ACADEMIC OR ‘ZOOMBIE’? CHARACTERIZING SLEEP QUALITY, WORK AND LIFESTYLE BEHAVIOURS AMONG A COHORT OF SOUTH AFRICAN ACADEMIC STAFF DURING THE COVID-19 PANDEMIC

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ABSTRACT

Working in academe is characterized by high work demands, long and late working hours and balancing multiple roles. This often leaves academic staff (interchangeably referred to as 'academics' and 'staff') with limited time to prioritize adequate rest and sleep. While sufficient sleep is important for general well-being and work performance, it may be important for academics given the cognitive and interactive nature of their work. However, limited research has characterized sleep behaviours and sleep quality in academic staff globally and specifically in South Africa (SA). Further, research shows that academics from different academic ranks and genders differ in their work experiences but less is known about whether these factors affect their sleep and lifestyle factors. Over and above the demands of academic work, the current study was conducted during COVID-19, which saw unprecedented change in workloads for academic staff due to online teaching and learning. Additionally, the pandemic has been associated with poorer sleep quality and lifestyle behaviours in the general population, but very few studies have explored this in the context of academics. Thus, this study aimed to characterize the sleep quality, work and lifestyle factors among academics from a university in the Eastern Cape province of SA and determine the effects of gender and academic rank on these measures. Additionally, the study aimed to determine the impact of COVID-19 on sleep and work-related factors of this group.

This study adopted a cross-sectional design and made use of an online questionnaire that was distributed to all academics employed at the institution via email. The data collection occurred over an 8-week testing period between August and September of 2020. The questionnaire explored sociodemographic, work and lifestyle characteristics, while the characteristics of sleep and sleep quality were explored with the Pittsburgh Sleep Quality Index (PSQI). Additionally, an open-ended section was included to determine the impact of COVID-19-related changes on sleep and work. The questionnaire responses were analyzed with descriptive and inferential statistics and the open-ended questions were analyzed with thematic analyses.

A total of 84 respondents completed the questionnaire. On average, sleep quality was poor (global score of 7.09 ± 3.8), the reported sleep duration was short (6.41 ± 1.06 hrs) and the group was classified as overweight according to median BMI (26.67 [23.8-

2 29.45] kg/m2). Over a third (35.71%) of academic staff reported not meeting physical activity guidelines and reported using screens one hour prior to bed every night during the week (76.19%) and the weekend (67.88%). Staff also worked long total weekly work hours (54.25 ± 11). Female academics had a poorer sleep quality ($p = 0.035$), spent a longer time in bed ($p = 0.04$), experienced more bad dreams ($p = <0.01$), had their last serving of alcohol earlier ($p = 0.04$) and worked less weekday ($p = 0.04$) and less total weekly ($p = 0.02$) hours compared to male academics. Professorship-level academics were significantly older than junior- and senior-level academics ($p = <0.01$) while senior-level academics had a poorer PSQI compared to professorship-level academics ($p = 0.03$). The thematic analysis showed that home environment, neighbourhood noise, work and mental health were the main emerging factors that disturbed sleep. The thematic analysis showed that, in relation to the impact of COVID19, sleep schedules changed and sleep duration and sleep quality improved or got worse. Respondents reported their work hours increasing, work schedules becoming less routine while working from home, dealing with the challenges of working online and experiencing worry, stress and anxiety due to the pandemic.

The study highlights that, in the context of lockdown and having to work and teach online from home, academics reported poor quality sleep and short sleep duration. Further, on average, the sample reported working extensive hours and unhealthy lifestyle behaviours. The sleep health, nature of work and overall lifestyles of academic staff deserves more research attention, given the importance of their work and the impact that inadequate sleep could have on academics’ health and work performance. Sleep quality was worse for females and mid-career academics, suggesting that their sleep quality may be at greater risk than other sub-groups. However, the reasons for these differences need to be explored in future studies. The findings contribute to the narrative that academe involves numerous demands and supports previous research that has suggested that academics’ sleep is insufficient. Furthermore, COVID-19 had an impact on staff’s sleep, with staff reporting changes in their sleep quality and duration. The pandemic impacted work of academics by presenting novel demands related to online teaching, intensifying demands overall and disrupting work routines. However, future research is needed to understand academics’ sleep behaviours, work and lifestyles, especially in South Africa.

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CHAPTER I

1 INTRODUCTION

1.1 BACKGROUND

Higher education (HE) was historically characterized as an elite activity, which meant that academic staff worked under relatively stable environments, with small numbers of students and little funding support or interest from government and industry (Coaldrake & Stedman, 1999). Being an academic has often been synonymous with flexible perks, light workloads (Barkhuizen & Rothmann, 2008) and high degrees of self-regulation and autonomy (Kenny & Fluck, 2014). However, since the turn of the century and as the result of globalization and internationalization (Singh & Han, 2005; Altbach & Knight, 2007), HE has undergone massive expansion and become increasingly more complex, resulting in increased demands on academic work. For academic staff, some argue that this has translated into a loss of autonomy (Bryson, 2004; Enders & Kaulish, 2006; Kenny & Fluck, 2014; Graham, 2015), high work demands (Dahlgren *et al.*, 2005; Hendel & Horn, 2008; Mkumbo, 2014; Taberner, 2018), long work hours (Tytherleigh *et al.*, 2005; Opstrup & Pihl-Thingvad, 2016; Afsonso *et al.* 2017), conflicting roles and expectations (Coaldrake, 2000; Winter & Sarros, 2002; Vardi, 2009; Coates & Goedegebuure, 2010; Kenny & Fluck, 2017), work-life imbalances (Byron, 2005; Hendel & Horn, 2008; Melin *et al.*, 2014; Dorenkamp & Süß, 2017; Torp *et al.*¸2018) and decrements in mental health (Fanghanel & Trowler, 2008; Catano *et al.*, 2010; Mkumbo, 2014; Afsonso *et al.*¸2017; Taberner, 2018; Mark & Smith, 2018; Fontinha *et al.*, 2018) and physical health ((Mkumbo, 2014; Hardy *et al.*, 2018).

The contemporary academic now has to balance multiple roles, demands, constraints and pressures (Tight *et al.*, 2010; Bentley & Kyvik, 2013; Freitas *et al.*, 2019). Having to manage these constant demands likely leaves academics with very little time to prioritize leisure, rest and recovery and, in particular, sleep (Van der Hulst, 2003; Melin *et al.*, 2014; Winefield *et al.*¸2014; Freitas *et al.*, 2019). Inadequate sleep (in terms of quality and quantity) has been shown to negatively impact work performance (Van der Hulst, 2003; Winwood & Lushington, 2007; Sekine *et al.*, 2006; Härmä, 2006; Kronholm *et al.*, 2006; Virtanen *et al.*, 2009; Loft & Cameron, 2014; Afonso *et al.*, 2017), well-being and overall health (Grandner *et al.*, 2010; Opp & Krueger, 2015;

Matricciani *et al.*, 2017; Grandner, 2017; Zaki *et al.*, 2018; Palagini *et al.*, 2019), which are important or all individuals, including academics.

While there are numerous studies that have investigated academics' well-being in the context of occupational stress and work-life balance (Kinman, 1998; Gillespie *et al.*, 2001; Biron *et al.*, 2008; Kinman & Jones, 2008; Winefield *et al.* 2014), fewer studies have characterized and profiled the sleep-wake behaviours and sleep quality of academic staff. There are, however, a handful of studies that have reported that academic staff may prone to sleep loss, poor sleep quality and short sleep durations (Kinman, 1998; Gillespie *et al.*, 2001; Barkhuizen & Rothmann, 2008; Kumar *et al.*, 2014; Yeshaw & Mossie, 2017; Mark & Smith, 2018; Kurfi *et al.*, 2018; Özgül & Polat, 2018; Freitas *et al.*, 2019). Despite limited research, sleep is important for academic staff given that it may influence critical areas of their work-life, such as productivity (Gibson & Shrader, 2014; Gingerich *et al.*, 2018), decision-making (Ratcliff & Van Dongen, 2009), cognitive performance (Van Dongen *et al.*¸2003), self-regulation (Barnes *et al.*, 2011; Barnes *et al.*, 2015), and mood (Gradisar *et al.*, 2013).

Research shows that occupational demands and lifestyle factors (such as physical activity, caffeine and alcohol use and screen time) affect sleep. While occupational demands and some lifestyle behaviours have been characterized among academic staff, a few lifestyle behaviours (such as sedentary time) and sleep are under-researched in the academic context locally and internationally. Additionally, there is evidence that the demands of academe (and the associated impact on well-being and lifestyle) may differ by gender (Jacob & Winslow, 2004; Misra *et al.*, 2012; Kinman & Wray, 2013; Hogan *et al.*, 2014; de Lourdes Machado-Taylor *et al.*, 2014) and between academics at different ranks or career phases (Link *et al.*, 2008; Puuska, 2010; Lissoni *et al.*, 2011; Abramo *et al.*, 2011; Mishra & Smyth, 2013; Price *et al.*, 2015; Kraimer *et al.* 2019). However, it is unclear if these factors affect sleep-wake behaviours, sleep quality, work and other lifestyle characteristics in academics.

Nonetheless, over and above the normal demands placed on academic staff, the current study was conducted during the COVID-19 pandemic, which has resulted in a significant increase in the demands and pressures placed on academics worldwide (Majeed, 2020; Corbera *et al.*, 2020; Motala & Menon, 2020; Zuccoli & Teruggi, 2020). The way in which academics had to perform their work underwent unprecedented

changes. This involved teaching, assessing, researching, consulting and communicating online and from home, which was associated with behaviours such as extended screen and sedentary times, which influence sleep (Grandner *et al.*, 2010; Grandner, 2017). In addition, growing evidence from general population studies has shown that sleep, especially sleep quality, as well as lifestyle behaviours, were negatively impacted by the COVID-19 pandemic (Arora & Grey, 2020; Gupta *et al.*, 2020; Innocenti *et al.*, 2020; Marelli *et al.*, 2020; Sañudo *et al.*, 2020; Casagrande *et al.*, 2020; Cellini *et al.*¸2020; Lin *et al.*¸2021). At the same time, the occupational demands for academic staff increased drastically (Majeed, 2020; Corbera *et al.*, 2020; Motala & Menon, 2020; Zuccoli & Teruggi, 2020), which as mentioned above, can impact sleep. Thus, the current study acknowledged the impact of COVID-19 on work and sleep in academic staff, given that they were operating under unusual and uncertain circumstances which could have influenced their sleep, work and lifestyles. Nevertheless, characterizing the sleep behaviours and sleep quality of academic staff in SA is useful given the lack of previous research and the important impact that sleep may have on academic work.

In light of the limited research characterizing sleep and lifestyle behaviours among academic staff in SA, the current study aimed to characterize self-reported sleep quality, work and lifestyle factors among academic staff using a sample of academic staff from a public higher education institution in the Eastern Cape province.

1.2 AIMS

1. Firstly, the aim is to characterize the self-reported sleep quality, work and general health and lifestyle features among academic staff from one higher education institution in SA.
2. Determine if gender affects self-reported sleep behaviours, sleep quality, work and general health and lifestyle among academic staff.
3. Determine if academic rank affects self-reported sleep behaviours, sleep quality, work and general health and lifestyle among academic staff.
4. Determine if and how the COVID-19 pandemic impacted the sleep and work patterns among academic staff.

1.3 THESIS LAYOUT

The following chapter begins with the literature review, which starts by highlighting the impact that HE has had on academic work and outlines the tasks and demands associated with modern academic work. The review discusses the background to sleep, the importance of sleep in general populations and sleep recommendations. The importance of sleep for academic staff is considered and the factors that impact sleep are reviewed and unpacked in an academic context. Thereafter, the studies that have investigated sleep in academic staff are reviewed. The chapter and literature review end by acknowledging the impact that COVID-19 lockdowns have had on sleep, lifestyle and academics' work. The next chapter involves the methods that were employed to meet the aims of the current study. This focuses on the study design, local research and lockdown context and the variables included in the questionnaire. It also includes participant characteristics, ethical approval process, sampling and data collection methods and the statistical tests that were chosen for analyses. The methods chapter is followed by the results chapter, which begins with the findings of the overall sample, the affects of gender and academic rank and ends with the findings from the thematic analysis. The following chapter, the discussion, outlines the key findings relating to sleep, work and lifestyle and the implications of the findings for academics. This is followed by practical recommendations based on the findings, directions for future research and limitations of the study. The final chapter is the conclusion, which comments on these findings in relation to the broader context of working in academe and the nature of academic work-life.

CHAPTER II

2 LITERATURE REVIEW

2.1 BRIEF OVERVIEW OF CHANGE IN HIGHER EDUCATION AND THE IMPACT ON ACADEMIC STAFF

Higher Education (HE) has experienced significant change over the past two to three decades (Blaxter *et al.*¸1998; Waghid, 2002; Briggs, 2005; Houston *et al.* 2006). Some of the most notable of these changes include the massification of student bodies (Blaxter *et al.*¸1998; Hornsby & Osman, 2014) and the mass production of education and research itself (Musselin, 2007). As research on changes to academic work has emerged, it has become clear that the nature of roles surrounding an academic career and the contexts in which they teach have become more diverse and more complex (Houston *et al.*, 2006; Fanghanel & Trowler, 2008; Larkin *et al.*, 2012; Price *et al.*, 2015). Historically, academic work has been characterised by high degrees of self-regulation, flexibility and autonomy (Kenny & Fluck, 2014). However, due to what has been outlined above, the self-regulatory nature of academic work has declined with time (McInnes, 1992; Bryson, 2004; Kenny & Fluck, 2014; Graham, 2015). It has been slowly replaced by increasing pressures to perform (Graham, 2015), the intensification of work (Bryson, 2004), the increase in administrative workloads (Tight, 2010; Pace *et al.*, 2019) and the increasing control by university managers (Bryson, 2004; Kenny & Fluck, 2014). These changes have amounted to numerous and sometimes conflicting work demands and mounting workloads for academic staff. Thus, it is important to expand upon these demands to understand the nature of academic work-life. Before contextualizing these demands, it is necessary to outline the primary tasks associated with being an academic.

2.2 THE DEMANDS OF MODERN ACADEMIC WORK

2.2.1 The primary tasks and roles of an academic

While there are differences across academic disciplines, generally, academics are required to perform a combination of broad tasks or roles that relate to teaching, researching, administration, management, scholarly activity (outside of research) and service-related duties (Blaxter *et al.*, 1998; Arimoto, 2009; Graham, 2015; Kenny & Fluck, 2017). The extent to which academics are involved in these main roles depends on subject areas, institutions, degree of seniority, the permanence of position and

specialization (Blaxter *et al.*, 1998; Zuckerman & Merton, 1972). Each academics' exact roles are therefore unique, making it difficult to fully describe and detail the components of the academic role (Graham, 2015). Nevertheless, academics are expected to display excellence in teaching, research, administration and pastoral care and frequently engage with industry (Kinman, 2014). Nested within these pressures is the significant increase in administrative workload (Kinman & Jones, 2008; Vardi, 2009; Tight *et al.*, 2010). Academics must spend a lot of time on accountability and administrative-related tasks that they may consider mundane (Bryson, 2004). Although these tasks may require little effort (e.g. creating lecture plans, drafting minutes), they still demand additional physical and mental effort (Pace *et al.*, 2019) and therefore take time away from research and other important tasks, which may increase stress experienced by academics and, subsequently, affect their work productivity (Pale *et al.*, 2019).

By extension, their primary work tasks have become more demanding, which has resulted in tasks such as teaching, research (Graham, 2015; Edsar *et al.*, 2016) and administration (Tight *et al.*, 2010; Christensen *et al.*, 2018) competing with one another. This has created role conflict for academic staff (Christensen *et al.*, 2018) and constant negotiation of time that academics are willing and able to dedicate to research, teaching, supervision, administration and other duties (Bentley & Kyvik, 2013; Esdar *et al.*, 2016). On top of the demands of their primary roles, there are supplementary work-related demands (particularly in the 21st century) that place academic staff under numerous pressures and expectations.

2.2.2 Demands of modern academic work

As HE has become increasingly internationalized and globalized, the expectations on academic staff are to be "highly qualified, international in outlook, dynamic and useful to the society" (Bennion & Locke, 2010 p. S8). Currently, academia is associated with high workloads and academics are expected to work within a highly competitive research arena despite reduced public funding (Houston *et al.*, 2006; Price *et al.*, 2015) and little support staff (Price *et al.*, 2015). Academics have to operate despite reduced staff numbers (Gillespie *et al.*, 2001), increases in student numbers (Gillespie *et al.*, 2001; Musselin, 2007), greater diversity of student cohorts (Gillespie *et al.*, 2001; Musselin, 2007) and unrealistic deadlines (Gillespie *et al.*, 2001). Moreover,

academics must deal with an increased application and requirement to use information and communication technologies (ICTs) (Stromquist, 2007; Altbach & Knight, 2007) despite it sometimes being complex, confusing and time-consuming (Gillespie *et al.*, 2001; Menzies & Newson, 2007; Heijstra & Rafnsdóttir, 2010; Njenga & Fourie, 2010). Further, academic staff are expected to display degrees of excellence in postgraduate supervision and research publications, establish industry-based relationships, submit or review grant applications (Houston *et al.*, 2006; Coaldrake & Stedman, 1999) and illustrate fiscal and administrative competencies (Houston *et al.*, 2006; Vardi, 2009). They must engage in activities or tasks that extend past traditional scholarly activities, such as community service and engagement, (Musselin, 2007; Coates & Goedegebuure, 2010; Kwiek, 2015) and perform a diversity of duties and roles (Vardi, 2009; Coates & Goedegebuure, 2010; Kenny & Fluck, 2017) yet develop in their specializations (Coates & Goedegebuure, 2010).

Overall, academic careers, environments and practices have become increasingly demanding, diverse and complex (Fanghanel & Trowler, 2008; Larkin *et al.*, 2012; Price *et al.*¸ 2015). Parallel to managing the intensification of primary roles (Price *et al.*, 2015) that are sometimes unclear and overloaded (Winter & Sarros, 2002) and the work demands that are associated with modern academic work, academics must also perform numerous 'invisible' roles that add to their workload.

2.2.3 The invisible roles of academic staff

Academics perform invisible labour, which refers to tasks, duties and roles necessary for the execution of primary roles and, yet, are unaccounted for in their workload (Fanghanel & Trowler, 2008). For examples, teaching involves preparation time and administrative work (Fanghanel & Trowler, 2008), and supervising involves listening, facilitating and collaborating (Gordan, 1997) - all of which support their core functions, but are often not measured or accounted for in many HE institutions. Thus, while banner of teaching, research, administration and service depicts contemporary academic work demands, the assumption that the fulfilment of these work roles alone would equate to a successful academic career obscures the variety, complexity and ultimate reality of academic work (Coaldrake, 2000).

While these roles, demands and work pressures may be experienced by academic cohorts on an international level, there are context-specific demands inherent in the

South African context. To explain, while South Africa (SA) has experienced changes to its HE that have occurred globally, there are national changes and constraints that impact HE and therefore academic staff. The HE context in SA and the subsequent demands placed on academics needs to be elucidated in order to understand the contextual demands placed on academics within these systems.

2.3 THE SOUTH AFRICAN HIGHER EDUCATION CONTEXT: BALANCING GLOBAL AND NATIONAL TRANSFORMATIONAL DEMANDS

SA has subscribed to the over-arching global trend of provision of education to the masses. However, due to contextual differences, countries of the Global North and Global South differ dramatically in their characteristics and challenges (Council on Higher Education, 2016). In South African HE, there is a 'push-and-pull' of addressing local issues whilst developing internationally relevant outputs (CHE, 2016). At the end Apartheid regime in 1994, the SA Department of Education (DoE) released a report entitled *Programme for the Transformation of Higher Education: Education White Paper 3* (DoE, 1997) that outlined a framework for the transformation of HE, which sought to reflect the changes taking place in society. Resultantly, the system of HE had to change such that it would redress past inequalities, serve a new social order, meet national needs and respond to new realities and opportunities (DoE, 1997). Thus, in South African HE, there is a significant "local pull" of democratisation wherein the system seeks to demolish and redress inequalities at varying levels of SA's society (CHE, 2016, p. 279). Simultaneously, a "global push" originates from the associations between HE and the emphasis on improved efficiency in the context of massification (CHE, 2016, p. 279). In summary, the post-1994 education system is new and highly diverse, yet still evolving (CHE, 2016), posing unique demands and pressures on academic staff in the country. These demands need to be contextualized among academic staff in SA.

