African resident	YES	NO
	☐	☐
I confirm that I have been employed at my company for at least 4 weeks	YES	NO
	☐	☐
I agree to take part in this survey.	YES	NO
	☐	☐

Appendix D: Biographical Questionnaire

BIOGRAPHICAL QUESTIONNAIRE

Please note that this questionnaire will not require you to provide your name or any other identifying information. All the information you provide in the questionnaire will therefore remain anonymous. We are primarily concerned with the information obtained from groups of shift-workers.

Please answer the following questions by ticking the relevant box and by providing typed answers where applicable:

1. Gender	☐ Male ☐ Female ☐ Other: ☐ Prefer not to answer
2. Age	☐ Below 18 ☐ 18 – 24 ☐ 25 – 34 ☐ 35 – 44 ☐ 45 – 54 ☐ 55 – 64 ☐ 65 and above
3. Ethnicity	☐ African ☐ White ☐ Coloured ☐ Indian/Asian ☐ Other: ☐ Prefer not to answer
4. Location (Province)	☐ Eastern Cape ☐ Free State ☐ Gauteng ☐ KwaZulu-Natal ☐ Limpopo ☐ Mpumalanga ☐ Northern Cape ☐ North West ☐ Western Cape
5. Highest Level of education	☐ Grade 9 ☐ Grade 10 and National (vocational) Certificates level 2 ☐ Grade 11 and National (vocational) Certificates level 3 ☐ Grade 12 (National Senior

	Certificate) and National (vocational) Cert. level 4 ☐ Higher Certificates and Advanced National (vocational) Cert. ☐ National Diploma and Advanced certificates ☐ Bachelor's degree, Advanced Diplomas, Post Graduate Certificate and B-tech ☐ Honours degree, Post Graduate diploma and Professional Qualifications ☐ Master's degree ☐ Doctor's degree
6. Marital status	☐ Single ☐ Married or domestic partnership ☐ Divorced ☐ Widowed
7. Number of dependents	☐ None ☐ 1 ☐ 2-4 ☐ More than 4 ☐ Prefer not to answer
8. Home Language	☐ English ☐ Afrikaans ☐ Xhosa ☐ Pedi ☐ Sotho ☐ Tswana ☐ Swati ☐ Venḓa ☐ Tsonga ☐ Ndebele ☐ Zulu ☐ Other:
9. Industry of work	☐ Agriculture; plantations; other rural sectors ☐ Basic Metal Production ☐ Chemical industries ☐ Commerce ☐ Construction ☐ Education ☐ Financial services; professional services ☐ Food; drink; tobacco ☐ Forestry; wood; pulp and paper ☐ Health services

	☐ Hotels; tourism; catering ☐ Mining (coal; other mining) ☐ Mechanical and electrical engineering ☐ Media; culture; graphical ☐ Oil and gas production; oil refining ☐ Postal and telecommunications services ☐ Public service ☐ Shipping; ports; fisheries; inland waterways ☐ Textiles; clothing; leather; footwear ☐ Transport (including civil aviation; railways; road transport) ☐ Transport equipment manufacturing ☐ Utilities (water; gas; electricity) ☐ Other:
10. Work level	☐ Entry level ☐ Intermediate/experienced level ☐ First level manager ☐ Middle level management ☐ Senior/Top level management
11. Average Annual Household Income	☐ R0 – R19,000 (R0 – R1,583 per month) ☐ R19,001 – R86,000 (R1,584 – R7,167 per month) ☐ R86,001 – R197,000 (R7,168 – R16,417 per month) ☐ R197,001 – R400,000 (R16,418 – R33,333 per month) ☐ R400,001 – R688,000 (R33,334 – R57,333 per month) ☐ R688,001 – R1,481,000 (R57,334 – R123,417 per month) ☐ R1,481,001 + (R123,418 + per month)

Appendix E: American Psychological Association Licence: Terms and Conditions

Jun 02, 2021

This Agreement between Stellenbosch University -- Sophia Smith ("You") and American Psychological Association ("American Psychological Association") consists of your license details and the terms and conditions provided by American Psychological Association and Copyright Clearance Centre.

License Number	5080701309186
License date	Jun 02, 2021
Licensed Content Publisher	American Psychological Association
Licensed Content Publication	Journal of Occupational Health Psychology
Licensed Content Title	Job demands–resources theory: Taking stock and looking forward.
Licensed copyright line	Copyright © 2017, American Psychological Association
Licensed Content Author	Bakker, Arnold B.; Demerouti, Evangelia
Licensed Content Date	Jul 1, 2017
Licensed Content Volume	22
Licensed Content Issue	3
Type of Use	Thesis/Dissertation
Requestor type	Academic institution
Format	Print
Portion	chart/graph/table/figure
Number of charts/graphs/tables/figures	1
Rights for	Main product
Duration of use	life of current edition
Creation of copies for the disabled	No
With minor editing privileges	No
In the following language(s)	Original language of publication

With incidental promotional use	No
The lifetime unit quantity of new product	0 to 499
Title	Student
Institution name	Stellenbosch University
Expected presentation date	Jul 2021
Order reference number	sophia1
Portions	Figure 1. The job demands-resources model. Adapted from Job Demands-Resources Theory: Taking Stock and Looking Forward by "Arnold B. Bakker" and "Evangelia Demerouti", 2016, Journal of Occupational Health Psychology, 22(3), p.275.
Requestor Location	Stellenbosch University 39 Anderson South street Joostenbergvlakte Cape Town, Western Cape 7569 South Africa Attn: Stellenbosch University
Total	0.00 USD

Terms and Conditions

RightsLink Plus Terms and Conditions
American Psychological Association

The publisher for this copyrighted material is the American Psychological Association ("APA"). By clicking "accept" in connection with completing this licensing transaction, you agree that the following terms and conditions apply to this transaction (along with the Billing and Payment terms and conditions established by the Copyright Clearance Center, Inc. ("CCC") at the time that you opened your CCC account.

APA hereby grants you a non-exclusive license to use this material, subject to the conditions below.

1. Limited License.
   Licenses are for one-time use only with a maximum distribution equal to the number that you identified in the licensing process; any form of republication must be completed with 12 months from the date hereof (although copies prepared before then may be distributed thereafter); and any electronic posting is limited to a period of 12 months.

2. Credit Lines and Translation Disclaimer.

The reproduced material must include one of the following credit lines:

For English language content: Copyright © [year] by [Copyright Owner]. Reproduced [or Adapted] with permission. [Full bibliographic citation.]

For translated language content: This material originally appeared in English as [full bibliographic citation]. Copyright © [year] by [Copyright Owner]. Translated and reproduced [or adapted] with permission. [Copyright Owner] is not responsible for the quality or accuracy of this translation. This translation cannot be reproduced or distributed further without prior written permission.

3. Author Permission.
   You must obtain the author's (or, in case of multiple authorship, one author's) permission. A good faith effort must be made to locate the author and obtain the author's permission. Author permission is not required for the reuse of small excepts or 1 to 3 figures or 1 to 3 tables; or for course pack or electronic reserve use.

4. Geographic Rights.
   Licenses may be exercised anywhere in the world.

5. Book Edition Limit.
   If the APA content will be reproduced in a book, then permission is limited to the life of the current edition.

6. Online Use Limitations.
   APA full-text articles or book chapters may only be posted on a secure and restricted web site. The credit line specified in Section 2 shall appear on the first screen on which the APA content appears and shall be amended to include the following additional wording: No further reproduction or distribution is permitted without written permission from the American Psychological Association.

7. Reservation of Rights.
   APA reserves all rights not specifically granted in the combination of (i) the license details provided by you and accepted in the course of this licensing transaction, (ii) these terms and conditions and (iii) CCC's Billing and Payment terms and conditions.

8. License Contingent on Payment.
   While you may exercise the rights licensed immediately upon issuance of the license at the end of the licensing process for the transaction, provided that you have disclosed complete and accurate details of your proposed use, no license is finally effective unless and until full payment is received

from you (either by APA or by CCC) as provided in CCC's Billing and Payment terms and conditions. If full payment is not received on a timely basis, then any license preliminarily granted shall be deemed automatically revoked and shall be void as if never granted. Further, in the event that you breach any of these terms and conditions or any of CCC's Billing and Payment terms and conditions, the license is automatically revoked and shall be void as if never granted. Use of materials as described in a revoked license, as well as any use of the materials beyond the scope of an unrevoked license, may constitute copyright infringement and APA reserves the right to take any and all action to protect its copyright in the materials. "$0.00" fee means that APA waived the fee.