2.3.1 Context-specific demands and pressures experienced by SA academic staff

South African academics must achieve measurable research outputs while balancing the teaching of larger classrooms and supervision of postgraduate students whose profiles are more diverse (Bezuidenhout & Cilliers, 2010; CHE, 2016). Moreover, they must influence and adopt methods of teaching that demand increasingly specialized

skills and undertake complex and transparent assessment procedures. Academic staff must also focus towards developing a socially responsive and relevant curriculum (CHE, 2016). In addition to these demands, academic staff are often sought to partake or run community service initiatives (Waghid, 2002; CHE, 2016; Seepe, 2017). Community service through education was considered a primary goal for the country's transformation in terms of developing responsiveness to regional and national needs, social responsibility, awareness, improved infrastructure and economic development (DoE, 1997). It is therefore considered the push toward a "corrective process" (Seepe, 2017, p. 135) and an attempt to make right the pattern of injustice (Waghid, 2002). However, it creates the expectation that academics must produce research that focuses on the political and social issues experienced by SA directly (Waghid, 2002).

Furthermore, South African academics have to deal with a considerable increase in student enrolment that has remained unmatched by the growth of academic staff, which has increased their workloads and overall work demands. There has been a 92% growth in student enrolments, which is unmatched by a 36% increase in academic staff in the same period (CHE, 2014; CHE, 2016). According to section 6.26 of the Education and Training Act (RSA, 2016), a 'desirable' ratio typically relates to a minimum of 15 scholars and a maximum of 30 scholars per teacher in a college classroom. In 2018, the ratio of permanent academic staff to students was 1:55, and the overall staff (permanent and temporary academics) to student ratio was 1:19, with no difference or improvement compared to the statistics in 2013 (CHE, 2020). The consequence is that there is an "always less than desirable" student to staff ratio which has continued to worsen over the last two decades (CHE, 2016, p. 7), and appears unchanged in more recent years (Tewari & Ilesanmi, 2020).

The demand on academic staff is further amplified by a large percentage of SA learners that enter into HE with poor quality primary and secondary education (Barkhuizen *et al.*, 2014). The result is students entering HE lacking the necessary English capabilities, having poor numerical and conceptual skills (Gibbons & Kabaki, 2006) and often having to learn in their second language, if not their third of fourth. For reasons like these, these students are often deemed under-prepared (Bozalek & Boughey, 2012). This amounts to increased pressure and necessity for academic staff to provide intense teaching and support for students (Bozalek & Boughey, 2012)

through bridging courses, academic development programmes and student support programmes (Gibbon & Kabaki, 2006). Hence, in conjunction with the massification of the student body as a whole, academic staff in SA have had to adapt to a greater diversity of student profiles and simultaneously manage learners with previously poor education (Rothmann *et al.*¸ 2008). Therefore, HE in SA is made more complex as the sector requires high efforts to make education more equitable and inclusive (Breetzke & Hedding, 2020).

Academic staff around the world experience high workloads and time pressures. Academic staff are simultaneously subject to the unique demands of their local contexts. Additionally, there is a plethora of research showing that the demands experienced by academics differ depending on factors that include but are not limited to gender and academic rank. The following section will unpack some of the differences in the work demands experienced by academics from different genders groups and academic ranks.

2.4 WORK EXPERIENCES OF DIFFERENT GENDER AND RANK GROUPS

While the academic profession itself and career as a whole are complex (Larkin & Neumann, 2009), the academic's career and overall work experiences are different based on different factors such as age, length of experience and career opportunities (Larkin *et al.*, 2012). Furthermore, while academics may be subject to similar pressures and demands, some argue that these vary especially between men and women (Jacob & Winslow, 2004; Prozesky, 2006; Koyuncu *et al.*, 2006; Puuska, 2010; Madsen, 2012; Misra *et al.*, 2012; Kinman & Wray, 2013; Hogan *et al.*, 2014; Obers, 2014; David, 2015; Ainston & Jung, 2015; Bhopal & Henderson, 2019; Hosking *et al.*, 2020). In addition, work pressures and demands can vary between academics at different phases or rankings in their career (Link *et al.*, 2008; Puuska, 2010; Lissoni *et al.*, 2011; Abramo *et al.*, 2011; Mishra & Smyth, 2013; Price *et al.*, 2015; Kraimer *et al.*, 2019).

2.4.1 Gender differences in work of academic staff

An abundance of research reveals that gender can and does impact various aspects of an academic's work. This research suggests that female academics encounter unique experiences and shortfalls in comparison to their male counterparts in terms of their representation, positions of seniority (Madsen, 2012; Misra *et al.*, 2012; Morley,

2013 de Lourdes Machado-Taylor *et al.*, 2014; David, 2015; Bhopal & Henderson, 2019; Hosking *et al.*, 2020), productivity, publications and work demands (Jacob & Winslow, 2004; Prozesky, 2006; Puuska, 2010; Misra *et al.*, 2012; Kinman & Wray, 2013; Hogan *et al.*, 2014; Obers, 2014; Ainston & Jung, 2015). Firstly, the representation of males and females is otherwise disproportionate in favour of men in HE around the world (Madsen, 2012; David, 2015; Bhopal & Henderson, 2019; Hosking *et al.*, 2020), despite efforts from countries and governments to implement various policies to close the gap of gender representation in academe (Hosking *et al.*, 2020). Although women's participation in academic labour markets has increased, it is unmatched by the increase in female representation in HE as students (David, 2015). Further, male academics are more dominant in or are more likely to assume higher academic positions (Misra *et al.*, 2012; de Lourdes Machado-Taylor *et al.*, 2014) and senior or managerial positions (Morley, 2013).

Moreover, male academics are generally more productive and publish more than their female colleagues (Prozesky, 2006; Puuska, 2010; Ainston & Jung, 2015), with one SA study showing men to be 30% more productive than women in terms of journal publications (Prozesky, 2006). Males spend more time on research compared to teaching (Misra *et al.*, 2012; Obers, 2014), tend to dominate in science-oriented disciplines (Joseph & Hirshfield 2011) and report working longer hours than female colleagues (Jacob & Winslow, 2004; Kinman & Wray, 2013; Hogan *et al.*, 2014). However, some studies have found no significant differences reported working hours between men and women (Koyuncu *et al.*, 2006; Misra *et al.*, 2012). Unfortunately, there are many examples where female academics also often receive lower salaries (Koyuncu *et al.*, 2006; Shen, 2013; Bhopal & Henderson, 2019), benefit less from funding opportunities (Shen, 2013) and often work at lower ranks when compared to men (Koyuncu *et al.*, 2006; Santos & Dang Van Phu, 2019). They are less likely to receive tenure from co-authoring (Sarsons, 2017) and are less likely to receive tenure overall (Koyuncu *et al.*, 2006). Women in academe are also often at greater risk of only securing part-time or fractional contracts (Barrett & Barrett, 2011) and are more likely to receive fewer rewards and recognition for their work (Bezuidenhout & Cilliers, 2010).

In SA, female academics often have lower rates of productivity and experience a slower career progression due to their tendency to be the primary caregivers of (young) children (Bezuidenhout & Cilliers, 2011; Obers, 2014). Women tend to be primarily responsible for young children's physical and emotional care, which is often due to a lack of negotiation between men and women on dividing these roles (Venn *et al.*, 2008). Thus, female faculty members, particularly those in their mid-career, often have to balance home and work responsibilities, childcare and possibly elderly care more than their male counterparts (Canale *et al.*, 2013). One study evidenced that academic women between the ages of 30 and 50 can perform over a hundred hours a week on caregiving, housework and professional responsibilities (Mason & Goulden, 2004). Another found that married female academics with children, on average, reported working four hours less per week compared to single academic women without children (Jacobs & Winslow, 2004), indicating the additional pressures on female academics with children. Simultaneously, because female academics can offer support and mentorship or role modelling to their female students, they often have to deal with added pressures of requests to sit on committees or take on additional mentees leading to personal conflict within their roles (Canale *et al.*, 2013). Overall, this may slow their career progression, deter their occupational goals (Obers, 2014) and evoke stress and strain (Barkzhuizen & Rothmann, 2008) in ways that male academics may not necessarily experience.

2.4.2 Differences in work experiences based on academic ranking or career phase

The working experiences of academics are diverse and differentiated between younger and older groups (Archer, 2008; Larkin *et al.*, 2012; Kristjuhan & Taidre, 2013; Kinman & Wray, 2013; Albert *et al.*¸2018) as well as at different academic rankings (Link *et al.*, 2008; Puuska, 2010; Lissoni *et al.*, 2011; Abramo *et al.*, 2011; Mishra & Smyth, 2013; Price *et al.*, 2015). These differences may be explained by the different tasks that academics undertake at different levels of rank (Kraimer *et al.*, 2019). Kraimer and colleagues (2019) showed that, among early-career academics, the focus is on mastering the technical requirements of the work. It also involves learning the norms and values of their work and institution, and working towards being considered a competent member of the community. In the mid-career, academics are consolidating their career progress while maintaining a level of contribution to the

institution (Kraimer *et al.*, 2019). The mid-career stage is considered the longest and most productive phase of academic life (Baldwin *et al.*, 2005; Randall, 2006) as academics tend to teach the majority of their students and produce a large proportion of their scholarship and publications. In addition, mid-career staff typically produce their best and most prolific contributions to teaching, research and service during this phase (Randall, 2006). At this stage of the career, academics also tend to assume leadership and expert roles at various levels of their institution (Baldwin *et al.*, 2005). For late-career faculty, academics are tasked with finding ways to maintain productivity and self-worth amid both reductions in physical health and possible reductions in opportunities (Kraimer *et al.*, 2019). Their work may also involve leaving a legacy to student teachers and colleagues, nurturing younger colleagues, sharing insights, continuous learning, sharing creative ideas, doing independent work and serving as a model for the future generation of educators (Gutman & Oplatka, 2020).

As tasks and work experiences differ between lower- and higher-ranked academics, so do their challenges at work. Research on academics in the mid-to-late phases of their careers (i.e. senior and professorship-level academics), indicates that they are often more productive (Puuska, 2010; Abramo *et al.*, 2011; Mishra & Smyth, 2013; Kristjuhan & Taidre, 2013), experience greater work demands (Barkhuizen & Rothmann, 2008; Kinman & Wray, 2013) and work longer hours (Jacobs & Winslow, 2004; Misra *et al.*, 2012; Kinman & Wray, 2013; Kwiek & Antonowicz, 2013). While working long hours is reported among all academic staff (Jacobs & Winslow, 2004; Cannizzo & Osbaldiston, 2016), other studies show that academic staff in more senior ranks work even longer hours (Jacobs & Winslow, 2004; Misra *et al.*, 2012; Kwiek & Antonowicz, 2013). Nevertheless, higher-ranked academics have to manage higher levels of perceived stress (Kinman & Wray, 2013), have less support from colleagues and management (Kinman & Wray, 2013), and experience less job satisfaction (Bexley *et al.*, 2011; Noordin & Jusoff, 2009; Albert *et al.*, 2018). On the contrary, these academics may have greater career resilience compared to their younger colleagues. This is because they understand the system of academe and how to work efficiently within in it and are more likely to cope with negative outcomes inherent in peer review processes. Furthermore, they have established career goals, a good understanding of their strengths and weaknesses and a higher academic standing and overall reputation (Larkin *et al.*, 2012).

On the other hand, work conditions for younger and lower-ranked academics have been described as somewhat “demanding and misarranged” (Dorenkamp & Süß, 2017, p. 402), as these conditions have been characterized by a lack of job security, high workloads, constant pressures to publish, and professional and personal isolation (Price *et al.*, 2015). Higher-ranked academics may also not have to deal with the issues that lower-ranked or early-career academic staff face. This is likely the result of experience built over numerous years, resulting in the accumulation of more human capital and the ability to identify better and critical research questions (Mishra & Smyth, 2013).

2.5 SUMMARY & BRIEF INTRODUCTION TO THE LINK WITH SLEEP

Although academic staff share similarities working as an academic, some work experiences are different depending on gender and rank. Overall, though, academic staff have had to respond to changes in HE and become adaptive to demanding ways of work. This is coupled with a large set of roles and responsibilities that often require academics to work long hours under much pressure and, resultantly, place conflicting demands on their time. Hence, due to the work demands and multiple roles that need to be fulfilled, academics are likely left with little time for additional duties outside of their core roles (Bentley & Kyvik, 2011) and a possible sense of time poverty, which is related to limited time resources for well-being, rest and leisure (Williams *et al.*, 2016). Academic staff have often reported poor work-life balance (Wilton & Ross, 2017; Dorenkamp & Süß, 2017; Torp *et al.*, 2018) and one area of life that may not be given the priority it needs is the time for recovery, which includes getting enough quality sleep (Freitas *et al.*, 2019). Sleep is sometimes compromised to engage in something more pertinent (Joiner, 2016), such as work. In fact, in the modern world and society, one of the strongest societal determinants of whether people get enough sleep is work (Grandner, 2017) and people frequently exchange their sleep for work (Basner *et al.*, 2014). Given the overall demands that academics are under, academic staff may trade in their sleep and recovery for work. A recent study found that one sphere of academic life that is compromised is the amount of time dedicated to sleep, rest and recovery (Freitas *et al.*, 2019) and several studies have suggested that academic staff experience recovery- and sleep-related challenges (Barkhuizen & Rothmann, 2008; Biron *et al.*, 2008; Kinman & Jones, 2008; Mark & Smith, 2018; Kurfi *et al.*, 2018).

Thus, there are indications that academic staff may have little time or opportunity to prioritize recovery from work through sleep and rest.

Sleep is a critical component for the successful execution of academic activities (Freitas *et al.*, 2019), given that academic work is largely cognitive in nature and cognitive workloads may reflect a greater need for sleep (Matricciani *et al.*, 2017). Yet, to date, there is limited research that has explored the sleep of academics. There is a relative abundance of research investigating productivity and well-being of academics, but this has predominantly been explored in the context of occupational stress, work demands and work-life balance (Kinman, 1998; Gillespie *et al.*, 2001; Coetzee & Rothmann, 2005; Barkhuizen & Rothmann, 2008; Kinman, 2008; Kinman & Jones, 2008; Biron *et al.*, 2008; Winefield *et al.* 2014).

Before delineating the importance of sleep as a component in academic work and life, the following section will provide a background to what sleep is, how it is regulated and the most recent sleep duration and quality recommendations. Thereafter, the chapter will emphasize the factors that serve as determinants of healthy sleep and comment on the status of these factors in the academic context. This will highlight that there are work and health-related aspects inherent in academic work-life that could have negative impacts on the sleep health of academics.

2.6 SLEEP IN ACADEMIC STAFF

2.6.1 Sleep: An overview

Sleep in humans is a behavioural, homeostatic and natural state that requires a higher arousal threshold compared to wake states (Allada & Siegal, 2008). This implies that a stimulus of a higher intensity (e.g. a loud noise, as compared to a soft noise) is required to bring an individual from a sleeping state to a waking state (Allada & Sigel, 2008), depending on the depth of sleep. It may also be conceptualized as a biological imperative that is driven largely by social factors (Grandner *et al.*, 2010). Sleep is composed of both quantitative (duration) and quality (intensity) dimensions (Cirelli & Tononi, 2008) and overall sleep health involves characteristics such as sleep depth, quality and timing (Hirshkowitz *et al.*, 2015). Behaviourally, sleep is characterized by a lowered response to stimulation and behavioural quiescence expressed as reduced motor activity (Fuller *et al.*, 2006; Allada & Siegel, 2008). It is also easily reversible and self-regulating (Fuller *et al.*, 2006; Cirelli & Tononi, 2008). Although sleep is

typically associated with rest and recovery, the brain does not rest even in the deepest sleep (Nicolau *et al.*, 2000). Further, it is homeostatically regulated meaning that when a night of sleep is lost, an intense drive for sleep accumulates even at atypical times of the day or night (Allada & Siegel, 2008). Effectively, sleep is a “systems-level process” that affects the entire organism (Diekelmann & Born, p.1, 2010).

2.6.2 General importance of human sleep

Sleep is important for individuals’ physical, social and mental well-being (Grandner *et al.*, 2010; Opp & Krueger, 2015; Matricciani *et al.*, 2017; Grandner, 2017; Zaki *et al.*, 2018; Palagini *et al.*, 2019). It is also a critical human state of being that encourages restorative neural processes to encode, consolidate and make sense of information received during wakefulness (Walker & Stickgold, 2006; Allada & Siegel, 2008). Sleep is beneficial both before and after learning (Walker *et al.*, 2002) and is primarily influential on consolidation, thus being an integral facet for human memory (Walker *et al.*, 2002; Walker, 2008; Talamini *et al.*, 2008; Diekelmann & Born, 2010). In conjunction with sleep’s contribution to an individual’s social and mental well-being (Matricciani *et al.*, 2017), it supports overall health and longevity (Grandner, 2017).

Alternatively, insufficient sleep can result in negative (Durmer & Dinges, 2005) or irregular mood states/disorders (Armitage, 2007; Harvey, 2011; Zaki *et al.*, 2018; Palagini *et al.*, 2019). It also has adverse effects on cognitive (Gunzelmann *et al.*, 2007; Ratcliff & Van Dongen, 2009) and motor (Durmer & Dinges, 2005) functioning and can result in heightened stress, drowsiness and fatigue (Orzel-Gryglewska, 2010). Insufficient sleep can prompt acute and chronic inflammation and disease (Opp & Krueger, 2015), weight gain (Trenell *et al.*, 2007; Grandner, 2017) and contributes to metabolic syndrome (Okubo *et al.*, 2014). Insufficient sleep, especially if chronic, has been related to abnormal glucose metabolism (Reutrakul & Van Cauter, 2014) and can contribute to immunity/immune dysfunction (Motivala & Irwin, 2007; Opp & Krueger, 2015). Further, ongoing insufficient sleep has a strong relationship with developing or having chronic diseases (Foley *et al.*¸2004; Meisinger *et al.*, 2005; Trenell *et al.*, 2007; Arber *et al.*, 2009; von Ruesten *et al.*, 2012; Hoefelmann *et al.*, 2012; Liu *et al.*, 2013; Rayward *et al.*, 2017) and is linked to increased mortality risk (Hublin *et al.*, 2007; Grandner & Patel, 2009).

2.6.3 Sleep regulation

The regulation of sleep is controlled by internal (biological, homeostatic, circadian) and external (exogenous/environmental) factors. The internal factors include the homeostatic regulation of sleep, which refers to an intense drive for sleep that accumulates from waking - irrespective of environmental influences (Allada & Siegel, 2008). It also relates to circadian rhythms, which are internally synchronized and self-sustaining through a circadian oscillator – maintaining a roughly 24-hour rhythm (Borbély, 1982). The circadian cycle is biologically entrained to the light-dark environment, and driven by a circadian oscillator found within the suprachiasmatic nucleus (SCN), although the oscillator is cell-autonomous. The SCN is located above the crossing of the optic nerves near the hypothalamus (Wright *et al.,* 2013; Roenneberg & Merrow, 2016). The effects of this central oscillator are evidenced through circadian rhythms in various internal, physiological circadian markers, such as core body temperature and hormones (Borbély, 1982; Johnson *et al.*, 2003; Roenneberg & Merrow, 2016), and behavioural processes such as the sleep/wake schedule, performance of mental activities (Johnson *et al.*, 2003; Roenneberg & Merrow, 2016) and physical performance (Drust *et al.*, 2005). While the circadian rhythm is influenced by environmental factors, it persists in the absence of environmental time cues.

To elaborate, when deprived of solar and social time (i.e. external cues), the circadian clock runs on biological time, meaning that it free runs over a period of approximately, but not exactly, 24-hours and persists without the input of external cues (Johnson *et al.*, 2003; Wright *et al.*, 2013; Roenneberg & Merrow, 2016). Furthermore, research has shown that sleepiness, sleep propensity, sleep length and sleep structure maintain a daily cycle irrespective of waking time or an individual's interaction with their environment as dictated by an internal circadian pacemaker (Borbély, 1982; Lavie, 2001).

In natural settings, the circadian clock synchronizes with the 24-hour world through a process known as entrainment (Johnson *et al.*, 2003; Roenneberg & Merrow, 2007. Individuals are externally entrained through various environmental cues, also known as *zeitgebers*, from the German term for "time giver" (Johnson *et al.*, 2003, p. 742). The primary external zeitgeber in humans is natural daylight, which synchronizes

individuals into day-night cycles (Roenneberg *et al.*, 2007). Additionally, internal and external cues work closely together in that the internal regulators of sleep gain information from the external environment to signal sleep onset or initiate wakefulness. Therefore, entrainment is a process of interpretation and communication between the external environment and internal physiological regulators, which cues wakefulness and activity or sleep and rest (Kantermann, 2013).

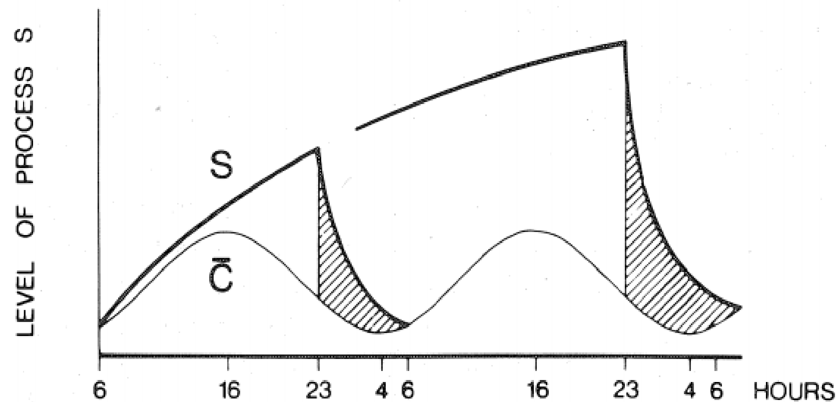

Figure 1. The Two-Process Model of Sleep Regulation established by Borbély (1982). Taken from *A two process model of sleep regulation by Borbély (1982)*. Process C represents the daily circadian rhythm that regulates sleep-wake behaviour and sleep propensity. Process S represents sleep pressure that builds throughout the day, which regulates sleep-wake behaviour and sleep propensity. As the gap between process S and Process C widens (between 1600 and 2300 hours), total sleep propensity increases. With the onset of sleep, sleep pressure decreases throughout the night's sleep cycle (2300 to 0600 hours) and the difference between the curves (hatched area) reduces until it reaches zero at the time of awakening (Borbély, 1982). If sleep is not initiated, the difference between the processes will continue to increase as the curve of Process S will continue to rise.

2.6.3.1 The Two Process Model of Sleep Regulation

Borbély (1982) posited a model of how sleep is regulated. The two-process model postulates that sleep is regulated by way of this internal, daily circadian rhythm that is controlled by the circadian oscillator (Process C). Further, the model suggests sleep is regulated by a process that serves as a function of sleep and waking (Process S) (Borbléy, 1982). This is known as sleep propensity and refers to the sleep pressure that arises from waking and builds throughout the day (Porkka-Heiskanen, 2013). Thus, the model posits that the drive for sleep is influenced not only by the period of prior wakefulness but also by internal circadian factors.

As seen in **Figure *1***, Process S drives a linearly increasing need for sleep that is upregulated during wakefulness and downregulated during sleep (Borléy, 1982; Durmer & Dinges, 2005). Hence, when the drive for sleep meets its peak, sleep is induced. Once below this peak, wakefulness is induced (Borbély, 1982; Goel *et al.*, 2009). Conversely, Process C is responsible for endogenous sleep cycling and is controlled by the circadian oscillator. It acts independently from and is unaffected by sleep and waking occurrences, therefore representing the circadian component of sleep propensity (Borbély, 1982; Borbély & Achermann, 1999). Process C determines the salient aspects of sleep regulation and is mirrored by specific physiological changes in core body temperature and cortisol and melatonin levels, to name but a few (Borbély, 1982; Borbély, 2016). As shown in **Figure *1***, the two processes are inversely related to one another, meaning that the wider the gap between the two curves, the greater the total sleep propensity (Borbély, 1982).

It is evident that sleep is complex: it is regulated by homeostatic and circadian processes, involves communication between internal and external factors and sustains numerous functions and consequences that influence individuals on a biological, neurophysiological and social level (Sadeh, 2011). To maximize the benefits of sleep, a sufficient duration and physiological continuity in the sleep state are of utmost importance (Basner *et al.*, 2013). The following section will detail how much sleep is enough and what constitutes sufficient sleep quality.

2.6.4 Sleep duration recommendations

Optimal sleep is “complex and poorly understood” as it is influenced by inter- and intra-individual factors, individual behaviour, lifestyle and environmental contexts (Matricciani *et al.*, 2017, p. 320). Thus, it remains without universal definition (Matricciani *et al.*, 2017). Nonetheless, a panel formed by the United States National Sleep Foundation (NSF) has provided scientifically sound and practical recommendations for daily sleep durations across the life span (Hirshkowitz *et al.*, 2015). It is recommended that young adults (18 to 25 years) sleep between seven to nine hours per day, adults (26 to 64 years) sleep seven to nine hours per day and older adults (65 and older) sleep seven to eight hours per day. However, the panel does indicate that some adults might sleep on the low or high ends of these ranges without experiencing any associated adverse effects (Hirshkowitz *et al.*, 2015). A

consensus statement made by the American Academy of Sleep Medicine and the Sleep Research Society pointed out that, overall, adults should sleep seven or more hours per night to promote optimal health (Watson *et al.*, 2015). Moreover, six hours of sleep per day is considered the minimum sleep time that adults can tolerate (Orzel-Gryglewska, 2010).

2.6.5 Sleep quality recommendations

Sleep quality is a predictor of physical and mental health, wellness and overall vitality (Ohayon *et al.*, 2017). Sleep quality recommendations provided by an NSF panel includes four sleep continuity variables, five sleep architecture variables and three nap variables (Ohayon *et al.*, 2017). The sleep continuity variables include: sleep latency, awakenings greater than five minutes, wake after sleep onset (WASO) and sleep efficiency. Sleep architecture variables include: REM sleep, N1 sleep, N2 sleep, N3 sleep and arousals, and nap variables include naps per 24 hours, nap duration and days per week with at least one nap (Ohayon *et al.*, 2017). For the purpose of this thesis and for brevity, only sleep latency, wake after sleep onset and sleep efficiency recommendations are discussed.

Across all age groups, a *sleep latency* of up to 30 minutes are considered appropriate for good sleep quality (Ohayon *et al.*, 2017). Sleep latencies of 45 to 60 minutes are indicative of poor sleep quality across all age groups, except for older adults, and sleep latency greater than 60 minutes indicates poor sleep quality for all age groups (Ohayon *et al.*, 2017). The panel did not provide information regarding sleep latencies between 30 to 45 minutes. For all age groups, *WASO* (i.e. the amount of time spent awake after sleep has been initiated and before final awakening) of less than 20 minutes is considered good for sleep quality. A WASO greater than 51 minutes indicates poor sleep quality. However, in young adults (i.e. 18-25 years) and adults (26-64 years), a WASO of 41 minutes or more also indicates poor sleep quality (Ohayon *et al.*, 2017). Lastly, *sleep efficiency* of 85% or more is considered an appropriate indicator of good sleep quality for all age groups. In young adults, sleep efficiency of 64% or lower poorly reflects good sleep quality and sleep efficiency of 74% or lower is considered indicative of good sleep quality for all other age groups (Ohayon *et al.*, 2017).

2.7 INFLUENCERS AND DETERMINANTS OF SLEEP

Sleep is influenced and in part determined by several individual, social and societal factors (Grandner, 2017). The next section of the review unpacks some of the determinants of sleep (particularly health- and work-related) and provides a review on the status of these determinants in the general population and in the context of academics. The purpose of this section is not to focus on how these determinants associate with sleep, although this will be briefly reviewed. Rather, the purpose is to acknowledge that there are a number of factors that influence an individual from obtaining sufficient sleep and some of these factors may be present in the academic context. In essence, the following section reviews the effects that various individual, lifestyle and work determinants/factors have on sleep, followed by reviewing these determinants/factors in the academic context. This is to build the narrative that some factors can negatively impact sleep, that some of these factors may be common in academic work-life and that these factors as well as the status of sleep require research in academic staff. There are some factors that impact on sleep that are under-researched in academic staff (e.g. screen time). In contrast, there are other factors that have more research (e.g. physical activity), although this will be mentioned.

Determinants of sleep can be seen as multi-levelled, including individual (micro), social (meso), and societal (macro) levels (Grandner *et al.*, 2010; Grandner, 2017). This perspective, which is grounded in the social-ecological model of the determinants of sleep (Grandner *et al.*, 2010), is used to guide how the review will proceed with unpacking the influencers of sleep. In the model, seen in **Figure *2***, the microsystem includes demographics, health and psychology, although the exact variables within this level are not listed (Grandner *et al.*, 2010). In the current review, individual (micro) variables will involve demographic characteristics (gender and age) and individual health behaviours (BMI, smoking status, chronic diseases, alcohol consumption,

nicotine consumption, caffeine consumption and sedentary behaviours).

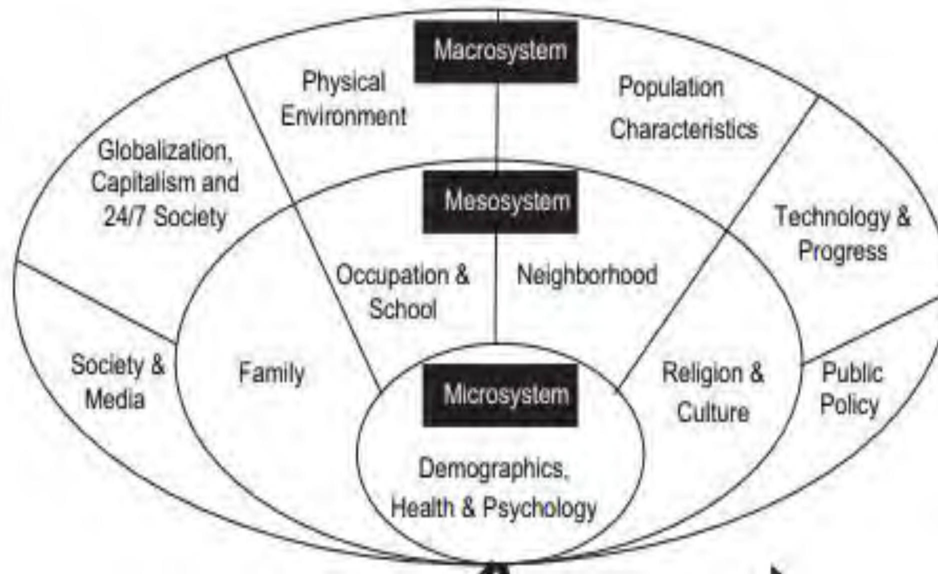

Figure 2. Model of the socioecological determinants and influences of sleep. The model contents there are multiple levels (or systems) of factors that influence sleep quality and duration. The microsystem includes individual characteristics and health behaviours. The mesosystem includes work, school, and social environments. The macrosystem includes policy and physical environments. Taken from *Mortality associated with short sleep duration: the evidence, the possible mechanisms, and the future (Grandner et al., 2010).*

According to the model, the mesosystem includes family, occupation, neighbourhood, and religion and culture (Grandner *et al.*, 2010). In the current review, the social (meso) variables will be of focus occupation- and family-related factors including work hours and demands, children and work-family conflict. Finally, the social-ecological model includes society and media, globalization, the 24/7 society, physical environments, population characteristics, technology and public policy within the macrosystem (Grandner *et al.*, 2010). In this literature review, technology is the primary societal (macro) variable of focus. Screen use behaviour is reviewed as a section of technology, despite it being an individual-level sleep determinant, as screen time and technology can go hand-in-hand.

2.7.1 Demographic factors and sleep

2.7.1.1 Gender

To clarify the use of the term 'gender', while gender is based on social construct and sex is based on biological construct (Heidari *et al.*, 2016), the term 'gender' will be

used and will relate to both biological and social factors, as outlined in Madeira-Revell *et al.* (2021). When reporting on findings from other studies, using either *men* and *women* or *males* and *females* will be used interchangeably. However, when referring to participants and findings from the current study, the terms *male* and *female* are used.

2.7.1.1.1 Gender and sleep duration

Concerning sleep duration, results from studies with large samples suggest that men report sleeping significantly less than women (Burgard & Ailshire, 2013; Basner *et al.*, 2014) and that men are more likely to be short than long sleepers (Burgard & Ailshire, 2013). Further, in a review of actigraphy studies, Knutson (2013) highlights that, habitually, women sleep longer durations. Men report going to bed significantly later than women (Custers & Van den Bulck, 2012; Burgard & Ailshire, 2013) and wake up earlier than women, although this is not always the case (Custers & Van den Bulck, 2012). On the contrary, a recent study using the Pittsburgh Sleep Quality Index (PSQI) showed that men and women did not differ significantly in sleep duration (Farah *et al.*, 2019). Similarly, among young adults, negligible gender differences were found for subjective sleep duration (Kalak *et al.*, 2015). The lack of gender differences has been reported previously, as one study that looked at the factors associated with long and short sleep durations showed that neither short nor long sleep durations were associated with factors that included sex (Magee *et al.*, 2009).

2.7.1.1.2 Gender and sleep quality

With regard to sleep quality, studies show that women report more sleep problems (Arber *et al.*, 2009), more sleep disturbances than men (Åkerstedt *et al.*, 2002; Grandner *et al.*, 2012) and are at increased risk of reporting sleep disturbances compared to men (Åkerstedt *et al.*, 2002). In a review of actigraphy studies, Knutson (2013) found that subjective sleep quality was lower and insomnia complaints were higher in women than in men. Additionally, results from a large (N = 56 149) time use study showed that women were significantly more likely to experience interrupted sleep (Burgard & Ailshire, 2013).

Sleep quality is often measured in studies using the PSQI (Buysse *et al.*, 1989). Some studies using the PSQI have shown that males and females differ significantly on sleep continuity variables and therefore on measures that relate to sleep quality. These

measures include sleep latency and sleep efficiency, sleep disturbance (Doi *et al.*, 2001; Tang *et al.*, 2017), sleep quality and global PSQI score (Tang *et al.*, 2017). However, several studies show no gender differences in sleep quality measures. For example, men and women did not differ based on their global PSQI scores (Chang & Choi, 2016; Exelmans & Scott, 2019; Farah *et al.*, 2019), sleep onset latency (Voderholzer *et al.*, 2003; Ursin *et al.*, 2005; Luca *et al.*, 2015), sleep efficiency (Voderholzer *et al.*, 2003; Luca *et al.*, 2015), time in bed (Voderholzer *et al.*, 2003). In addition, men tend to report significantly less time in bed than women (Custers & Van den Bulck, 2012). In their systematic review and meta-analysis of the PSQI as a screening tool for clinical and non-clinical samples, Mollayeva and colleagues (2016) report a lack of consistency in sex differences between studies. The review highlights that some studies report significant differences by gender, yet others do not. Thus, there is research indicating that gender affects sleep duration and sleep quality, while other studies indicate this is not the case.

2.7.1.1.3 The status of gender differences in sleep in academic staff

To the best of the authors' knowledge, there are little-to-no studies directly investigating the gender differences in sleep in the academic context. Thus, competently reviewing the impact of gender on sleep in an academic context is challenging. Instead, some studies provide reasons or attributes for why gender differences may be expressed in sleep, such as the impacts of child-rearing, which is relevant in the academic context. The purpose of this part of the review is to highlight that while gender-based differences in sleep in academics is not well known, the differences between male and female academics in academic work-life incites questions relating to potential differences in their sleep.

Outside of the academic context, Arber and colleagues (2009) argued that gender differences relating to sleep problems were due to gender differences in work conditions, domestic roles and family-work conflicts. Another study argued that some of the most significant gender gaps in sleep time were found during the life stage of child-rearing, as women's sleep were most commonly interrupted by caregiving (Burgard & Ailshire, 2013). This may be relevant for female academics who have reportedly had to balance significantly more domestic, housekeeping and work-related expectations or pressures (Mason & Goulden, 2004; Bezuidenhout & Cilliers, 2011;

Canale *et al.*, 2013; Obers, 2014) compared their male counterparts. Research outside the academic sphere shows that housework and childcare affects sleep quality (Chatzitheochari & Arber, 2009) and that women are more likely to forego their sleep needs for those of their family (Venn *et al.*, 2008). Research in the academic context shows that men undertake fewer housekeeping duties, providing more time for recovery from their academic work demands (Rafnsdóttir & Heijstra, 2011) and possibly more time for recovery and sleep. Therefore, although gendered differences in sleep in academic staff are under-researched, sleep of female academics may be more vulnerable to being insufficient.

Additionally, involvement in paid work is a major underlying factor contributing to gender differences in sleep time (Burgard & Ailshire, 2013). Although male and female academics are both involved in paid work, research indicates that males may have more time to work longer hours. This is because women tend to take on child-caring duties, thus tending to work less (Bezuidenhout & Cilliers, 2011; Obers, 2014). This might imply that, because male academics have more time to involve themselves in work and because involvement in paid work contributes to gender differences in sleep, sleep-related gender differences may exist in the academic context.

2.7.1.2 Age

2.7.1.2.1 Sleep changes across the lifespan

Sleep changes with normal aging (Grandner, 2017). Sleep physiology undergoes significant changes across the lifespan (Vaz Fragoso & Gill, 2007) as sleep patterns from childhood through to older adulthood change across the normal aging process in complex ways (Ohayon *et al.*, 2004). Therefore, sleep needs naturally change across the lifespan, with the common trend inferring a gradual reduction in sleep duration as age increases (Porkka-Heiskanen *et al.*, 2013; Pearson, 2017) and changes to sleep quality and architecture (Espiritu, 2008).

As adults age from young adulthood (19 to 29 years), middle adulthood (30 to 45 years) and old adulthood (45 years and older), they tend to go to bed earlier (Pearson, 2017), wake up earlier (Gradisar *et al.*, 2013; Luca *et al.*, 2015) and have shorter sleep durations (Hume *et al.*, 1998; Bixler *et al.*, 2005; Espiritu, 2008; Porkka-Heiskanen *et al.*, 2013; Pearson, 2017). In terms of sleep quality and continuity, healthy elderly respondents (i.e. 70 years and older) struggle to initiate and maintain sleep and

experience decreases in the proportion of deep, restorative slow-wave sleep and REM sleep (Espiritu, 2008). Older adults experience taking longer to fall asleep, lighter sleep (Pearson, 2017), more involuntary awakenings during sleep and greater episodes of WASO (Hume *et al.*, 1998; Ohayon *et al.*, 2004; Pearson, 2017), which may result in reduced sleep efficiency (Ohayon *et al.*, 2004; Bixler *et al.*, 2005) and unintended sleep episodes when awake (Pearson, 2017). Further, age is a predictor of disturbed sleep, with an increased risk of reporting sleep disturbances associated with age (Åkerstedt *et al.*, 2002; Vitiello *et al.*, 2002; Stranges *et al.*, 2012; Salfi *et al.*, 2020). Furthermore, usual aging is associated with a greater likelihood of primary sleep disorders, including sleep-disordered breathing, sleep-related movement disorders, dream-directed behaviours and circadian rhythm disorders (Vaz Fragoso & Gill, 2007).

2.7.1.2.2 Drivers of age-related changes in sleep

The above review of research on sleep and age seems to reiterate the notion that sleep inevitably deteriorates with age. However, literature has begun to challenge this belief (Vitiello *et al.*, 2002; Foley *et al.*, 2004; Vaz Fragoso & Gill, 2007; Ancoli-Isreal, 2009; Grandner *et al.*, 2010). Some large-scale studies (Vaz Fragoso & Gill, 2007; Grandner *et al.*, 2010) have shown no significant relationship between sleep complaints and age. The authors from these studies comment that subjective perceptions of poor sleep in older adults may be related to factors outside of those associated with physiological and biological aging. Hence, decrements in sleep may not necessarily be related to the process of aging per se. Usual and normal aging results in predisposing, precipitating and perpetuating sleep complaints and adverse outcomes (Vaz Fragoso & Gill, 2007) but aging itself is not necessarily the cause (Vitiello *et al.*, 2002; Vaz Fragoso & Gill, 2007; Ancoli-Israel, 2009). Instead, age-related factors (e.g. chronic conditions, health status, medication use, loss of function, neuropsychological conditions) can predispose older/elderly adults to sleep complaints (Vaz Fragoso & Gill, 2007) and can influence one's perception of sleep quality (Foley *et al.*, 2004). If untreated, these can lead to an increased vulnerability to suboptimal sleep outcomes, leading to even more complex sleep disorders over time (Vaz Fragoso & Gill, 2007). This is supported by a number of studies (Vitiello *et al.*, 2002; Foley *et al.*, 2004; Vaz Fragoso & Gill, 2007; Ancoli-Isreal, 2009; Grandner *et al.*, 2010) and suggests that individual health is a sleep-related factor that should be studied alongside age

2.7.1.2.3 The status of sleep differences in different age and rank groups of academic staff

Rather than considering age-related sleep differences in academic staff, the review will focus on rank-related differences in academic staff. This is based on the rationale that academic rank is linked with age (Santos & Dang Van Phu, 2019). Again, to the best of the authors' knowledge, there is very limited research directly investigating the rank-based differences in sleep in the academic context. Thus, competently reviewing the relationship between age, rank and sleep in academic staff is not achievable. Rather, as discussed in the previous chapter, working at different ranks poses different work demands. Although discussed later in the review, work experiences such as work hours and overall work demands have been linked to poor and insufficient sleep in general populations (Åkerstedt *et al.*, 2002; Van der Hulst, 2003; Winwood & Lushington, 2007; Sekine *et al.*, 2006; Härmä , 2006; Kronholm *et al.*, 2006; Virtanen *et al.*, 2009; Loft & Cameron, 2014; Afonso *et al.*, 2017). This may point to the fact that academics at different ranks might have differing sleep experiences and that the sleep behaviour of academics at different ranks may vary. This, therefore, warrants research to characterize sleep among these groups.