9. License Revocation.
   APA or CCC may, within 60 days from the date of license, deny the permissions described in this License at their sole discretion, for any reason or no reason, with a full refund payable to you. Notice of such denial will be made using the contact information provided by you. Failure to receive such notice will not alter or invalidate the denial. In no event will APA or CCC be responsible or liable for any costs, expenses or damage incurred by you as a result of a denial of your permission request, other than a refund of the amount(s) paid by you to CCC for denied permissions.

10. Warranties.
    APA warrants that it has, to the best of its knowledge, the rights to license reuse of this content. However, you must ensure that the material you are requesting is original to APA and does not carry the copyright of another entity (as credited in the published version). If any part of the material you have requested indicates that it was reprinted or adapted with permission from another source, then you should also seek permission from that original source to reuse the material.

11. Indemnity.
    You hereby indemnify and agree to hold harmless APA and CCC, and their respective officers, directors, employees and agents, from and against any and all claims arising out of your use of the licensed material other than as specifically authorized pursuant to this license.

12. No Transfer of License.
    This license is personal to you, but may be assigned or transferred by you to your employer or a business associate if you give prompt written notice of the assignment or transfer to the APA. No such assignment or transfer shall relieve you of the obligation to pay the designated license fee on a timely basis (although payment by the identified assignee can fulfill your

obligation).

13. No Amendment except in Writing.
    This license may not be amended except in a writing signed by both parties (or, in the case of APA, by CCC on APA's behalf).

14. Objection to Contrary Terms.
    APA hereby objects to any terms contained in any purchase order, acknowledgment, check endorsement or other writing prepared by you, which terms are inconsistent with these terms and conditions or CCC's Billing and Payment terms and conditions. These terms and conditions, together with CCC's Billing and Payment terms and conditions (which are incorporated herein), comprise the entire agreement between you and APA (and CCC) concerning this licensing transaction. In the event of any conflict between your obligations established by these terms and conditions and those established by CCC's Billing and Payment terms and conditions, these terms and conditions shall control.

15. Jurisdiction.
    This license transaction shall be governed by and construed in accordance with the laws of the District of Columbia. You hereby agree to submit to the jurisdiction of the federal courts located in the District of Columbia for purposes of resolving any disputes that may arise in connection with this licensing transaction.