2.7.2 Individual health status

2.7.2.1 Body mass index (BMI) and obesity

The relationship between sleep and body mass index (BMI) is bidirectional: sleep is impacted by but is also a determinant of individual BMI (Åkerstedt *et al.*, 2002; Taheri *et al.*, 2004; Bixler *et al.*, 2005; Bjorvatn *et al.*, 2007; Jennings *et al.*, 2007; Vgontzas *et al.*¸2008; Schoenborn & Adams, 2008; Bixler, 2009; Lauderdale *et al.*, 2009; Park *et al.*, 2010; Magee *et al.*, 2011; Ford *et al.*, 2014; Yang *et al.*, 2014; Rayward *et al.*, 2017; Grandner, 2018). BMI is a metric used to define anthropometric characteristics (stature and mass) in adults, classifying them (Nuttall, 2015) into normal weight, overweight and obesity classes. BMI ranges are as follows: 18.5 kg/m^2 (underweight), 18.5 to 24.9 kg/m^2 (normal weight), 25 to 29.9 kg/m^2 (overweight/pre-obese), 30 to 34.9 kg/m^2 (obesity class I), 35 to 39.9 kg/m^2 (obesity class II) and ≥40 kg/m^2 (obesity class III). Higher BMIs are associated with short sleep durations (Taheri *et al.*, 2004; Magee *et al.*, 2011) through various complex mechanisms (Magee *et al.*, 2011). To put it briefly, short sleep durations are associated with decreases in leptin (an appetite suppression hormone) and increases in ghrelin (an appetite-stimulating hormone)

(Taheri *et al.*, 2004). Therefore, sleeping short durations results in changes in these hormones that affect eating behaviour (e.g. overeating), which may contribute to an increase in BMI (Taheri *et al.*, 2004). Behavioural and lifestyle factors such as higher BMIs (and obesity) are associated with several sleep-related outcomes, including suboptimal sleep durations (Taheri *et al.*, 2004; Bjorvatn *et al.*, 2007; Vgontzas *et al.*¸2008; Schoenborn & Adams, 2008; Bixler, 2009; Lauderdale *et al.*, 2009; Park *et al.*, 2010; Ford *et al.*, 2014; Grandner, 2018), poor sleep quality (Jennings *et al.*, 2007; Yang *et al.*, 2014; Rayward *et al.*, 2017), risks of reporting sleep disturbances (Åkerstedt *et al.*, 2002) and increased excessive daytime sleepiness (Bixler *et al.*, 2005).

2.7.2.1.1 BMI of academic staff

According to several studies, it is common for high BMIs to be present in samples of academic staff, with many falling within the 'overweight' category according to BMI ranges (Hogan *et al.*, 2002; Pirinçci *et al.*, 2009; Khruakhorn *et al.*, 2010; Hajichehasae *et al.*, 2017; Madzaga, 2017; Issa *et al.*, 2017; Mouttapa & Wallace, 2017; Esaiyas *et al.*, 2018; Reddy & Naidoo, 2018; Ahmed, 2019; Molina-Torres *et al.*, 2020; Tee *et al.*, 2020; Janakiraman *et al.*, 2020; Shahani *et al.*, 2021). For example, studies show that 21% to 30% of their samples of academic and university staff were classified as pre-obese (Janakiraman *et al.*, 2020) or obese (Pirinçci *et al.*, 2009; Kumar *et al.*, 2014; Issa *et al.*, 2017; Esaiyas *et al.*, 2018; Amanyire *et al.*, 2019; Tee *et al.*, 2020; Shahani *et al.*, 2021). On the contrary, there are several studies that whose samples of academic staff report having normal and healthy average BMI values (Turkmen *et al.*, 2015; Ahmed, 2019; Redondo-Flórez *et al.*, 2020; Yap *et al.*, 2020).

2.7.2.2 Caffeine consumption

Caffeine is a psychoactive substance that increases wakefulness, restores alertness and enhances performance (Shochat, 2012). During waking hours, the brain releases adenosine which is considered a sleep-promoting chemical (National Institute of Neurological Disorders and Stroke [NINDS], 2017). Caffeine blocks adenosine receptors (NINDS, 2017) and, when administered in the evening, suppresses melatonin (Burke *et al.*, 2015), extending wakefulness at night. Research shows that sleep quality, sleep duration (Hindmarch *et al.*, 2000; Shilo *et al.*, 2002; Roehrs & Roth, 2008; Clark & Landolt, 2017), the perceived onset of sleep (Hindmarch *et al.*, 2000)

and daytime sleepiness (Roehrs & Roth, 2008; Shocat, 2012) are negatively affected by caffeine consumption. However, this is dose-related meaning the higher the dose of caffeine administration, the greater the adverse effects are on all aspects of sleep (Hindmarch *et al.*, 2000). A review of epidemiological studies and randomized controlled trials shows that more caffeine consumed translates into poorer quality sleep and shortened sleep durations (Clark & Landolt, 2017). Similarly, studies have shown that drinking several (Ban & Lee, 2001), five (Ergün *et al.,* 2017) and six or more (Janson *et al.*, 1995; Ohayon, 2004) cups of coffee per day is associated with short sleep (Ohayon, 2004), difficultly initiating sleep (Janson *et al.*, 1995), experiencing sleep problems in the past (Ergün *et al.,* 2017) and a higher likelihood of experiencing sleep disturbances (Ban & Lee, 2001). However, studies have shown that this is not always the case (Janson *et al.*, 1995; Sanchez-Ortuno *et al.*, 2005; Irish *et al.*, 2015; Watson *et al.*, 2016). For example, Sanchez-Ortuno *et al.* (2005) found that consuming of seven cups of coffee per day (or 600mg of caffeine) was not associated with a decrease in sleep duration.

A review of empirical evidence related to sleep hygiene practices showed that, while the effects of caffeine consumption in either the morning or afternoon on sleep are less clear, it is evident that caffeine administration close to bedtime disrupts sleep (Irish *et al.*, 2015). Nevertheless, there is a noteworthy agreement in the literature that caffeine affects measures of sleep quality and duration in negative ways (Hindmarch *et al.*, 2000; Shilo *et al.*, 2002; Sanchez-Ortuno *et al.*, 2005; Shocat, 2012; Irish *et al.*, 2015; Clark & Landolt, 2017).

2.7.2.2.1 Caffeine consumption in academic staff

Although caffeine consumption has not been reported extensively among academic staff, some studies show that academic and university staff consume less than one or one cup (Bryan *et al.*, 2012; Khwanchuea *et al.*, 2012) a day, more than three cups a week (Sookpeng *et al.*, 2005) and up to 5.3 cups a week (Mouttapa & Wallace, 2017). It seems that academic and university staff members do not tend to drink large quantities of coffee daily or weekly. However, the timing of caffeine consumption, how close consumption is to bedtime and caffeine consumption overall is largely under-reported.

2.7.2.3 Nicotine consumption

Being a smoker and cigarette smoking is related to suboptimal sleep durations (Schoenborn & Adams, 2008; Magee *et al.*¸2009), poor sleep quality (McNamara *et al.*, 2014), sleep disruption (McNamara *et al.*, 2014; Irish *et al.*, 2015), sleeping difficulties (Soldatos *et al.*, 1980) and sleep-related problems (Lexcen & Hicks, 1993; Irish *et al.*, 2015). It has been evidenced that, compared to individuals who have never smoked, current smokers have shown to have less total sleep time, lower sleep efficiency, longer sleep onset latencies and shift toward lighter stages of sleep (Zhang *et al.*, 2006). On the contrary, Conway *et al.* (2008) found that non-smokers, former smokers and current smokers did not differ significantly based on their sleep architecture.

2.7.2.3.1 Prevalence of nicotine consumption in academic staff

Concerning the consumption of nicotine, previous research has shown that the prevalence of smoking in academic populations is relatively low (Sookpeng *et al.*, 2005; Pirinçci *et al.*, 2009; Khruakhorn *et al.*, 2010; Mulenga & Siziya, 2013; Yeshaw & Mossie, 2017; Madzaga, 2017; Reddy & Naidoo, 2018; Esaiyas *et al.*, 2018 Amanyire *et al.*, 2019). The proportions of non-smokers from these studies include over 90% (Sookpeng *et al.*, 2005; Khruakhorn *et al.*, 2010; Yeshaw & Mossie, 2017; Madzaga, 2017; Esaiyas *et al.*, 2018), over 80% (Hogan *et al.*, 2002; Reddy & Naidoo, 2018; Amanyire *et al.*, 2019) and over or just under 70% (Pirinçci *et al.*, 2009; Mulenga & Siziya, 2013). These studies indicate that nicotine consumption is uncommon and not highly prevalent in academic populations.

2.7.2.4 Alcohol consumption

While alcohol is typically considered as a sleep aid, convincing evidence suggests that it has disruptive effects on sleep homeostasis (Thakkar *et al.*, 2015). Alcohol, of both high (Shochat, 2012) and low (Ebrahim *et al.*, 2013) quantities, administered just before or near bedtime, affects sleep (Shochat, 2012; Ebrahim *et al.*¸2013; Irish *et al.*, 2015). It can affect sleep by reducing sleep onset latency (Shochat, 2012; Ebrahim *et al.*¸2013; Irish *et al.*, 2015) and increasing slow-wave sleep (Ebrahim *et al.*¸2103; Irish *et al.*, 2015) during the first half of the night, which promotes sleep, initially. However, during the second part of the night, once alcohol is metabolized, sleep becomes markedly lighter, thus promoting more or easier arousal from sleep (Irish *et al.*, 2015)

and increasing awakenings throughout the night (Shochat, 2012). Hence, sleep is more disturbed in the second half of the night (Ebrahim *et al.*¸ 2013). Overall, though, alcohol consumption has been linked to adverse sleep quality outcomes (Roehrs & Roth, 2001; Lyndon *et al.*, 2016) and extended sleep durations (Lyndon *et al.*, 2016). However, a review of empirical evidence concluded that the effects of alcohol on sleep are dose-dependent and that tolerance to alcohol's effects on sleep occurs within days (Irish *et al.*¸ 2015).

2.7.2.4.1 Prevalence of alcohol consumption in academic staff

Previous studies on academic and university staff indicate that the proportions of staff that consume alcohol are varied. These studies demonstrate wide ranges of prevalence of alcohol consumption including 5.2% (Kumar *et al.*, 2014), 7.4% (Pirinçci *et al.*, 2009), 11.8% (Esaiyas *et al.*, 2018), 14.1% (Amanyire *et al.*, 2019), 23% (Madzaga, 2017), 27.8% (Khruakhorn *et al.*, 2010), 32.6% (Sookpeng *et al.*, 2005), 57.9% (Yeshaw & Mossie, 2017), 63% (Mulenga & Siziya, 2013), 65.5% (Hogan *et al.*, 2002) and 68% (Reddy & Naidoo, 2018). Not all weekly or daily quantities were provided in these studies, nor was it indicated if alcohol was consumed late at night or near bedtime. Nevertheless, some of the studies have reported daily or weekly units of alcohol consumed. For example, 59% of university staff that consumed alcohol indicated drinking six or more drinks on one occasion and 28% of those did so on a monthly or weekly basis (Awoliyi *et al.*, 2014). One SA study showed that 49% and 34% of staff consumed alcohol one to two days in the week and three to five days in the week, respectively (Madzaga, 2017). Another SA-based study evidenced that over half of the sample of academic staff consumed alcohol in the last 12 months, with 21.9% and 12.5% of their male cohort drinking a minimum of once a week and at least five times a week, respectively (Reddy & Naidoo, 2018). Thus, the prevalence of alcohol consumption among academic staff is varied. However, the studies investigating the daily or weekly dose as well as how near to bedtime the last serving of alcohol is consumed are limited.

2.7.2.5 Physical activity

In a meta-analytic review on the effects of physical activity (PA) on sleep, acute exercise (less than one week of exercise) showed beneficial but small effects on total sleep time, slow-wave sleep, sleep onset latency, sleep efficiency, WASO and can

reduce sleep disturbances (Kredlow *et al.*, 2015). Among individuals with and without sleep complaints, regular exercise (equal to or greater than one week of exercise) offered moderate and robust positive effects on sleep quality overall. Further, it had small benefits to total sleep time and sleep efficiency as well as small-to-moderate effects on sleep onset latency (Kredlow *et al.*, 2015). Behavioural and lifestyle factors such as physical inactivity are linked to suboptimal sleep durations (Youngstedt *et al.*, 1997; Schoenborn & Adams, 2008; Bixler, 2009; Park *et al.*, 2010), poor sleep quality (Youngstedt *et al.* 1997; Hoefelmann *et al.*, 2012; Yang *et al.*, 2012; Kredlow *et al.*, 2015; Rayward *et al.*, 2017) and the experience of sleep problems (Foley *et al.*, 2004) or disturbances (Åkerstedt *et al.*, 2002; Gosling *et al.*, 2014).

2.7.2.5.1 PA in academic staff

Unlike some of the other health and lifestyle factors, PA has been well researched among academics. A number of studies signal issues of low PA participation rates among academic or university staff, with it being evident that academics are not moving or exercising enough. Results from several studies show proportions of 34.5% (Freitas *et al.*, 2019), 37.3% (Gorczynski *et al.*, 2017), 43.6% (Madzaga, 2017), 47.4% (Sookpeng *et al.*, 2005), 51.3% (Amanyire *et al.*, 2019), 54.5% (Esaiyas *et al.*, 2018), 63.2% (Issa *et al.*, 2017), 71.1% (Pirinçci *et al.*, 2009) of academic or university staff members not participating in PA or exercise at all. Other studies show their staff participating in PA but at low levels or not enough to meet appropriate guidelines (Hogan *et al.*, 2002; Kumar *et al.*, 2014; Turkmen *et al.*, 2015; Cooper & Barton, 2016; Reddy & Naidoo, 2018; Faghy *et al.*, 2021).

Low rates of PA have been linked to the period of transition into professional academia or moving up rank once in academia (Kirk & Rhodes, 2012), having children (Freitas *et al.*, 2019), opportunities for PA during work (Faghy *et al.*, 2021) and the little time available to staff (Leicht & Sealey, 2013; Cooper & Barton, 2016) due to work commitment, family commitments (Leicht & Sealey, 2013; Freitas *et al.*, 2019) and a lack of energy (Leicht & Sealey, 2013). However, PA may be particularly important for academic staff, as implied by a recent study. The study showed that practicing PA modified the effect that work-related stress experiences had on poor sleep quality in university professors. PA was therefore considered an important lifestyle adjustment to reduce poor sleep quality in academics (Freitas *et al.*, 2019).

2.7.2.6 Sedentary behaviours

Sedentary behaviours refer to activities where one sits without being active and includes the time spent sitting during an individual's "non-exercise" waking hours (Owen *et al.*, 2009, p. 81). Sedentary behaviours or lifestyles are associated with having a sleep problem, perceived poor sleep quality, a number of medical conditions (Foley *et al.*, 2004) and short sleep duration (Lakerveld *et al.*, 2016). Regarding time guidelines for sedentary behaviour, there is no upper or lower threshold that has been established because of the continuous nature of daily activity (Chaput *et al.*, 2020). Nonetheless, to gauge average sedentary times reported in general populations, international and population-based studies show average daily sedentary times of 8.5 hours (Van Dyck *et al.*, 2015), 7.7 hours (Matthews *et al.*, 2008), 5.8 hours (Mielke *et al.*, 2014), 5.15 hours (Bennie *et al.*, 2013) and 5 hours (Bauman *et al.*, 2011).

2.7.2.6.1 Sedentary behaviours in academic staff

Although research is limited, university staff have reported sedentary times between roughly 6 to 8 hours daily (Leicht *et al.*, 2013; Faghy *et al.*, 2021). University staff from one study highlighted sedentary behaviours as problematic and a predictor of many health risks (Shehu *et al.*, 2013). Additionally, a different study showed that the risk of being overweight and having abnormal fat deposits was, in part, attributed to a sedentary lifestyle and lack of exercise, among other factors (Hajichehasae *et al.*, 2017). Among a sample of university staff, just over 75% (75.8%) were classified as sedentary based on their habitual PA level (Khruakhorn *et al.*, 2010) and a large proportion of a sample of academic staff (52%) from a SA university indicated their work involves sitting (Reddy & Naidoo, 2018). Similarly, among a study of university staff outside of SA, 65.3% worked in a seated and sedentary position in the day (Khruakhorn *et al.*, 2010). In summary, evidence would suggest that academic staff may partake in extended sedentary behaviours, and that this may have something to do with the nature of their work.

2.7.3 Work and work-family interactions

2.7.3.1 Cognitive-based work and sleep

Work that involves cognitive demands (which forms part of an academic's work) has a distinctive relationship with sleep (Winwood & Lushington, 2007; Loft & Cameron, 2014; Goel *et al.*, 2014). In non-academic populations, high cognitive workloads, even

in the absence of sleep loss, delays sleep onset and may increase subjective sleepiness and fatigue (Goel *et al.*, 2014). In addition, it may prolong the decision to go to bed (Loft & Cameron, 2014). Winwood & Lushington (2007) found that psychological demands (e.g. emotional demand, mental effort) of work may have adverse influences on sleep quality and recovery, with it being a stronger predictor of sleep quality, recovery, and acute fatigue compared to physical workload. Additionally, irrespective of age or work schedule, work that requires mental or physical effort is linked to reporting more sleep problems, with sleep problems becoming more significant if the work is considered as difficult or stressful (Marquié *et al.*, 1999), which may be the case for academic work.

2.7.3.2 Long working hours and sleep

Generally, long working hours (Van der Hulst, 2003; Sekine *et al.*, 2006; Härmä, 2006; Kronholm *et al.*, 2006; Virtanen *et al.*, 2009; Afonso *et al.*, 2017) and high work demands and loads (Åkerstedt *et al.*, 2002; Loft & Cameron, 2014; Winwood & Lushington, 2007) are linked to poor or insufficient sleep. Long working hours have been associated with poor sleep quality (Sekine *et al.*, 2006), reduced sleep time (Kronholm *et al.*, 2006; Virtanen *et al.*, 2009; Afonso *et al.*, 2017), difficulties falling asleep (Virtanen *et al.* 2009) and increased sleep disturbances (Afonso *et al.*, 2017). A review on work hours and health in the general population highlights that continuously working for long hours (i.e. 50 hours or more each week) and sustaining long total working hours (at work and home) is associated with objective and self-rated health problems, sickness absences and fatigue (Härmä, 2006). Further, working long hours has been related to needing a greater recovery period (Virtanen *et al.*, 2009). Lastly, Van der Hulst (2003) highlights that the most consistently found association with long work hours was short sleep durations, which may be related to lack of time dedicated for recovery.

2.7.3.3 Long working hours and weekend work in the academic context

Working long hours and overtime is reported extensively in the literature. Research indicates that a high proportion of academic staff work well beyond their full-time requirements (Kinman & Jones, 2008; Houston *et al*, 2006). For example, studies show academics work more than 45 hours a week (Jacobs & Winslow, 2004; Tytherleigh *et al.*, 2005; Kinman & Jones, 2008; Barkhuizen & Rothmann, 2008;

Bentley & Kyvik, 2011; Kinman & Wray, 2013; Mkumbo, 2014; Barkhuizen *et al.*, 2014; Samad *et al.*, 2015; Opstrup & Pihl-Thingvad, 2016; Kenny & Fluck, 2017) and notable proportions work beyond 50 hours a week (Tytherleigh *et al.*, 2005; Kinman & Jones, 2008; Misra *et al.*, 2012; Kinman & Wary, 2013; Mkumbo, 2014; Hogan *et al.*, 2016; Koen *et al.*, 2018). To cope with demands of work and the resultant demands on time, academics tend to continue their work in the evenings and over weekends (Bryson, 2004; Kinman & Jones, 2008; Barkhuizen & Rothmann, 2008; Fanghanel & Trowler, 2008; Hunter & Leahey, 2010; Cannizzo & Osbaldiston, 2016). This may affect the work-life balance of academics, which has shown to be unbalanced, according to numerous studies.

2.7.3.4 Work-life interactions in the academic context

The demands of academic work often compel academic staff to bring work home, contributing to work-life imbalances. Academics often extend their workplace to the home environment, dissolving the boundary between work- and home-life (Kinman & Jones, 2008; Barkhuizen & Rothmann, 2008; Beigi *et al.*, 2018). There is extensive research that indicates that balancing work and life among academics is a major concern (Byron, 2005; Kinman & Jones, 2008; Fox *et al.*, 2011; Kinman & Wray, 2013; Cannizzo & Osbaldiston, 2016; Wilton & Ross, 2017; Dorenkamp & Süß, 2017; Torp *et al.*, 2018 Beigi *et al.*, 2018). Furthermore, academic staff are reportedly likely to neglect their personal life and important activities due to the demands of their work (Kinman & Jones, 2008; Kinman & Wray, 2013). This may limit their time for leisure (Cannizzo & Osbaldiston, 2016) and possibly their opportunity to prioritize sleep.

2.7.3.5 The influence of family

Over and above the demands of work, some academics also deal with the demands of parenthood (Jacobs & Winslow, 2004; Byron, 2005; Reddick *et al.*, 2012; Melin *et al.*¸2014; Dorenkamp & Süß, 2017; Hardy *et al.*¸2018; Freitas *et al.*, 2019), which affects sleep (Chatzitheochari & Arber, 2009; Meadows & Arber, 2012; Fowler *et al.*, 2014 Basner *et al.*¸2014). In the academic context, it appears that much of the demands of parenthood and domestic upkeep have been assumed by the women (Mason & Goulden, 2004; Bezuidenhout & Cilliers, 2011; Obers, 2014). It has meant that academic mothers are more likely to sacrifice their time to assume the bulk of child-caring and household responsibilities (Misra *et al.*, 2012; Dickson, 2020). This

compromises the time they can dedicate to their occupational goals (Shen, 2013; Obers, 2014), professional well-being (Dickson, 2020) and possibly to their sleep.

2.7.4 Information and Communication Technologies

2.7.4.1 Technology and screen use behaviours

Currently, the use of electronics and electronic media have become interwoven into periods of bedtimes, lights out and sleep (Exelmans & Van den Bulck, 2015). Over-exposure to (artificial) light is problematic because it changes circadian entrainment and, subsequently, alters sleep timing (Kantermann, 2013). The use of screen-based electronics – especially after work, in the evenings or close to bedtime - is linked to greater sleep problems (Thomée *et al.*, 2007; Schieman & Young, 2013; Gradisar *et al.*, 2013), short sleep durations (Suganuma *et al.*, 2007; Basner *et al.*¸2014; Lanaj *et al.*, 2014; Lakersveld *et al.*, 2016) poor sleep quality (Suganuma *et al.*, 2007; Exelmans & Van den Bulck, 2016), disturbed sleep patterns (Gradisar *et al.*, 2013), changes to bed and rise times (Custers & Van den Bulck, 2012; Exelmans & Van den Bulck, 2016), insomnia (Exelmans & Van den Bulck, 2016) and lower work engagement the following day (Lanaj *et al.*, 2014).

2.7.4.1.1 Technology and screen use in the academic context

As part of the changes experienced in HE in the 21st century, HE has shifted toward and focused on using technology to teach, learn, deliver information and network. It has transformed and continues to transform what academics do, how they do it and their overall pedagogical approach (Coaldrake, 2000; Gül *et al.*, 2010; Akbar *et al.*, 2016). While technology offers outstanding benefits to academic practice (Gappa *et al.*, 2005**;** Singh & Han, 2005; Ng, 2006; Enders & Kaulisch, 2006; Boswell & Olson-Buchanan, 2007; Menzies & Newson, 2007; Unwin, 2007; Balasubramanian *et al.*, 2009; Heijstra & Rafnsdóttir, 2010; Gül *et al.*, 2010; Kyvik, 2013; Akbar *et al.*, 2016), it may also result in extended screen times and screen use at night. This contention is based on findings from previous research, showing that academic staff tend to work using technology in the evenings and late at night (Gappa *et al.*, 2005; Currie & Eveline, 2011; Heijstra & Rafnsdóttir, 2010) as well as reports of long screen use durations in academics (Ahmed, 2019), which may impact their sleep. However, research quantifying screen use behaviours in the context of academe is limited.

Overall, several factors that influence sleep and the presence of these factors in the academic context suggest that academic staff's sleep may be compromised. However, few studies have characterized or quantified sleep among academic staff, making it difficult to understand if insufficient sleep is a reality in this context. Thus, the following section will review the studies that have characterized sleep in academic staff or that have suggested that their sleep may be insufficient.

2.8 PREVIOUS RESEARCH ON SLEEEP IN ACADEMIC STAFF

For academic staff, sleep is important for work-life factors such as high workloads (Dahlgren *et al.*, 2005), decision-making (Ratcliff & Van Dongen, 2009), performance efficiency (Ratcliff & Van Dongen, 2009), behavioural alertness and cognitive performance (Van Dongen *et al.*¸2003), cognitive control and self-regulation (Barnes *et al.*, 2011; Barnes *et al.*, 2015), work effectiveness and motivation (Orzel-Gryglewska, 2010), work-family interactions (Sekine *et al.*, 2006), mental health status (Gosling *et al.*, 2014), mood (Gradisar *et al.*, 2013) and vigour (Durmer & Dinges, 2005). Sleep impacts work productivity (Gibson & Shrader, 2014; Gingerich *et al.*, 2018) and it is beneficial both before and after learning (Walker *et al.*, 2002). This is important for academics who are known to engage in a lot of cognitive work (Tight *et al.*, 2010; Christensen *et al.*, 2018), have many interactive roles (Fanghanel & Trowler, 2008; Price *et al.*, 2015), are self-regulating/self-motivating (McInnes, 1992; Enders & Kaulisch, 2006; Kenny & Fluck, 2017) and tend to experience occupational stress (Kinman & Wray, 2013; Mkumbo, 2014; Hardy *et al.*, 2018; Fontinha *et al.*, 2018). Although very little is known of the characteristics of sleep and sleep behaviours of academic staff, some research has been done. Among this research, sleep was either marginally considered or it was one of the primary focuses of the study. The following begins with the studies that have marginally researched sleep in academics. Thereafter, studies that have directly focused on sleep are reviewed.

2.8.1 Overview of studies that included sleep

With regards to the studies that marginally considered sleep, sleep was measured by asking one or two broad questions relating to sleep quality and sleep duration. Since sleep was not the primary focus of these studies, some did not report or discuss their participants' responses concerning the sleep-related question. Kinman (1998) surveyed academic and academic-related staff employed across numerous HEIs in

the UK. The results indicate that more than one third of the sample regularly reported losing sleep through worry and several respondents felt that work pressures often resulted in mental exhaustion. Gillespie *et al.* (2001, p. 65) reported that three-quarters of respondents suffered from physical health effects of occupational stress, of which "sleep disorders" was listed. Similarly, Biron and colleagues (2008) evidenced an association between higher levels of reports of psychological distress (a common issue for academics) with increased psychosomatic symptoms, of which "sleep disorders" was listed. In addition, Kurfi *et al.* (2018) confirmed that occupational stress resulted in reasonable health implications that included "disordered sleep", although the authors did not extend further on this particular finding. Academics across 99 UK HEIs experienced a negative "spill-over" where work negatively affected psychological components of non-life, with these spill-overs producing constraints to sleeping and relaxing (Kinman & Jones, 2008, p. 56). Additionally, 60% of academic or academic-related staff experienced sleeping difficulties (Kinman & Jones, 2008). Barkhuizen and Rothmann (2008), who investigated occupational stress across SA higher education institutions (HEIs), found that their academic sample was troubled by "sleep loss". Further, more than half of university staff from the Medicine and Health Sciences faculty in one SA HEI indicated having difficulty relaxing (Koen *et al.*, 2018). In another study investigating stress among university staff, respondents reported that the most common consequence of work-related stress was the experience of disordered sleeping, whether in the form of inability to sleep, restlessness from worry, or staying up late to work (Mark & Smith, 2018). A study on Canadian academics reported that 53% of women and 42% of men experience "sleep deprivation", which was also the most common stress symptom across the sample (Menzies & Newson *et al.*, 2007). A sample of academic staff from Tanzania reported feeling overtired as the most frequent form of psychological stress among the sample (Mkumbo, 2014). Furthermore, Winefield *et al.* (2014) found that high job demands did not necessarily lead to undesirable health outcomes. Rather, it was the "lack of sufficient opportunity to recover from the effort or energy expended on them", whether it was during or following official working hours (Winefield *et al.*, 2014, p. 693). In these studies, sleep was categorized within a list of physical health symptoms or effects alongside allergies, hypertension, cardiovascular problems, fatigue, headaches, back and neck pains, muscle tension, weight loss and weight gain, immunity, skin disorders, short-

term memory loss, concentration (Gillespie *et al.*, 2001; Menzies & Newson, 2007; Biron *et al.*, 2008; Kinman & Jones, 2008; Kurfi *et al.*, 2018). As a result, it is difficult to determine the proportions of academics from these studies that were directly experiencing sleep problems. Additionally, measures such as sleep duration and sleep quality were not quantified. Further, there were discrepancies in sleep terms and, therefore, how sleep was reported and problematized. Some referred to sleep disorders (Gillespie *et al.*, 2001; Biron *et al.*, 2008; Kurfi *et al.*, 2018), sleep difficulties (Kinman & Jones, 2008; Mark & Smith, 2018), sleep deprivation (Menzies & Newson, 2007) and sleep loss (Barkhuizen & Rothmann, 2008) – all of which have their own definitions. These different terms have different consequences that should not be confused or misused, as they have different implications on health, well-being and performance. Thus, while these studies hint towards sleep-related problems, sleep was only measured by asking one or two questions and therefore lacks measurement and quantification using valid and reliable tools.

2.8.2 Overview of studies that directly focused on sleep in academic staff

One study has investigated the quality of sleep among university professors (Freitas *et al.*, 2019). The researchers found that poor quality sleep is highly prevalent (61.3%) amongst academics, specifically professors. Researchers posited that the growing number of tasks and activities that academics are expected to complete restricts the time available for relaxation possibilities, which likely negates the appropriate quality and quantity of sleep academics should experience (Freitas *et al.*, 2019). Further, excessive workload, work-related activities pursued in and outside of working hours and pressures to increase productivity and performance contributed to heightened stress amongst staff, affecting their quality of sleep (Freitas *et al.*, 2019). Researchers from an Ethiopian university found that having either anxiety, stress and depression was associated with the duration of sleeping time (Yeshaw & Mossie, 2017). They further report that 38.7% of their sample of university staff did not report an 8-hour sleep per 24 hours in the month of their reporting (Yeshaw & Mossie, 2017). Among a sample of university staff, 51.28% were categorized as poor sleepers using the PSQI (Kumar *et al.*, 2014). Furthermore, research investigating burnout among Turkish was were were was referred 56 university staff established that sleep duration per day directly contributed to burnout features such as depersonalization and reduced personal accomplishment. In addition, participants who obtained 6 hours or less of

sleep per day were 2.10 times more likely to depersonalize and experienced 2.63 times higher reductions in personal accomplishment (Özgül & Polat, 2018). Freitas *et al.* (2019) demonstrated that one third of their sample reported sleeping six hours or less a day and Yeshaw and Mossie (2017) found that, over a one-month period, 38.7% of their respondents did not experience an 8-hour sleep.

The overview of these studies reveals three main findings: (1) that several studies categorize sleep within a generalized list of physical symptoms, rather than as an individual variable, making it difficult to quantify; (2) some of these studies misuse sleep terms, which have respective implications on health, well-being and performance; and (3) where studies have addressed sleep in academic staff directly, it is evident that getting enough or sufficient quality of sleep is a challenge for this group. The lack of direct sleep studies on this group is an issue for two reasons. Firstly, as pointed out in the occupational stress literature, the nature of being an academic involves work-related demands and consequent stress that hinders sleep. Secondly, obtaining enough or adequate quality of sleep may be a challenge for this group, despite it being potentially beneficial to their work and health. Despite this, sleep in academics is not well quantified or characterized both nationally and internationally. Evidence suggests that academics operate within a context where the time available and utilized for rest, recovery and sleep is compromised – thus warranting direct study.

2.9 SUMMATION: SLEEP IN ACADEMIC STAFF NEEDS MORE RESEARCH

The literature provides evidence that work-related and health-related factors that are common among academics are shown to compromise sleep. However, the characterizations of sleep and lifestyles of academic staff are limited in research. However, quantifying these characteristics is necessary in order to determine if these areas of academics' health are sufficient or not.

Moreover, the impact of the COVID-19 pandemic may have presented additional challenges to these areas of academic work-life. Recent research indicates that sleep, work, and individual health were negatively affected by COVID-19 for both general populations and academics more specifically. Therefore, the following section aims to acknowledge the impact of COVID-19 on sleep, work and health in general populations as well as in academic staff.

2.10 ACKNOWLEDGING CHANGES TO SLEEP, HEALTH AND WORK OF ACADEMIC STAFF: IMPACT OF THE COVID-19 LOCKDOWNS

COVID-19 is an infectious disease that is caused by the coronavirus – a respiratory pathogen - also known as SARS-CoV-2. It was identified on 31 December 2019, with initial cases from Wuhan, the People's Republic of China (WHO, 2020). During the initial months of the outbreak, the virus spread to over 100 countries, including SA. Around the world, governments instituted lockdown regulations and the majority of individuals were confined to their homes (Gupta *et al.*¸2020). In many countries, home confinement meant that individuals had to stay at home, work from home, home-school their children, drastically reduce outings, reduce social interactions and work more hours under stressful circumstances (Altena *et al.*¸2020). The pandemic effectively introduced changes to various dimensions of sleep, mental health and lifestyles and, more specifically, on academic work-life and HE as a whole. The following section will begin by considering these changes in the general populace and then discuss the changes specific to HE and academic staff.

2.10.1 General changes to sleep

2.10.1.1 Altered circadian cues and rhythms

The COVID-19 pandemic introduced changes to daily routines and lifestyle behaviours. The COVID-19 pandemic forced individuals to change their day-to-day rhythms, providing pathways for anxiety, stress and mood alterations – all of which affect human well-being and sleep (Innocenti *et al.*, 2020). Normal life routines serve as circadian cues. With the induction of lockdown regulations, these cues were ultimately disrupted (Gupta *et al.*, 2020) by reducing exposure to sunlight and major change of daily social schedules (Leone *et al.*¸ 2020). Environmental (e.g. daylight) and social (e.g. weekday vs weekend sleep schedules) factors are circadian synchronizers that influence circadian factors and act as synchronizers of circadian rhythms (Borbély, 1982). During the COVID-19 pandemic, a shift from regular entrainment is reflected by lower exposure to direct sunlight (Leone *et al.*, 2020; Voitsidis *et al.*, 2020), increased use of electronic devices (Voitsidis *et al.*, 2020) and social cues such as work or school schedules that became more flexible, delayed or even non-existent (Leone *et al.*¸ 2020).

Additionally, working from home makes following a structured routine much less compelling (Gupta *et al.*, 2020), where opportunities for extending sleep in the morning, taking naps in the day and watching television or playing video games become more accessible (Gupta *et al.*, 2020; Lin *et al.*, 2021). Overall, these factors may have disrupted an individual's biological rhythm and homeostatic processes (Gupta *et al.*, 2020; Lin *et al.*, 2021). In addition to the changes in circadian rhythmicity during the COVID-19 pandemic, new stressors (Gupta *et al.*, 2020; Mandelkorn *et al.*, 2021), such as confinement itself (Gupta *et al.*, 2020) and the spread of the virus (Mandelkorn *et al.*, 2021), changes of roles and poor clarity about health and economic security are likely to have affected sleep (Gupta *et al.*, 2020).

2.10.1.2 Modified sleeping behaviours

Studies from Italy (Innocenti *et al.*, 2020; Cellini *et al.*, 2020), Brazil (Barros *et al.*, 2020), Greece (Voitsidis *et al.*, 2020), Argentina (Leone *et al.*, 2020), the UK (Bann *et al.*, 2021), Bangladesh (Sultana *et al.*, 2020), China (Lin *et al.*, 2021) and broad international studies (Mandelkorn *et al.*, 2021) reported general changes of sleep behaviours as a result of COVID-19-related lockdowns. These observations involved going to bed later and/or later rise times (Sañudo *et al.*, 2020; Cellini *et al.*, 2020; Innocenti *et al.*, 2020; Gupta *et al.*, 2020; Leone *et al.*, 2020), spending longer times in bed (Cellini *et al.*, 2020; Lin *et al.*, 2021), increased (Leone *et al.*, 2020; Sultana *et al.*, 2020; Sañudo *et al.*, 2020; Bann *et al.*, 2021; Mandelkorn *et al.*, 2021) or similar sleep durations (Innocenti *et al.*, 2020; Bann *et al.*, 2021), increased sleep disturbances or problems and/or insomnia complaints (Barros *et al.*, 2020; Voitsidis *et al.*, 2020; Mandelkorn *et al.*¸2021; Huang & Zhao, 2020; Gualano *et al.*¸2020; ; Lin *et al.*, 2021) and poorer sleep quality (Gupta *et al.*, 2020; Innocenti *et al.*, 2020; Marelli *et al.*, 2020; Sañudo *et al.*, 2020; Casagrande *et al.*, 2020; Cellini *et al.*¸2020; Lin *et al.*¸2021). Notably, a number of these studies indicate that the negative impacts on sleep were more severe for younger adult groups (Leone *et al.*, 2020; Gualano *et al.*, 2020; Barros *et al.*, 2020; Sultana *et al.*, 2020; Bann *et al.*, 2021; Mandelkorn *et al.*, 2021). Additionally, negative impacts on sleep were experienced more severely by women in several studies (Voitsidis *et al.*, 2020; Gualano *et al.*, 2020; Barros *et al.*, 2020; Casagrande *et al.*, 2020; Bann *et al.*, 2021; Mandelkorn *et al.*, 2021). This implies that younger adult groups as well as women may have experienced more difficulties with their sleep during COVID-19 lockdowns.

2.10.2 General health-related behavioural changes

Under conditions of lockdown, it is largely inevitable that lifestyle behaviours (i.e. sleep, alcohol consumption, physical activity and dietary habits) undergo modifications (Arora & Grey, 2020). Home confinement, which resulted in staying indoors and limiting movement, reduced PA and exposure to sunlight, increased levels of stress due to social isolation, and made it challenging to engage in satisfying activities (Cellini *et al.*¸2020). The COVID-19 lockdown resulted in reduced PA (Arora & Grey, 2020; Meyer *et al.*, 2020; Stanton *et al.*, 2020; Cellini *et al.*, 2020) and notable increases in sedentary behaviours (Meyer *et al.*, 2020), which is problematic for groups such as academic staff who, before the pandemic, experienced challenges in these areas of health. In addition, depression, anxiety and stress were higher (Stanton *et al.*, 2020; Meyer *et al.*, 2020), although the impact on mental health was significantly worse for younger adult cohorts (Huang & Zhao, 2020; Barros *et al.*, 2020) as well as women (Gualano *et al.*, 2020; Casagrande *et al.*, 2020; Barros *et al.*, 2020; Lin *et al.*, 2021).

2.10.3 Adaptions of HE systems to the pandemic and implications for academic work

Closing of campuses in the early months of 2020 meant that academic staff had to work from home and swiftly institute new systems and methods for teaching, monitoring and assessing students remotely (Majeed, 2020). Essentially, academics had to adapt to a completely new way of working (Majeed, 2020). The majority of academics from around the globe who taught in mainstream universities were required to transition to online learning within a matter of days (Corbera *et al.*, 2020) and were only left with the option of distance teaching and learning (Motala & Menon, 2020). Methods of online learning became the cornerstone to the continuation of education. Academic employees had to redesign assessments (Sahu, 2020), course modules, laboratories, work placements, examination procedures as well as all academic activities that were typically conducted on campus (Zuccoli & Teruggi, 2020). Meetings had to be conducted virtually using platforms such as Zoom and Microsoft Teams, research projects were rapidly developed to address COVID-19 concerns, approval processes for studies were expedited (Majeed, 2020), research projects were compromised, journal article reviews were delayed and submissions of grants may have been deferred (Hedding *et al.*, 2020). Due to time sensitivity, academic staff were not necessarily accompanied by guidelines or toolkits to undertake these transitions

effectively (Sobaih *et al.*, 2020) and might not have had the adequate IT equipment to support their productivity and flow of work at home (Sahu, 2020).

The onset of the pandemic also highlighted pre-existing inequalities in both academic and societal groups (Corbera *et al.*, 2020). For example, some academics may have or are nearing tenure, spend lockdown with the company of their family and have themselves and their families in good health. Others may not have such secure employment, have family members outside of academia losing their jobs and/or have poorer health, live in small or shared houses or have a poor internet connection (Corbera *et al.*, 2020). Hence, it is unfair to assume that all academic staff have suitable, safe and supportive home environments that support their work. In addition, inequitable experiences during the COVID-19 pandemic are exacerbated by gender, race and economic status (Corbera *et al.*¸2020).

2.10.3.1 The increase of the gender gap in academe during the COVID-19 pandemic

Gender differences in academe were present long before the onset of the pandemic (Oleschuk, 2020) – COVID-19 simply amplified these differences (Gabster *et al.*, 2020). For example, female academics' productivity and scientific output were disproportionately affected by COVID-19 (Gabster *et al.*, 2020). Prior to the pandemic there was a gendered publication gap in academia, which became especially apparent during the period of the COVID-19 lockdown. In their review of gender equity considerations for tenure and promotion during COVID-19, Oleschuk (2020) highlighted numerous, well-known journals that released reports showing that a smaller proportion of women constituted journal submissions within the first two months of the pandemic compared to prior to it.