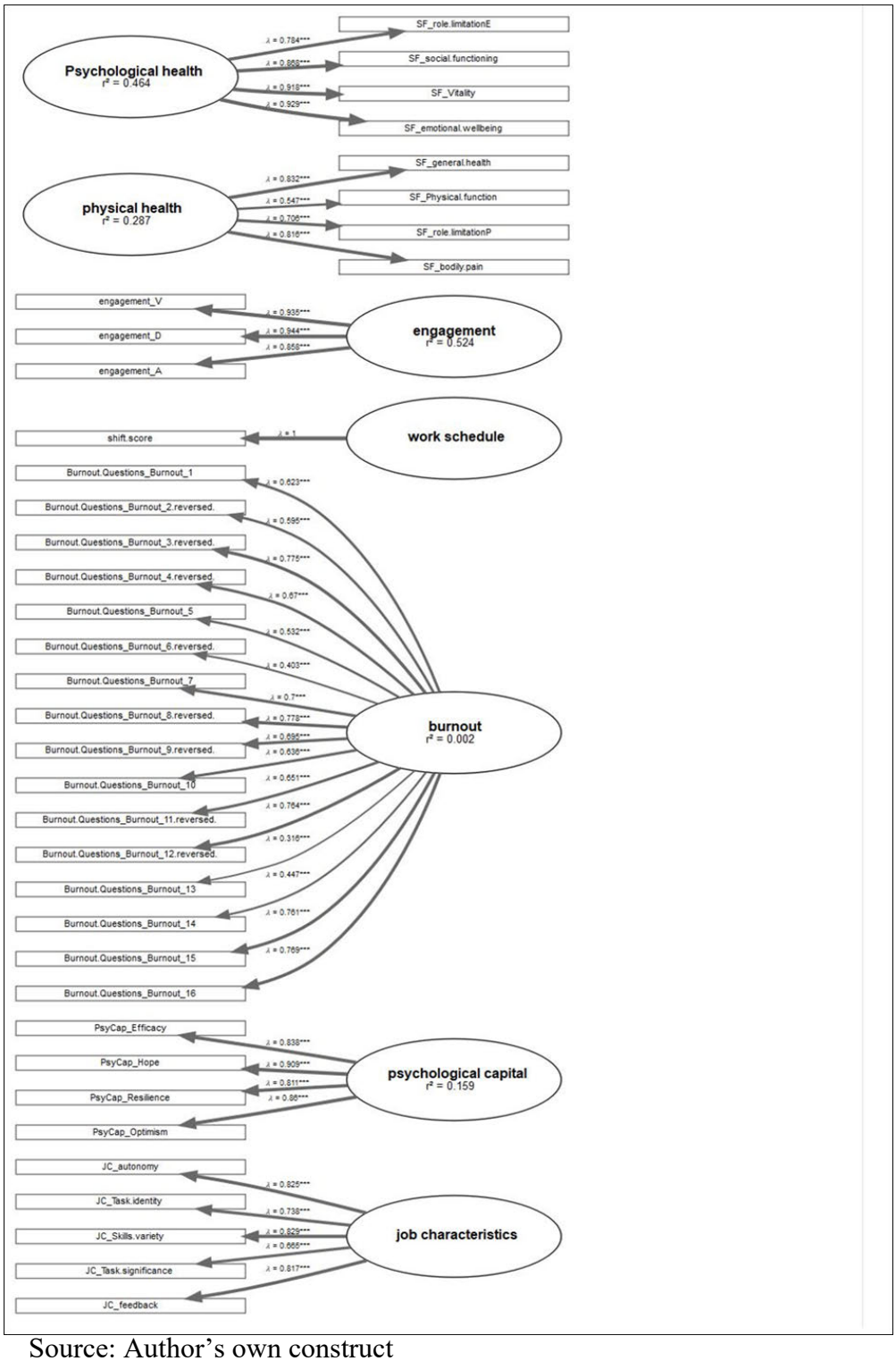
Other Conditions:
v1.2

Questions? customercare@copyright.com or +1-855-239-3415 (toll free in the US) or +1-978-646-2777.

Appendix F: Statistical Outputs

Figure F1

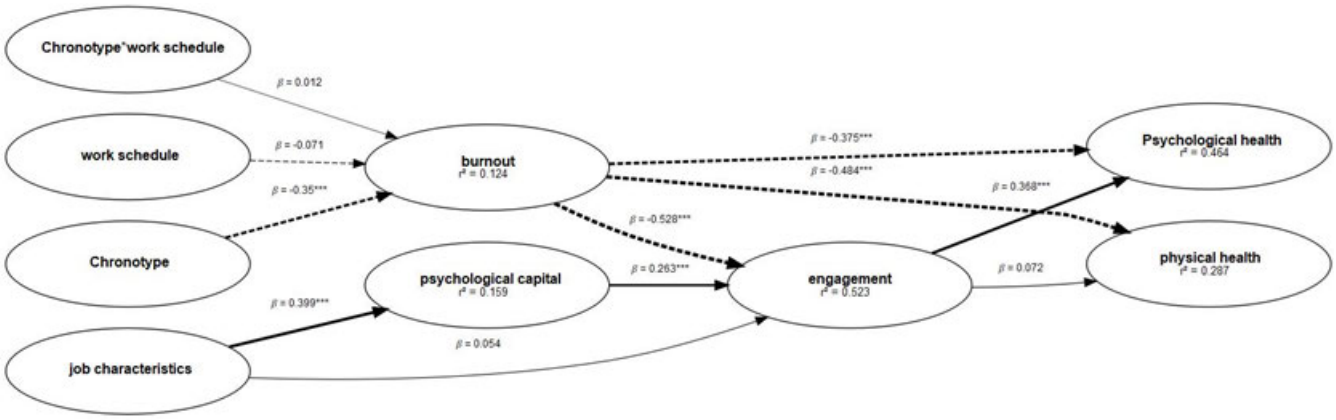
PLS-SEM Outer Model Diagram



Source: Author's own construct

Figure F2

PLS-SEM Inner Model Diagram with Chronotype as a Moderator on the Relationship between Work Schedule and Burnout



Source: Author's own construct

Table F1

VIF Values of the Measures

	Variance Inflation Factor (VIF)			
	Engagement	Burnout	Physical Health	Psychological Health
Job Characteristics	1.29			
Psychological Capital	1.40			
Burnout	1.43		1.86	1.86
Work Schedule		1.01		
Chronotype		1.01		
Chronotype*Work Schedule		1		
Engagement			1.86	1.86

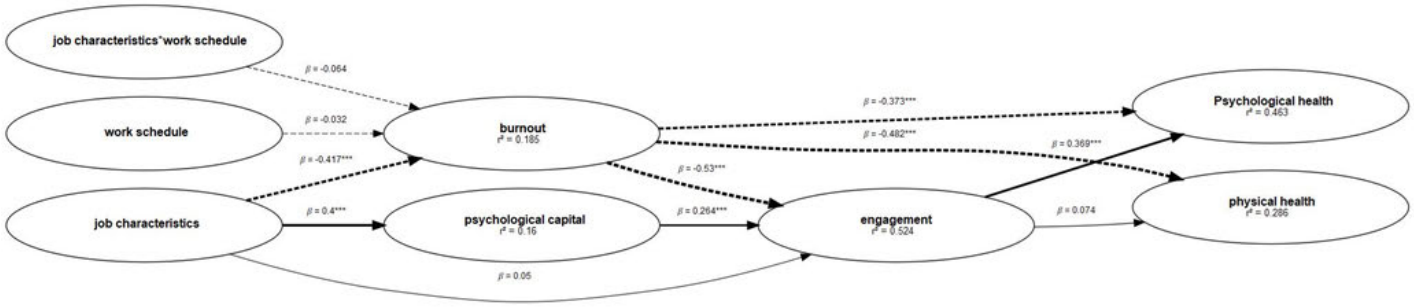
Table F2

The Coefficients of determination of the measures

Construct	R^2	Adjusted R^2
Engagement	0.52	0.52
Burnout	0.12	0.11
Physical Health	0.29	0.28
Psychological Health	0.46	0.46
Psychological Capital	0.16	0.15

Figure F3

PLS-SEM Inner Model Diagram with Job Characteristics as a Moderator on the Relationship between Work Schedule and Burnout



Source: Author's own construct

Table F3

VIF Values of the Measures

	Variance Inflation Factor (VIF)			
	Engagement	Burnout	Physical Health	Psychological Health
Job Characteristics	1.30	1.01		
Psychological Capital	1.40			
Burnout	1.44		1.86	1.86
Work Schedule		1		
Job Characteristics*Work Schedule		1.01		
Engagement			1.86	1.86

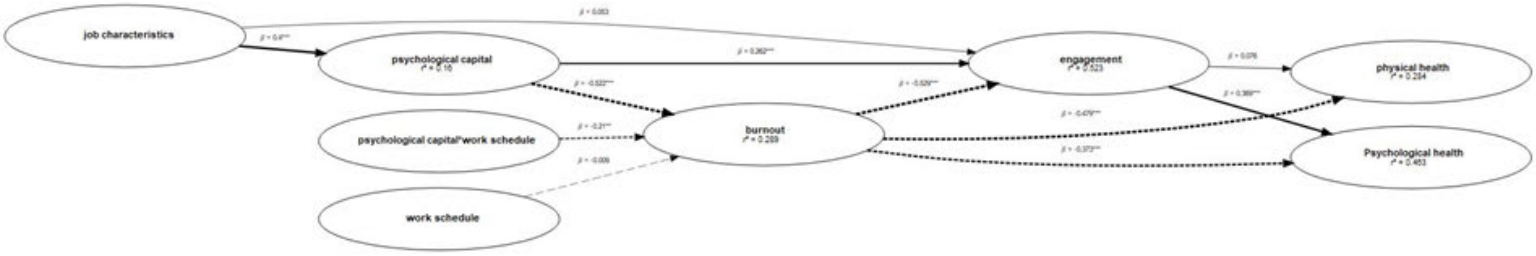
Table F4

The Coefficients of determination of the measures

Construct	R^2	Adjusted R^2
Engagement	0.52	0.52
Burnout	0.19	0.17
Physical Health	0.29	0.28
Psychological Health	0.46	0.46
Psychological Capital	0.16	0.16