This is understandable since recent reports indicate the exacerbated disparities for academic women, especially those with children (Langin, 2021). The data shows that, in sum, academic mothers were hit hard by the pandemic (Langin, 2021). Women's pre-existing caring responsibilities became heightened under the emotional strain of expedited 61 the pandemic. This amounted to increasing work-life conflicts, contributing further to a slow-down of female faculty career advancement (Oleschuk, 2020). Female academics or researchers increased their domestic labour as a result of the care-based activities (Corbera *et al.*¸2020) and had to postpone or dispense

with their research, which negatively impacts on their career (Minello *et al.*, 2021). Academic staff with young children may have reduced their productivity while attempting to juggle childcare and work in the same household (Hedding *et al.*, 2020). Thus, female academics may have experienced an increase in the demands of household and childcare responsibilities, subsequently and disproportionately disrupting their work.

2.11 SUMMARY, RATIONALE AND STUDY OBJECTIVES

Before COVID-19, the working context for academics included a number of demands and challenges. Research shows that academic staff work under high work demands, for long hours and interact with many students and colleagues online and face-to-face. In addition, especially since the start of pandemic, academics have to integrate information and communication technologies (ICTs) and e-technologies into their work. However, work in academia can be experienced differently by academics of different genders and rank groups. While research highlights the relationships that sleep has with aspects of academic work and life - and that sleep itself is a crucial component of health - very little is known of the sleep characteristics of academic staff. Additionally, academic staff around the world have had to operate within the context of a global pandemic. This has ultimately remodelled how academics traditionally perform their work and magnified the gender disparities between academic staff.

In summary, academics' work, health and lifestyle behaviours may contribute to and facilitate suboptimal sleep experiences. However, the characteristics of sleep quality and sleep duration are not well-researched among academic staff. Further, while much is known of the gender and rank differences of work demands among academic staff, differences within these groups in terms of sleep have not been explored in an academic context. Furthermore, sleep, work and lifestyles worsened under the context of the COVID-19 pandemic, with female academics experiencing significant setbacks. With these points in mind, the current study has a number of objectives.

Firstly, this study aims to characterize the self-reported sleep behaviours and sleep quality among a sample of academic staff. In addition to this, the study aims to characterize work factors and lifestyle behaviours among academic staff. The aim to characterize sleep and lifestyle is established due to the lack of research that has quantified sleep and lifestyle measures in academics. The aim to characterize work

demands such as week and weekend working hours among academic staff from SA is to establish if their aspects of their work demands are similar to previous reports among SA and international academics. The second aim of the study is to determine if gender affects sleep, health and work factors among academic staff. Gender differences in sleep, lifestyle and work are well reported in general populations but less so in academic staff populations. However, research shows that male and female academics differ notably in their work conditions. Thus, the current study aims to determine if this is the case among academic staff. The third aim is to determine if academic rank affects sleep, lifestyle and work factors. While previous studies cover work-related differences by academic ranks, much less is known of the differences between ranks regarding their health and sleep. Thus, the current study will determine if the work-related differences between academic ranks from the current study are similar to that of previous findings. Lastly, the study aimed to consider if and how patterns of sleep and work may have changed under the context of COVID-19, given reports in academic contexts and general populations that characteristics of sleep, lifestyle and work modified during the pandemic.

CHAPTER III

3 METHODS

3.1 DESIGN

The current study adopted a cross-sectional design, which was composed of qualitative and quantitative research.

3.2 LOCAL RESEARCH CONTEXT

The study was conducted in one of South Africa's 26 public universities. Founded in 1904, the university has an enrolment of just over 8200 students and is considered a relatively small institution. The university is located within the Eastern Cape province and is primarily a research-led institution, being a critical research institution in the African continent. Thirty percent of students are postgraduates and 18% are international students from 54 countries worldwide (Mabizela, 2019). There are 509 permanent and part-time academic staff are organized into 44 departments (Rhodes University, 2020), housed within six faculties. Students and academic staff are organized within the faculties of Humanities, Science, Commerce, Pharmacy, Law, and Education (Rhodes University, 2020). Some academic staff only conduct research or lecture, while others engage in a combination of teaching and research. As of March 2020, the student population was divided into the faculties as follows: 42.7% Humanities; 18.9% Science; 15.8% Commerce; 10.7% Education; 9.1% Pharmacy; 2.4% Law (Rhodes University, 2020). It is also considered to have the most favourable ratio of academic staff to student among all South African universities (Mabizela, 2019).

3.3 SETTING OF COVID-19 LOCKDOWN DURING TIME OF STUDY AND DATA COLLECTION

The study aimed to report sleep, work and health characteristics of sleep in academic staff. However, as discussed in the previous chapter, these characteristics modified during the COVID-19 pandemic. Hence, the context during the time of the data collection period should be acknowledged such that the sleep, work and lifestyle features of academic staff who participated were studied under abnormal conditions that involved learning and working from home. The academic staff that were involved in this study participated just after the mid-year exams. Most academic staff were marking, teaching, assessing and consulting online during the duration of the data

collection period. Data collection occurred between 21 July 2020 and 14 September 2020.

In terms of the general COVID-19 lockdown setting, on 26 March, the South African government instituted a 21-day nationwide lockdown that severely restricted travel and movement. Every SA citizen was only allowed to leave their homes to buy food, acquire medical help or under extreme circumstances (SADoH, 2020). The SA government instituted a risk-adjusted alert system, with levels 1 to 5, to manage the gradual easing of the lockdown. Alert level 5 involved drastic and strict regulations whereas level 1 involved the resuming of most normal activity. From 26 March to 20 April 2020, SA was at alert level 5. Alert level 4 was instituted from 1 to 31 May 2020. Thereafter, the country went to level 3 from 1 June to 17 August 2020. On 18 August and up until the end of the study's testing period, the country was on alert level 2 (RSA, 2020). Over this period, all citizens could only leave their homes for food, health reasons or work (if permitted). For academic staff, no face-to-face teaching activities were permitted and the majority of learning occurred online. To curb the spread of the virus, social isolation was essential for all citizens wherever possible and, in circumstances where physical interactions were necessary, the practice of social distancing 2 meters apart was imposed. Unless classified as an essential worker, the majority of citizens had to work from home (SADoH, 2020).

3.4 QUESTIONNAIRE & VARIABLES

The study utilized a self-administered, anonymous questionnaire that comprised of five main sections: (1) sociodemographic information; (2) work-related information; (3) general health and lifestyle information; (4) the Pittsburgh Sleep Quality Index (PSQI) that included a follow-up open-ended question relating to sleep disturbances (Buysse *et al.*, 1989); and (5) an open-ended question relating to the change in work and sleep patterns during the lockdown. Extended explanations and justifications of the questions can be found in **Appendix A**. The fourth and fifth parts employ the PSQI and the open-ended question whose details will be found below. All five parts were compiled into one online questionnaire accessed on Google Forms (**Appendix F**)

3.4.1 Overview of the questionnaire sections

3.4.1.1 Section 1: Sociodemographic characteristics

Sociodemographic variables included questions related to participant age, gender (male, female, non-binary, prefer not to say), marital status (single, in a relationship, married, divorced/separated, widowed), number of children and number of children under the age of 5 years.

3.4.1.2 Section 2: Work characteristics

In this section of the survey, participants were asked questions related to characteristics of their highest postgraduate qualification (diploma, honours/Bachelor's degree, Master's degree, PhD), academic rank (junior researcher, junior lecturer, researcher, lecturer, senior researcher, senior lecturer, associate professor, professor, distinguished professor, teaching assistant, other position), faculty (humanities, science, commerce, pharmacy, law, education), estimated weekly (Monday to Friday) work hours (h), frequency of weekend work (never, rarely/occasionally, one day of the weekend, both weekend days), estimated daily weekend work hours (h) and commute time to and from work (min). Other work variables that the literature has highlighted as a component to sleep, such as weekday and weekend work hours were also included (Sekine *et al.*, 2006; Virtanen *et al.*, 2009; Afonso *et al.*, 2017). Detailed justifications for these questions can be found in **Appendix A.**

3.4.1.3 Section 3: General health and lifestyle characteristics

In order to compute body mass index (BMI, kg/m^2), participants were asked to provide their stature/height (cm) and mass (kg). Participants were asked to select which of the chronic diseases they had been diagnosed with, such as cardiovascular disease, stroke, cancer, diabetes mellitus, obesity, high blood pressure, asthma, arthritis, memory problems/forgetfulness, enlarged prostate (men only) or none of the above. Additionally, smoking status was determined by asking participants to indicate if they were either a 'current smoker', 'former smoker' or 'non-smoker' and adherence to WHO (2020) physical activity (PA) guidelines was asked dichotomously (yes, no). Respondents were asked to provide their estimated weekday sedentary time (h), daily weekday screen time (h), daily weekend screen time, frequency of screen use one hour before bed on weeknights (never, rarely/occasionally, once or twice a week, three

nights a week, every weeknight) as well as the frequency of screen use one hour before bed on weekend nights (never, rarely/occasionally, one weekend night, all/every weekend night).

Participants were asked to provide their average daily caffeine servings (0, 1-10, >10) as well as the time they estimate to have their last serving of caffeine which could be selected at half-hour intervals on a 24-hour clock (e.g. 12h00, 12h30, 13h00). Similarly, they were asked to provide their average weekly servings of alcohol (0, 1-20, >20) and the time estimated for which they tend to have their last serving. This could also be selected at half-hour intervals on a 24-hour clock (e.g. 20h00, 20h30, 21h30). These variables of health and lifestyle were included because they are also major determinants or components of sleep and therefore need to be characterized or quantified (Foley *et al.*, 2004; Taheri *et al.*, 2004; Vgontzas *et al.*, 2008; Shochat, 2012; Egger & Dixon, 2014; Irish *et al.*, 2015). Detailed justifications for these questions may be found in **Appendix A**.

3.4.1.4 Section 4: Sleep quality and behaviour characteristics

3.4.1.4.1 The Pittsburgh Sleep Quality Index (PSQI)

The PSQI was utilized to determine sleep quality and sleep quality parameters of the sample. The instrument is advantageous in investigating both qualitative and quantitative factors affecting sleep quality of the prior month (Buysse *et al.*, 1989). The purpose of the instrument is to: (1) measure sleep quality in a way that is reliable, valid and standardized; (2) distinguish between “good” and “bad” sleepers; (3) offer an easy-to-use index for researchers to interpret; and (4) provide a brief assessment of various sleep disturbances that may affect sleep quality (Buysse *et al.*, 1989, p. 194). Because the PSQI assesses sleep quality for the prior month, it is useful as a general assessment of sleep quality, although it does not rate sleep quality on a particular night (Donnell *et al.*, 2009). Nevertheless, an assessment of 1-month intervals is considered clinically and scientifically useful (Buysse *et al.*, 1989). However, the instrument primarily measures sleep quality to identify good and bad sleepers, and therefore cannot provide accurate clinical diagnoses of sleep-related issues.

3.4.1.4.1.1 Sleep-related variables

The PSQI includes 19 self-rated questions (items) that assess a wide variety of factors affecting sleep quality based on seven subscales. These seven

subscales/components include: sleep quality rating (very good, fairly good, fairly bad, very bad), sleep duration (h), sleep latency (min), sleep efficiency (actual sleep duration/time in bed x 100) and frequencies of sleep disturbances as well as sleep medication use and daytime dysfunction. Sleep disturbances that include: “I cannot get to sleep within 30 minutes”, “I wake up in the middle of the night or early morning”, “I have to get up to use the bathroom”, “I cannot breathe comfortably”, “I cough or snore loudly”, “I feel too cold”, “I feel too hot”, “I have bad dreams”, “I have pain” and “other reasons”.

Each component is scored and equally weighted on a scale of 0 to 3. The global PSQI score was computed for each respondent by following the instructions laid out by Buysse *et al.* (1989). The seven subcomponent scores were added up to get a global score out of 21. The sum of the seven component scores yields a global PSQI score that ranges between 0-21. High scores reveal a worse sleep quality while lower scores indicate better sleep quality. Global scores five or more (≥5) classifies participants as poor sleepers and indicates the clinical cut-off point for potential sleep disorders (Buysse *et al.*, 1989).

3.4.1.4.1.2 Follow-up question

If participants had other reasons for their sleep being disturbed, the PSQI included a follow-up, qualitative question that allowed respondents to extend on this. The question read, “Please state and describe any other reason(s) your sleep may be disturbed or disrupted”.

3.4.1.5 Section 5: Open-ended question relating to sleep and work patterns during COVID-19

During the time of the data collection process, academic staff from the study were under level 2 lockdown in SA. Consequently, academic staff (among other workers classed as ‘non-essential’) had to work from home and emphasize social distancing to curb the spread of the virus (SADoH, 2020). Early research on the impact of COVID-19 lockdowns showed that both work conditions (Altena *et al.*¸2020) and sleep (Sañudo *et al.*, 2020; Cellini *et al.*, 2020; Innocenti *et al.*, 2020; Gupta *et al.*, 2020; Leone *et al.*, 2020) changed under conditions of home confinement. Hence, while the initial aim of the study was to characterise sleep and work variables of academic staff, an open-ended question was warranted to provide respondents with the opportunity

to qualitatively detail their experiences of working and living under this 'new normal'. The open-ended question asked about any changes to work and sleep patterns in the context of the COVID-19 lockdown. The question posed was, "*Has COVID-19 affected your normal work routines and sleep patterns? If so, how*?"

3.5 PARTICIPANT CHARACTERISTICS

3.5.1 Inclusion criteria

All employed academic staff (including those employed on research tracks only) were invited to participate in the study. This included academic staff on both permanent and temporary contracts irrespective of the length. This is because one of the main objectives was to characterize sleep, health and work features of a sample of academic staff from the university as a whole.

3.6 ETHICAL APPROVAL PROCESS

Ethical approval application for the study was submitted to the Rhodes University (RU) Ethics Committee on 17 June 2020 and was granted provisional acceptance with pending Gatekeeper permission on 29 June 2020 (ref: 2020-1432-3549) (**Appendix B**). Gatekeeper permission was requested from the Human Resources Division of RU on 29 June 2020 and the study was fully approved on 8 July 2020 (**Appendix C**).

3.7 STUDY PREPARATIONS, SAMPLING PROCEDURES & DATA COLLECTION

3.7.1 Pilot of the questionnaire

A draft questionnaire was piloted on Google Forms to five academic staff from a single department in the university. Staff provided feedback related to some of the questions (excluding the PSQI which could not be changed). Some changes, for example, involved providing some examples of physical activity and re-wording the questions to be more explicit. Final adjustments were made and the final questionnaire was developed. The feedback can be found in **Appendix D**.

3.7.2 Distribution of email invitation

Following ethical clearance from the RU Ethics Committee (ref: 2020-1432-3549), permission from the university's Human Resources department and finalization of the questionnaire, an email invitation was distributed to all employed academic staff at the university. The email invitation was sent out three times throughout the testing period (week 1, 4, 6). In week 1 and 4, convenience sampling was used such that the email

invitation was distributed to faculty and departments via faculty administrators or department heads. Convenience sampling is a non-probability method of sampling members that meet practical criteria (i.e. easy to access and willingness to participate) especially when it is desirable to use the entire population but, in most cases, it is not possible (Etikan *et al.*, 2016). By week 6, in order to increase the opportunities for staff to participate, a method of snowball sampling was used. Snowball sampling tends to follow convenience sampling of an initial subject who then passes on the study invitation onto potential respondents based on their social (in this case, professional) connections (Etikan *et al.*, 2016). The primary researcher of the study, a senior-level academic at the institution, distributed the email invitation to several individual colleagues from all departments and requested them to distribute it to their colleagues in the university as well.

3.7.3 Contents of the email invitation and provision of consent

The study invitation email included a brief background, objectives, general procedure and usefulness of the study. These forms can be found in **Appendix E** and the questionnaire can be found in **Appendix F**. The survey was made accessible on the email via a link to the Google Form. Once individuals followed the link to the form, an information/introductory page outlined the contents of the questionnaire, participant rights, the risks and benefits associated with participation and contact details of the researchers. At the bottom of the briefing page, participants could click 'Next' which took them directly to the questionnaire. By clicking 'Next', participant consent was assumed. Participants were asked to fill it out in their own time. All questions were compulsory unless stated otherwise and the questionnaire took between 10 to 15 minutes to complete. The testing period was between 21 July 2020 and 14 September 2020 (9 weeks). At the end of the testing period, an excel sheet including all the raw data were downloaded from the Google Form page to an excel document for data reduction and statistical analyses.

3.8 ANALYSES

3.8.1 Data cleaning and reduction

At the end of the testing period, the raw dataset was downloaded from Google Forms onto a Microsoft Excel document, where it was cleaned and coded. Five of these questionnaires were excluded as they were used in the pilot of the questionnaire.

Table 1 details instances where data cleaning issues were evident and how these issues were dealt with. Other instances of data cleaning not included in the table involved changing entries into numerical responses where respondents used words (e.g. “two” was changed to “2”). Data were converted to numerical format to correct it. Where respondents provided numerical ranges (e.g. 60-65), the median value (e.g. 62.5) was inserted into the datasheet. For statistical analyses, smoking status was collapsed such that former smokers were joined with non-smokers. Additionally, although ranges were presented in the questionnaire, alcohol and caffeine consumption were converted into mean values. If a respondent indicated “>10” or “>20”, it was entered as “10” or “20” for analysis.

3.8.2 Grouping of academic ranks

Prior to statistical testing, academic staff were organized into three main groups of increasing academic rank. The first, *junior and intermediate-level academics,* consisted of junior researchers, researchers, and lecturers. In addition, it included three respondents who indicated academic rank as ‘other position’ and one who indicated being a teaching assistant. The ‘other position’ (3 respondents) and one teaching assistant were initially placed in their own separate group but were later put within the junior and intermediate-level group. This was done because: (1) having a group of 4 respondents meant that the representation of that group was extremely small compared to others; (2) three of the four were 25 years or younger and respondents in other groups were at least 30 years or older; and (3) the fourth respondent, although 44 years old, held a Diploma and the only level where participants held degrees below the Master’s were junior and intermediate-level academics. Hence, these respondents were included into the junior and intermediate-level academics group. The second, *senior-level academics*, relates to academics in their mid-career and included senior lecturers and some senior researchers. The third and last, *professorship-level academics*, included associate professors, professors and a distinguished professor.

Table 1. List of data cleaning issues in participants' raw responses and how the data were cleaned prior to statistical testing.

	Variable	Participant's response	Cleaned response
General health and lifestyle	**BMI**	"0" provided for mass	BMI could not be computed, individual response omitted.
	Sedentary time	Two respondents answered, "38 hours" and "84" which was assumed as a weekly average	Responses were divided by 5 to compute daily average.
	Weekday screen time	Several respondents provided responses that indicated the weekly average.	Responses were divided by 5 to compute the daily average.
	Weekend screen time	A participant said, "20" which was assumed as the average of the entire weekend.	20 was divided by 2 to compute daily weekend average.
	Time of last caffeine serving	Participant gave very early morning hours were coded as evening hours after cross-checking other measures and using discretion.	"05h00" was changed to "17h00". The was done for participants who recorded hours such as "01h30", "03h30" and "07h30" which were changed to "13h30", "15h30" and "19h30".
	Alcohol time	Some respondents provided morning hours.	Morning hours were changed to afternoon/evening hours as alcohol consumption in the morning is atypical.
Work	**Weekly work hours**	a) Respondents gave answers such as "9am to 10pm", "7.30am to 10pm, and so on b) Respondents within middle to higher ranks provided: '9', '12', '14', '13'	a) Daily work hours were calculated (e.g. 9am to 10pm = 11 hours) and multiplied by 5 to determine the total weekly work hours. b) Responses were multiplied by 5 to provide weekly estimation.
	Daily weekend work hours	a) A response of '50h' was provided. It was assumed as the sum of weekday + weekend work hours as the respondent indicated 40 hours of weekly work hours. b) Four respondents indicated "0"	a) 40 was subtracted from 50 to get a total weekend hour of 10. b) These responses were excluded from the analysis so as not to skew the data.
	Commute time	a) "15 min x 2" and "5 min one way" b) "5 min drive, 20 min walk" c) "540"	a) Values were multiplied by 2 to gain full commute time. b) Computed as 25 minutes c) Coded as 54 minutes (540min made no sense as a daily commute time).
Sleep	**Bed time**	Participants provided their response in hours which was changed to numerical values.	E.g. "20h30" was coded as "20.5" and "01h30" was coded as (25.5) as bedtime extends beyond the 24-hour clock.
	Sleep duration	Two respondents have their total sleep hours for the entire month (e.g. "170" and "180").	Values were divided by 30 to determine daily sleep duration.

3.8.3 Descriptive statistics

TIBCO Statistica® (Version 14.0.0) was the statistical software used to conduct all statistical testing. The Shapiro-Wilks test was used to test the data for normality. Descriptive statistics in terms of means (*M*) and standard deviations (±*SD*) or medians (*Mdn*) and interquartile ranges (*IQR*) of 25% and 75% were computed prior to determining inferential statistics. Age, total weekly hours, week hours, weekday sedentary time, weekday screen time, timing of last caffeine serving, time of last serving of alcohol, wake time, time in bed and global PSQI scores were all normally distributed and were therefore reported using *M* and ±*SD*. Responses for the number of children, number of children under the age of 5 years, weekend work hours, weekend screen time, commute time, BMI, smoking status, bedtime, time to fall asleep, sleep efficiency, mean alcohol and caffeine serving and actual hours of reported sleep were not normally distributed and were therefore reported in *Mdn* with an *IQR* of 25% to 75%.

3.8.4 Inferential statistical analyses comparing responses by genders

Only males and females were included in the analyses of genders, as only one respondent fell within the ‘prefer not to say’ group. This individual’s responses are reported in Appendix H. When determining the differences between males and females for normally distributed data, independent t-tests were applied. Where data were not normally distributed, the non-parametric equivalent, the Mann-Whitney U test, was employed. An alpha level of 0.05 was set to define statistically significant results. All statistical findings can be found in **Appendix I**.

3.8.5 Inferential statistical analyses comparing responses by academic ranks

When data was normally distributed, a one-way Analysis of Variance (ANOVA) was used to determine the differences between the three academic rank groups (junior and intermediate, senior and professorship levels). When data was not normally distributed, the non-parametric equivalent (the Kruskal-Wallis test) was utilized. If significant differences were evident between academic ranks in the normally distributed data, Tukey’s HSD posthoc test was run. For data that was not normally distributed, pairwise comparisons were made using the Mann-Whitney U test. An alpha level of 0.05 was set to define statistically significant results. All statistical findings can be found in **Appendix J**.

3.9 THEMATIC ANALYSES

3.9.1 Method of thematic analyses for qualitative data

The first qualitative question came from the PSQI in which respondents could detail any other sleep disturbances that the PSQI did not list specifically. The second qualitative question pertained to the changes in work and sleep patterns due to the impact of COVID-19.

Analyses of the two open-ended questions were performed through thematic analyses. Braun and Clarke (2006) provide guidelines for identifying, analyzing and reporting patterns within the data. The guidelines included six main phases: (1) familiarizing with the data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; (6) producing the report. The analysis method for both questions relied on steps 1 to 4 as steps 5 and 6 take place in the discussion chapter. The final thematic maps were modelled using an online website called Miro (https://miro.com/mind-map/), which offers free and easy-to-use mind mapping software. Maps were developed on the website and were exported and saved as JPG image files.

The following provides a brief overview ad the use of the phases by Braun and Clarke (2006):

1. *Familiarizing with the data* involved repeated reading and taking notes or writing out ideas of any notable meanings or patterns. Individual entries were organized into a table format (column 1) and read over three times prior to formal coding. The focus was to become familiar with all aspects of the data. Next to the responses, a second column (column 2) was created for the researcher to write out notes and ideas that emerged from reading over the data. These notes supplemented later stages.

2. *Generating initial codes* involved going through each response, giving equal attention to each data item and writing out initial codes in a new column (column 3). The purpose of the initial codes was to identify basic features of the data, including what was most interesting to the analyst and begin organizing the data into meaningful groups. These codes were meant to be broader than the actual themes that would be identified in later steps. The coding process was data-driven

instead of theory-driven, meaning that codes and themes did not depend upon a pre-existing hypothesis but otherwise depended on the data directly. It was key that as many potential patterns or themes were coded for, that the codes maintained context from the data extracts and that individual extracts included as many different themes it could be coded into to gage patterns of repeatability. When codes were repeated or a pattern of similar codes was identified, they were colour-coded. Colour-coding was performed by highlighting words or parts of sentences of the initial codes in column 3 where repetitions or patterns were identified throughout the entire dataset.

3. *Searching for themes* involved identifying broader themes by sorting the different codes into potential themes. All initial codes were colour-coded and sorted into potential themes by determining how different codes might combine to form an overarching theme and sub-themes. Paper-based draft mind-maps were developed during this stage to visually represent grouped codes under broader themes. The phase ended with all data extracts being coded and a collection of candidate themes and sub-themes developed.

4. *Reviewing themes* involved refining the candidate themes identified in phase 3. This phase was focused on ensuring that the data within the themes make sense being grouped together whilst maintaining clear and distinguishable boundaries between themes. During this phase, some themes may be removed, some might collapse together or may have to be separated. Reviewing themes involved refinement of candidate themes by reading over individual extracts that have been coded. This is to ensure that the content of data truly does fit within a pattern and, therefore, within that code. Secondly, it involved a phase of re-reading the entire data set to guarantee that the themes ‘work’ in relation to the overall data set. It also provided an opportunity to code any additional data that could have been missed in earlier stages.

5. *Defining and naming themes* was the process of identifying the essence of what each theme was about. This involved accompanying the organized themes and sub-themes with a narrative of what was of interest and why. Essentially, the phase detailed the ‘story’ that each theme tells and how it fit within the overall story that the data was telling. At the end of this phase, researchers were able to define what

the themes were and what they were not. In the current study, this phase was blended into the Results section.

Although not mentioned within the guidelines of Braun and Clarke (2006), for the purpose of validating the codes and themes generated, the primary and secondary researcher ensured agreement about the generation of the initial codes and themes. If the reader is interested in how the steps were directly applied to the dataset, it can be found in **Appendix G**.

CHAPTER IV

4 RESULTS

Out of 509 of academic staff employed at university, 84 questionnaires were submitted, making the response rate 16.5%.

The sociodemographic, work, general health and lifestyle and sleep characteristics of the entire sample are reported first. Thereafter, the results of the gender comparisons followed by the rank comparisons are presented. Significance levels are presented in the tables in *p*-values with significantly different values (<0.05) marked in red font with an asterisk. All results for the quantitative data are presented in tables with the supplementary text for each table coming above/before it. Suppose the number of responses for a particular variable was greater or less than the total number of expected responses (*N* = 84). In that case, the number of respondents as well as the percentage that responded are indicated in bold in the tables. Where the number and percentage are not indicated for a variable, it must be assumed that that all respondents provided data. Reponses from the participant whose gender was selected as 'prefer not to say' can be found in **Appendix H**. Their responses could not be included within the statistical analyses due to only having one respondent in this group.

RESULTS OF THE OVERALL SAMPLE

4.1.1 Sociodemographic characteristics of the academic sample

As displayed in **Table *2***, of the sample of 84 respondents, 35 (41.66%) were male, 48 (57.14%) were female and 1 (1.19%) preferred not to say. Participants' ages ranged from 24 to 79 years. The average age was 46.53 (±11.72 years), with one respondent not providing their age. The majority of respondents (27.1%) were between the ages of 40-49, followed by 50-59 (25.3%). The majority of respondents (57.14%) were married, 38.01% did not have children while 35.71% had two children and the majority (91.01%) did not have children under the age of 5 years.

Table 2. Summary of descriptive statistics detailing sociodemographic information of academic staff using mean (*M*) and standard deviation (±*SD*) where appropriate. The number of total responses is provided in bold if less or more than the total number of respondents (i.e. *N* = 84) that provided responses

Variables	*N (%)*	*M ± SD*
Gender		
Male	35 (41.66)	
Female	48 (57.14)	
Non-binary	-	
Prefer not to say	1 (1.19)	
Age	**83 (98.81)**	46.53 ± 11.72
Marital status		
Single	20 (23.81)	
In a relationship	11 (13.01)	
Married	48 (57.14)	
Divorced/separated	3 (3.57)	
Widowed	2 (2.38)	
Number of children		
None	32 (38.01)	
1	16 (19.05)	
2	30 (35.71)	
3	4 (4.76)	
4	2 (2.38)	
Number of children under 5 years		
0	76 (91.01)	
1	8 (8.98)	

4.1.2 General health and lifestyle characteristics of the academic sample

As indicated in **Table *3***, the median body mass index (BMI) of the group was 26.67 kg/m^2 (*IQR* of 23.8 to 29.45 kg/m^2). Based on the responses related to health chronic diseases (*n* = 90), majority of academic staff (63.33%) did not report having a chronic illness. Eight (8.89%) had asthma, seven (7.76%) had high blood pressure, five (5.56%) had arthritis, four (4.44%) had obesity, four (4.44%) had memory problems/forgetfulness, two (2.22%) had cancer and one (1.11%) had diabetes mellitus. Most of respondents (85.71%) were non-smokers and over two-thirds (64.29%) reported meeting WHO physical activity guidelines. Mean weekday daily sedentary time was 9 h 56 min (±2 h 50 min). Daily weekday screen time was 9 h 24 min (±3 h 16 min) and daily weekend screen time was 5 h 30 min (*IQR* 4 to 10 h).

On weeknights (Monday to Friday) the majority of the respondents (76.19%) used a screen at least one hour before bed every weeknight, followed by three nights a week (15.48%). On weekend nights (Saturday and Sunday), the majority of academic staff (67.88%) used a screen at least one hour before bed every weekend night, followed by one weekend night (22.62%). Twelve (14.29%) respondents reported not consuming caffeine. Out of the respondents who reported consuming caffeine (*n* = 72), median consumption was three (*IQR* 2 to 4) servings per day. The mean time of the last serving of caffeine was 15:06 p.m. (±3 h 43 min). Over one third of academic staff from the study (38.1%) indicated not consuming alcohol. From the pool of respondents who reported consuming alcohol (*n* = 52), median consumption was seven servings per week (*IQR* 3 to 10). The mean time for the last serving of alcohol was 20:10 p.m. (±1 h 5 min).

4.1.3 Work characteristics of the academic sample

As indicated in **Table 4**, holding a PhD was the most common and highest postgraduate qualification (61.9%), followed by a Master's degree (28.57%). The representation of academic ranks was: 28.57% lecturers, 19.05% senior lecturers, 19.05% associate professors, 16.67% professors, 4.76% senior researchers, 3.57% junior researchers, 3.57% in other positions, 1.19% teaching assistants, 1.19% distinguished professors and none of the respondents were junior lecturers. Faculties with the highest representation were Science (38.1%), Humanities (22.62%) and Education (16.67%). Mean reported total estimated weekly work hours (i.e. week and weekend work hours combined) was 54 h 25 min (±11 h 31 min). Total reported estimated weekly work hours (i.e. Monday to Friday) averaged at 47 h 25 (±9 h 52 min). Total estimated weekend work hours had a median of 6 h (*IQR* 4 to 8 h 30 min). Respondents worked over weekends most frequently on one day of the weekend (44.05%), while 29.76% reported on both weekend days followed by those who worked on weekends rarely or occasionally (22.62%) and never (3.57%). Lastly, median daily commute time was 10 min (*IQR* 7 min 30 s to 20 min).

Table 3. Descriptive statistics of general health and lifestyle information of academic staff using mean (*M*) and standard deviation (±*SD*) or median (*Mdn*) and interquartile ranges (*IQR*; 25-75%) where appropriate. The number of total responses is provided in bold if less or more than the total number of respondents (i.e. *N* = 84) provided responses.

Variables	*N* (%)	*M ± SD*	*Mdn* (IQR 25-75%)
Body Mass Index (BMI)	**83 (98.81)**		26.67 (23.8 - 29.45)
Chronic conditions	**90 (107.14)**		
Cardiovascular disease	-		
Stroke	-		
Cancer	2 (2.22)		
Diabetes mellitus	1 (1.11)		
Obesity	4 (4.44)		
High blood pressure	7 (7.76)		
Asthma	8 (8.89)		
Arthritis	5 (5.56)		
Memory problems/forgetfulness	4 (4.44)		
Enlarged prostate	2 (2.22)		
None of the above	57 (63.33)		`
Smoking status			
Current smokers	12 (14.29)		
Non-smokers	72 (85.71)		
Meeting physical activity guidelines			
Yes	54 (64.29)		
No	30 (35.71)		
Weekday sedentary time (h.min/day)	**82 (97.62)**	9.56 ± 2.50	
Weekday screen time (h.min/day)		9.24 ± 3.16	
Weekend screen time (h.min/day)	**81 (96.43)**		5.30 (4 – 10)
Screen use 1 h before bed (weeknights)			
Never	1 (1.19)		
Rarely/occasionally	2 (2.38)		
Once/twice a week	4 (4.76)		
Three nights a week	13 (15.48)		
Every weeknight	64 (76.19)		
Screen use 1 h before bed (weekend nights)			
Never	1 (1.19)		
Rarely/occasionally	7 (8.33)		
One weekend night	19 (22.62)		
All/every weekend night	57 (67.88)		
Caffeine consumption (servings/day)	**70 (83.33)**		3 (2 – 4)
Time of last serving (hh:mm)		15:06 ± 03:45	
Alcohol consumptions (drinks/week)	**51 (60.71)**		7 (3 – 10)
Time of last serving (hh:mm)		20:10 ± 01:05	

Table 4. Descriptive statistics of work-related characteristics of academic staff using means (*M*) and standard deviations (±*SD*) or medians (*Mdn*) and interquartile ranges (IQR; 25-75%) where appropriate. The number of total responses is provided in bold if less or more than the total number of respondents (i.e., *N* = 84) provided responses.

Variables	***N* (%)**	***M ± SD***	***Mdn (IQR* 25 – 75%)**
Highest postgraduate qualification			
Diploma	1 (1.19)		
Honours degree	7 (8.33)		
Master's degree	24 (28.57)		
PhD	52 (61.9)		
Academic rank			
Junior researcher	3 (3.57)		
Junior lecturer	-		
Researcher	2 (2.38)		
Lecturer	24 (28.57)		
Senior researcher	4 (4.76)		
Senior lecturer	16 (19.05)		
Associate professor	16 (19.05)		
Professor	14 (16.67)		
Distinguished professor	1 (1.19)		
Teaching assistant	1 (1.19)		
Other position	3 (3.57)		
Faculty			
Humanities	19 (22.62)		
Science	32 (38.1)		
Commerce	11 (13.1)		
Pharmacy	2 (2.28)		
Law	6 (7.14)		
Education	14 (16.67)		
Estimated weekday work hours (h.min)	**83 (98.81)**	47.25 ± 9.52	
Estimated daily weekend work hours (h.min)	**78 (92.86)**		6 (4 – 8.30)
Total estimated weekly work hours (h.min)	**83 (98.81)**	54.25 ± 11.31	
Frequency of weekend work			
Never	3 (3.57)		
Rarely/occasionally	19 (22.62)		
One day of the weekend	37 (44.05)		
Both weekend days	25 (29.76)		
Daily commute time (min.sec)	**82 (97.62)**		10 (7.30 – 20)

4.1.4 Sleep behaviours and characteristics of the academic sample

Table 5. Descriptive statistics of sleep characteristics of academic staff using means (M) and standard deviations (±*SD*) or medians (*Mdn*) and interquartile ranges (*IQR*; 25-75%) where appropriate. The number of total responses is provided in bold if less or more than the total number of respondents (i.e., *N* = 84) provided responses.

Variable	*N* (%)	*M ± SD*	*Mdn (IQR* 25 – 75%)
Estimated bedtime (hh:mm)			22:00 (22:00 – 23:00)
Time taken to fall asleep (min.sec)	**82 (97.62)**		20 (10 – 33.45)
Wake time (hh:mm)		06:38 ± 01:14	
Estimated sleep duration (h.min)	**81 (96.43)**	6.41 ± 1.06	
Time in bed (h.min)		8.01 ± 1.12	
Subjective sleep quality			
Very good	18 (21.43)		
Fairly good	44 (52.38)		
Fairly bad	19 (22.62)		
Very bad	3 (3.57)		
Sleep efficiency (%)	**79 (94.04)**		87.5 (77.03 – 93.3)
Presence of bed partners			
No bed partner/roommate	25 (29.76)		
Partner/roommate in other room	2 (2.38)		
Partner/roommate in same room, different beds	1 (1.19)		
Partner/roommate in same room, same bed	56 (66.67)		

As depicted in **Table 5**, the median bedtime was 22:00 (*IQR* 22:00 to 23:00). The median time it took to fall asleep was 20 min (*IQR* 10 to 30 min 45 s). Mean wake time 06:38 (±1 h 14 min). On average, academic staff reported sleeping for 6 h 41 min (±1 h 6 min).

Average reported time in bed was 8 h 1 min (±1 h 12 min). Median sleep efficiency was 87.5% (*IQR* 77.03% to 93.3%). In terms of subjective sleep quality of the prior month, most academic staff (52.38%) rated their sleep as fairly good, 22.62% rated their sleep as fairly bad, 21.43% slept very good and 3.57% slept very badly. Fifty-six (66.67%) respondents had a bed partner/roommate they shared a bed with, 25 (29.76%) did not have a bed partner/roommate, 2 (2.38%) had a partner/roommate in

another room and 1 (1.19%) respondent had a partner/roommate in the same room but in different beds.

4.1.5 Experiences and frequencies of sleep disturbances of the prior month

As seen in **Table 6,** over half (55.95%) reported to *wake up in the middle of the night or early morning* three or more times a week, followed by once or twice a week (20.24%). Exactly half of the sample reported *having to get up to use the bathroom* three or more times a week followed by once or twice a week (23.81%). Regarding *cannot get to sleep within 30 minutes*, most respondents reported this either not during the past month (39.29%) or less than once a week (29.76%). Most respondents (89.29%) did not experience troubles breathing in the past month, followed by experiencing it less than once a week (7.14%). Additionally, the majority of academics (60.71%) did not *cough or snore loudly* during the prior month, followed by those who did less than once a week (15.48%). In terms of feeling *too cold*, over two-thirds (65.48%) of the sample did not experience this in the prior month, followed by experiencing it less than once a week (17.86%). In terms of feeling *too hot*, exactly half of the academic group did not experience this in the prior month, followed by once or twice a week (20.24%). Exactly half (50%) and one-third (33.33%) of the group did not experience *bad dreams* in the prior month and experienced it less than once week, respectively. Majority (70.24%) did not experienced *pain* in the prior month followed by experiencing it less than once a week (19.05%) in the prior month. Lastly, based on other reasons for sleep disruption of the prior month (determined in the open-ended question), other stated reasons were experienced by half (50%) of the group three or more times per week followed by once or twice a week (16.67%).

Table 6. Frequencies of different sleep disturbances experienced by the academic sample over the prior month. *N* of total responses is provided if less than total *N* of respondents (i.e. *N* = 84).

Frequency n (%)	**Not during the past month**	**Less than once a week**	**Once or twice a week**	**Three or more times a week**
Cannot get to sleep within 30 min	33 (39.29)	25 (29.76)	8 (9.52)	18 (21.43)
Wake up in the middle of the night or early in the morning	8 (9.52)	12 (14.29)	17 (20.24)	47 (55.95)
Have to get up to use the bathroom	15 (17.86)	7 (8.33)	20 (23.81)	42 (50)
Cannot breathe comfortably	75 (89.29)	6 (7.14)	3 (3.57)	-
Cough or snore loudly	51 (60.71)	13 (15.48)	12 (14.29)	8 (9.52)
Feel too cold	55 (65.48)	15 (17.86)	8 (9.52)	6 (7.14)
Feel too hot	42 (50)	16 (19.05)	17 (20.24)	9 (10.71)
Have bad dreams	42 (50)	28 (33.33)	8 (9.52)	6 (7.14)
Have pain	59 (70.24)	16 (19.05)	4 (4.76)	5 (5.95)
Other reasons, *N* = 60	8 (9.52)	8 (9.52)	14 (16.67)	30 (50)

4.1.6 Sleep quality of the academic sample

With reference to **Table 7**, the global PSQI was computed from 80 full responses of which the mean was 7.09 ± 3.8.

Table 7. Pittsburgh Sleep Quality Index global score mean (*M*) and standard deviation (*±SD*).

Sleep quality	***N* (%)**	***M ± SD***
Global PSQI score	**80 (95.24)**	7.09 ± 3.8

4.1.7 Proportion of good and poor sleepers among academic staff

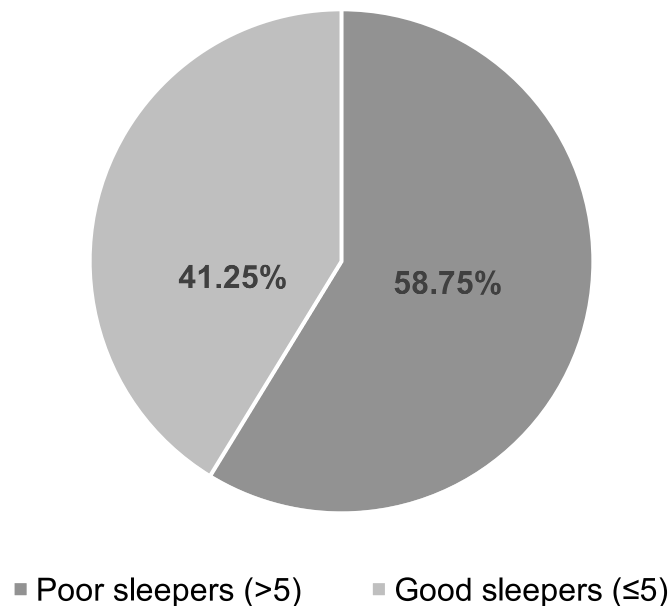

Figure 3. Percentage (%) of good and poor sleepers among the sample (*N* = 80) of academic staff. Obtaining global scores five or more (≥5) classifies participants as poor sleepers and indicates the clinical cut-off point for potential sleep disorders. More than half (58.75%) of the sample was categorized as poor sleepers, on average.