Figure F4

PLS-SEM Inner Model Diagram with PsyCap as a Moderator on the Relationship between Work Schedule and Burnout



Source: Author's own construct

Table F5

VIF Values of the Measures

	Variance Inflation Factor (VIF)			
	Engagement	Burnout	Physical Health	Psychological Health
Job Characteristics	1.29			
Psychological Capital	1.41	1.02		
Burnout	1.43		1.86	1.86
Work Schedule		1.01		
Psychological Capital*Work Schedule		1.02		
Engagement			1.86	1.86

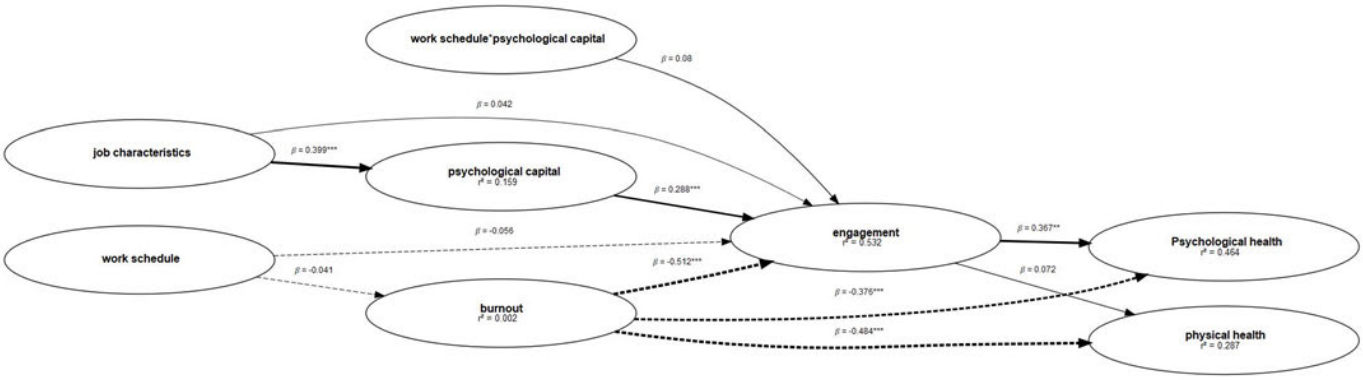
Table F6

The Coefficients of determination of the measures

Construct	R^2	Adjusted R^2
Engagement	0.52	0.51
Burnout	0.29	0.28
Physical Health	0.28	0.28
Psychological Health	0.46	0.46
Psychological Capital	0.16	0.16

Figure F5

PLS-SEM Inner Model Diagram with Work Schedule as a Moderator on the Relationship between PsyCap and Engagement



Source: Author's own construct

Table F7

VIF Values of the Measures

	Variance Inflation Factor (VIF)		
	Engagement	Physical Health	Psychological Health
Job Characteristics	1.31		
Psychological Capital	1.50		
Burnout	1.48	1.86	1.86
Work Schedule	1.01		
Work Schedule*Psychological Capital	1.1		
Engagement		1.86	1.86

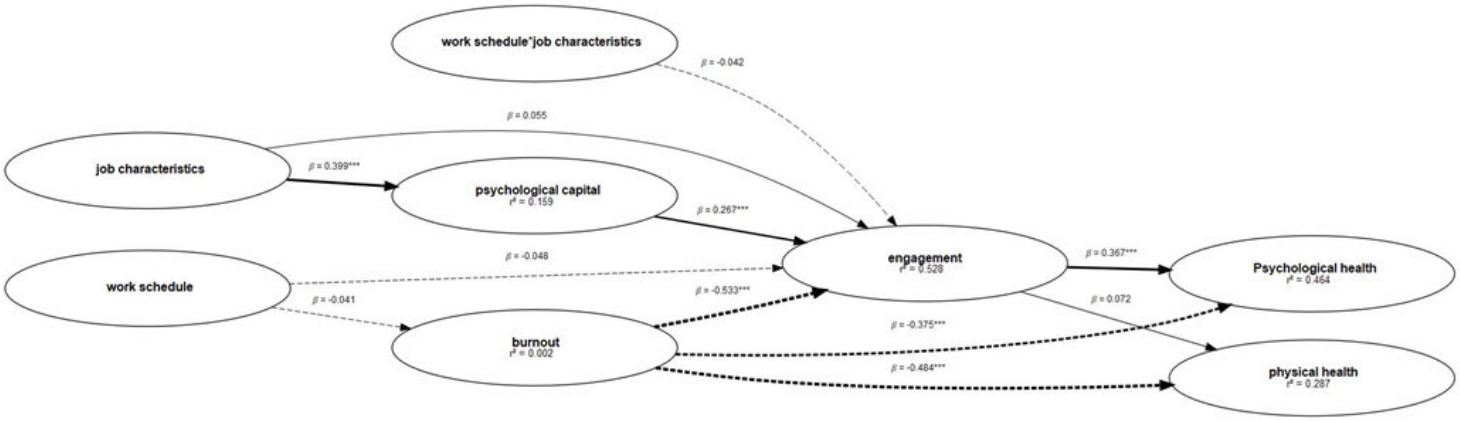
Table F8

The Coefficients of determination of the measures

Construct	R^2	Adjusted R^2
Engagement	0.53	0.52
Burnout	<0.01	<0.01
Physical Health	0.29	0.28
Psychological Health	0.46	0.46
Psychological Capital	0.16	0.15

Figure F6

PLS-SEM Inner Model Diagram with Work Schedule as a Moderator on the relationship between Job Characteristics and Engagement



Source: Author's own construct

Table F9

VIF Values of the Measures

	Variance Inflation Factor (VIF)		
	Engagement	Physical Health	Psychological Health
Job Characteristics	1.29		
Psychological Capital	1.41		
Burnout	1.43	1.86	1.86
Work Schedule	1.01		
Work Schedule*Job Characteristics	1.02		
Engagement		1.86	1.86

Table F10

The Coefficients of determination of the measures

Construct	R^2	Adjusted R^2
Engagement	0.53	0.51
Burnout	<0.01	<0.01
Physical Health	0.29	0.28
Psychological Health	0.46	0.46
Psychological Capital	0.16	0.15

Appendix G: Editor's Declaration

I 'Avenir Consulting

Monica Botha
T/a I'Avenir Consulting
PO Box 32945
WAVERLEY
0135

Cellular: 083 269 0757
E-mail: monicabo@lantic.net

TO WHOM IT MAY CONCERN

This serves to confirm that I have edited and proofread the document entitled

THE INFLUENCE OF JOB CHARACTERISTICS, PSYCHOLOGICAL CAPITAL, WORK SCHEDULE AND CHRONOTYPE ON THE ENGAGEMENT, BURNOUT AND GENERAL HEALTH OF SHIFT WORKERS

prepared by Ms Sophia M Smith in partial fulfilment of the requirements of the degree Master of Commerce in Industrial Psychology in the Faculty of Economic and Management Sciences at Stellenbosch University, according to the specifications of the University, where available, and the latest standards for language editing and technical (computer-based) layout.

Editing was restricted to language usage and spelling, and a cursory overview of the formatting of the document and the references used. No structural writing of any content was undertaken.

As an editor I am not responsible for detecting any content that may constitute plagiarism.

To the best of my knowledge all references have been provided in the prescribed format.

I am not accountable for any changes made to this dissertation by the author or any other party after the date of my edit.

(Electronically signed – actual signature withheld for security reasons)
MONICA BOTHA
30 November 2022

Sole Proprietor: Monica Botha

Business Planning Corporate Systems Engineering Corporate Document Standards
Business and Academic Document Technical and Language Editing