4.2 COMPARISONS BY GENDER

4.2.1 The effects of gender on sociodemographic characteristics of academic staff

With reference to **Table 8**, 48 women (57.83%) and 35 males (42.17%) responded to the questionnaire. Males did not differ significantly compared to females in mean age ($t(80) = -0.46$, $p = 0.65$) as well as in age categories ($U = 761$, $z = -0.51$, $p = 0.61$). Males and females did not differ significantly with regard to marital status ($U = 728$, $z = -0.1$, $p = 0.3$), number of children ($U = 832$, $z = -0.07$, $p = 0.94$) and children under the age of 5 years ($X^2(1, N = 83) = 0.22$, $p = 0.64$).

Table 8. Descriptive statistics (*M*, ±*SD*) as well as differences between males and females based on socio-demographic information, with the level of significant difference set at 0.05.

Gender **Variables**	**Females (*N* = 48)**	**Males (*N* = 35)**	***p*-value**
Age	45.96 ± 12.87	47.18 ± 10.2	0.65
Marital status, n (%)			0.3
Single	14 (29.17)	6 (17.14)	
In a relationship	7 (14.58)	3 (8.57)	
Married	23 (47.92)	25 (71.43)	
Divorced/separated	2 (4.17)	1 (2.86)	
Widowed	2 (4.17)	-	
Number of children, n (%)			0.95
None	16 (33.33)	15 (42.86)	
1	14 (29.17)	2 (5.71)	
2	14 (29.17)	16 (45.71)	
3	2 (4.17)	2 (5.71)	
4	2 (4.17)	-	
Number of children under 5 years, n (%)			0.64
0	44 (91.67)	31 (88.57)	
1	4 (8.33)	4 (11.43)	

4.2.2 The effects of gender on general health and lifestyle characteristics

With reference to **Table 9**, male and female academics did not differ significantly in mean BMI (U = 759, z = -0.74, p = 0.46) as well as in BMI categories (U = 750, z = -0.67, p = 0.5). Gender was not significantly associated with being a smoker or non-smoker (X^2(1, N = 83) = 0.1, p = 0.95) nor was it associated with adherence to WHO physical activity guidelines, X^2(1, N = 83) = 0.09, p = 0.76. There were no significant differences between females and males regarding weekday sedentary time (t(80) = 0.21, p = 0.84), weekday screen time (U = 707, z = -1.02, p = 0.31) and weekend screen time (U = 757, z = 0.33, p = 0.74). No significant gender differences were found for caffeine consumption (U = 786.5, z = 0.49, p = 0.632) and alcohol consumption (U = 678.5, z = -1.48, p = 0.14). Regarding the time of last caffeine serving, no significant differences were found between females and males (t(68) = 0.95, p = 0.34). However,

males had their last serving of alcohol significantly later compared to women serving ($t(48) = -2.49$, $p = 0.016$).

Table 9. Descriptive statistics (*M*, ±*SD* or *Mdn*, *IQR*; 25-75%) and differences between males and females based on general health and lifestyle information, with the level of significant difference set at 0.05. Values marked in red accompanied with an asterisk indicate a significant difference.

Gender Variables	Females (*N* = 48)	Males (*N* = 35)	*p*-value
Body mass index (BMI)	26.67 (22.31 – 29.3)	25.51 (24.31 – 29.57)	0.46
Smoking status, n (%)			0.95
Non-smoker	41 (85.42)	30 (85.71)	
Current smoker	7 (14.58)	5 (14.29)	
Meeting physical activity guidelines, n (%)			0.76
Yes	30 (62.5)	23 (65.71)	
No	18 (37.5)	12 (34.29)	
Daily weekday sedentary time (h.min)	9.10 (3.06)	9.18 (2.39)	0.84
Daily weekday screen time (h.min)	10 (7 – 10.12)	10 (8 – 12)	0.31
Daily weekend screen time (h)	6 (4 – 10)	5 (4 – 10)	0.74
Screen use 1 h before bed (weeknights), n (%)			0.49
Never	-	1 (2.86)	
Rarely/occasionally	-	2 (5.71)	
Once/twice a week	3 (6.25)	1 (2.86)	
Three nights a week	7 (14.58)	6 (17.14)	
Every weeknight	38 (79.17)	25 (71.43)	
Screen use 1 h before bed (weekend nights), n (%)			0.06
Never	-	1 (2.86)	
Rarely/occasionally	2 (4.17)	5 (14.29)	
One weekend night	9 (18.75)	9 (25.71)	
All/every weekend night	37 (77.08)	20 (57.14)	
Caffeine consumption (servings/day)	3 (2 – 4)	3 (2 – 5)	0.63
Time of last serving (caffeine, hh:mm)	15:28 (3:47)	14:37 (3:41)	0.35
Alcohol consumption (drinks/week)	7 (3 – 10)	10 (5 – 15)	0.14
Time of last serving (alcohol, hh:mm)	19:51 (00:58)	20:04 (1:08)	0.016*

Using descriptive statistics, as seen in **Figure 4,** 1.96% (*N* = 1) of females had cancer and diabetes mellitus compared to 2.63% (*N* = 1) of males that had cancer and none that had diabetes. A slightly higher proportion of males (5.26%, *N* = 2) compared to females (3.92%, *N* = 2) reported being obese and the almost the same proportions reported having high blood pressure (7.84%, *N* = 4 for females and 7.89%, *N* = 5 for males). More than double the proportion of males had asthma compared to females (5.88%, *N* = 3 vs 13.16%, *N* = 5) although 9.8% (*N* = 5) of females had arthritis compared to no males who reported being diagnosed or experiencing this disease. More females (5.88%, *N* = 3) reported having memory problems/forgetfulness compared to males (2.63%, *N* = 1) and, naturally, only males reported having an enlarged prostate (5.26%, *N* = 2). Finally, similar proportions of the sample reported having no chronic diseases (62.75%, *N* = 32 for females and 63.16 %, *N* = 24 for males). The *N* is not provided in the graph but is included in the description.

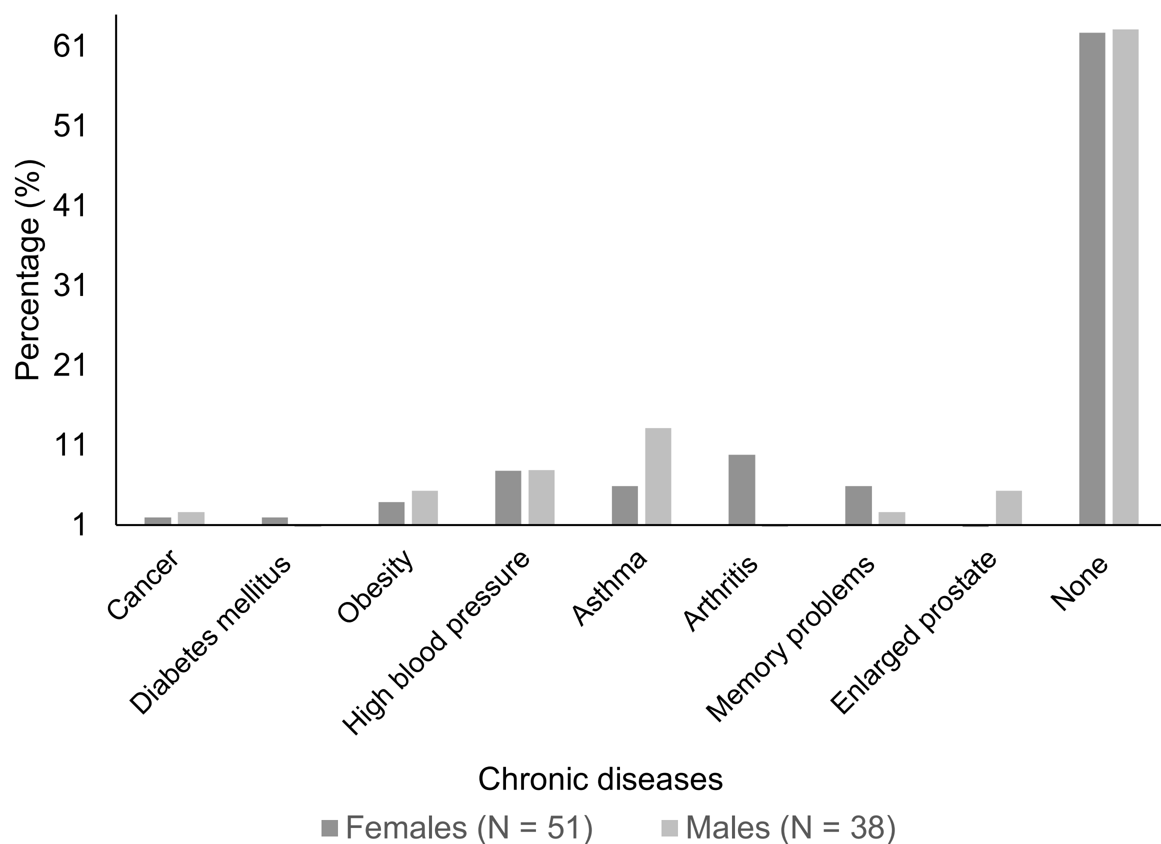

Figure 4. Percentage (%) of females (*N* = 51) and males (*N* = 38) that reported having or not having chronic disease(s). Note that there are more responses than the number of females and males in the sample, as some indicated having more than one chronic disease.

4.2.3 The effects of gender on work-related factors

Based on **Table 10**, male and female academics did not differ significantly in academic ranking (U = 767, z = -0.67, p = 0.5), faculties (U = 750, z = -0.08, p = 0.41) or highest postgraduate qualification (U = 829.5, z = -0.09, p = 0.93). Male academics reported significantly more total weekly work hours (t(80) = -2.3, p = 0.02), in addition to reporting significantly more weekday work hours (t(80) = -2, p = 0.048) when compared to female academics. However, no significant gender differences were evidenced for weekend work hours (U = 615, z = -1.34, p = 0.18). There was no significant gender difference in terms of the frequency of weekend work (U = 702.5, z = -1.26, p = 0.21) and differences of daily commute times between females and males were also not significantly different (U = 634.5, z = 1.76, p = 0.08).

4.2.4 The effects of gender on sleep behaviours

As seen in **Table 11**, males and females did not differ significantly in their reported bedtimes (U = 686.5, z = -1.41, p = 0.16), time taken to fall asleep (U = 704.5, z = 1.04, p = 0.3), wake time (t(81) = 0.6, p = 0.55) or reported sleep duration (U = 746, z = 0.35, p = 0.73). However, women had a significantly longer time in bed compared to their male counterparts (t(81) = 2.1, p = 0.039). In terms of sleep efficiency, male and female academics did not differ significantly (U = 578, z = -1.79, p = 0.07). The rating of sleep quality among academic staff also did not statistically differ between males and females (U = 700.5, z = -1.28, p = 0.2). Lastly, males and females did not differ significantly with respect to the presence of bed partners (U = 723, z = 1.07, p = 0.28).

Table 10. Descriptive statistics (*M*, ±*SD* or *Mdn*, *IQR*; 25-75%) and differences between male and female academics based on work-related characteristics, with the level of significant difference set at 0.05. Values marked in red accompanied with an asterisk indicate a significant difference.

Gender Variables	**Females (*N* = 48)**	**Males (*N* =35)**	***p*-value**
Highest postgraduate qualification, n (%)			0.93
Diploma	1 (2.08)	-	
Honours degree	3 (6.25)	4 (11.43)	
Master's degree	15 (31.25)	9 (25.71)	
PhD	29 (60.42)	22 (62.86)	
Academic rank, n (%)			0.5
Junior researcher	1 (2.08)	2 (5.71)	
Junior lecturer	-	-	
Researcher	1 (2.08)	1 (2.86)	
Lecturer	16 (33.33)	8 (22.86)	
Senior researcher	2 (4.17)	2 (5.71)	
Senior lecturer	8 (16.67)	7 (20)	
Associate professor	9 (18.75)	7 (20)	
Professor	8 (16.67)	6 (17.14)	
Distinguished professor	-	1 (2.86)	
Teaching assistant	-	1 (2.86)	
Other position	3 (6.25)	-	
Faculty, n (%)			0.41
Humanities	14 (29.17)	4 (11.43)	
Science	16 (33.33)	16 (45.71)	
Commerce	4 (8.33)	7 (20)	
Pharmacy	1 (2.08)	1 (2.86)	
Law	4 (8.33)	2 (5.71)	
Education	9 (18.75)	5 (14.29)	
Total estimated weekly work hours (h.min)	51.27 (10.58)	57.10 (11.18)	0.02*
Estimated weekly weekday work hours (h.min)	45.24 (9.26)	49.43 (9.50)	0.04*
Estimated weekend work hours (h)	5 (4 - 8)	6 (5 – 10)	0.18
Frequency of weekend work, n (%)			0.21
Never	3 (6.25)	-	
Rarely/occasionally	11 (22.92)	8 (22.86)	
One day of the weekend	23 (47.92)	14 (40)	
Both weekend days	11 (22.92)	13 (37.14)	
Daily commute time (min)	10 (10 – 20)	10 (5 – 15)	0.08

Table 11. Descriptive statistics (*M*, ±*SD* or *Mdn*, *IQR*; 25-75%) and differences between male and female academic staff based on sleep characteristics, with the level of significant difference set at 0.05. Values marked in red accompanied with an asterisk indicate significant difference.

Gender Variable	Females (*N* = 48)	Males (*N* = 35)	*p*-value
Estimated bedtime (hh:mm)	22:00 (22:00 – 23:30)	22:30 (22:00 – 23:00)	0.16
Time taken to fall asleep (min.sec)	20 (10 – 37.30)	15 (10 – 30)	0.3
Wake time (hh:mm)	06:42 (1:16)	06:53 (1:15)	0.55
Estimated sleep duration (h.min)	7 (6 – 7.5)	7 (6 – 7)	0.73
Time in bed (h.min)	8.17 (1.06)	7.44 (1.17)	0.04*
Subjective sleep quality, n (%)			0.16
Very good	8 (16.67)	10 (28.57)	
Fairly good	25 (52.08)	17 (48.57)	
Fairly bad	12 (25)	8 (22.86)	
Very bad	3 (6.25)	-	
Sleep efficiency (%),	87.1 (76.5 – 90.3)	87.5 (80 – 100)	0.07
Presence of bed partners, n (%)			0.63
No bed partner/roommate	15 (31.25)	10 (28.57)	
Partner/roommate in other room	-	2 (5.71)	
Partner/roommate in same room, different beds	1 (2.08)	-	
Partner/roommate in same room, same bed	32 (66.67)	23 (65.71)	

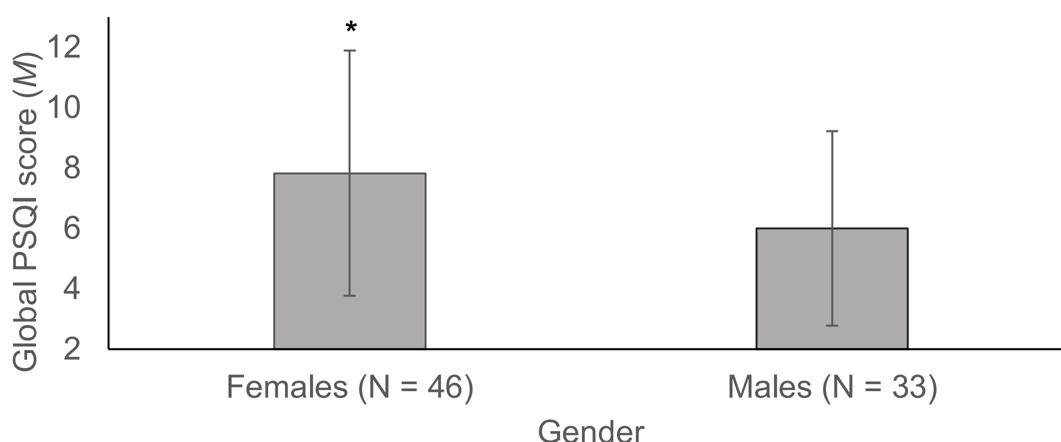

Figure 5. Difference between females (*N* = 46) and males (*N* = 33) in mean global PSQI scores (*M,* ± *SD*), with the p-value set at 0.05. The asterisk indicates a significant difference as the *p*-value was 0.035

With reference to **Figure *5*.** Difference between females (N = 46) and males (N = 33) in mean global PSQI scores (M, ± SD), with the p-value set at 0.05. The asterisk indicates a significant difference as the p-value was 0.035 female academic staff scored a significantly higher mean global PSQI score compared to men, indicative of being worse quality sleepers ($t(77) = 2.14$, $p = 0.035$). Females global PSQI was 7.83 ± 4.06 and males was 6 ± 3.22.

Figure 6. Percentage (%) of poor and good sleepers between females (*N* = 46) and males (*N* = 33). Note that the *p*-value was 0.71, indicating no statistically significant difference in these proportions, hence it is not illustrated in the graph directly. *P*-value for statistical significance was set at 0.05

Differences in the proportion of good and bad sleepers by gender

As seen in **Figure 6**, both males (57.58%) and females (60.87%) had a higher percentage of poor sleepers, respectively. However, results from the chi-square showed that gender was not statistically associated with being either a good or poor sleeper ($X^2(1, N = 83) = 0.14$, $p = 0.71$.

4.2.5 Experiences of sleep disturbances by gender

As seen in **Table 12**, males and females did not differ significantly based on the frequency of sleep disturbances except for one: there was a significant difference in the frequency of *I have bad dreams* ($U = 561$, $z = 2.57$, $p = <0.01$). There were no significant differences between males and females reporting the frequencies of the following disturbances: *I cannot fall asleep within 30 minutes* ($U = 723$, $z = 1.07$, $p =$ 0.28), *I wake up in the middle of the night or early morning* ($U = 775$, $z = 0.59$, $p =$

0.55), *I have to use the bathroom* (U = 746.5, z = 0.86, p = 0.39), *I cannot breathe properly* (U = 748.5, z = -0.84, p = 0.4), *I cough or snore loudly* (U = 663.5, z = -1.62, p = 0.1), *I feel too cold* (U = 781, z = 0.54, p = 0.59), *I feel too hot* (U = 781.5, z = 0.53, p = 0.59), *I have pain* (U = 700.5, z = 1.28, p = 0.2) and *other reasons* (U = 583, z = 0.53, p = 0.6).

Table 12. Differences between males and females in the frequency of sleep disturbances experienced in the prior month, with the level of significant difference set at 0.05. Values marked in red accompanied with an asterisk indicate a significant difference.

Frequency, n (%)	**Not during the past month**	**Less than once a week**	**Once or twice a week**	**Three or more times a week**	***p*-value**
Cannot get to sleep within 30 min					0.26
Females	17 (35.42)	14 (29.17)	6 (12.5)	11 (22.92)	
Males	16 (45.71)	11 (31.43)	2 (5.71)	6 (17.14)	
Wake up in the middle of the night or early in the morning					0.16
Females	2 (4.17)	8 (16.67)	10 (20.83)	28 (58.33)	
Males	6 (17.14)	3 (8.57)	7 (20)	19 (54.29)	
Have to get up to use the bathroom					0.35
Females	7 (14.58)	3 (6.25)	12 (25)	26 (54.17)	
Males	7 (20)	4 (11.43)	8 (22.86)	16 (45.41)	
Cannot breathe comfortably					0.12
Females	45 (93.75)	2 (4.17)	1 (2.08)	-	
Males	29 (82.86)	4 (11.43)	2 (5.71)	-	
Cough or snore loudly					0.06
Females	34 (70.83)	6 (12.5)	3 (6.25)	5 (10.42)	
Males	17 (48.57)	7 (20)	8 (22.26)	3 (8.57)	
Feel too cold					0.52
Females	31 (64.58)	6 (12.5)	5 (10.42)	6 (12.5)	
Males	22 (62.86)	9 (25.71)	3 (8.57)	-	
Feel too hot					0.56
Females	22 (45.83)	11 (22.92)	9 (19.75)	6 (12.5)	
Males	19 (54.29)	5 (14.29)	8 (22.26)	3 (8.57)	
Have bad dreams					0.004*
Females	19 (39.58)	16 (33.33)	8 (16.67)	5 (10.42)	
Males	23 (65.71)	11 (31.43)	-	1 (2.86)	
Have pain					0.2
Females	30 (62.5)	12 (25)	3 (6.25)	3 (6.25)	
Males	28 (80)	4 (11.43)	1 (2.86)	2 (5.71)	
Other reasons					0.58
Females	3 (7.9)	5 (13.16)	9 (23.68)	21 (55.26)	
Males	5 (22.73)	4 (18.18)	5 (22.73)	9 (40.91)	

4.3 COMPARISONS BY ACADEMIC RANKS

4.3.1 The effects of academic rank on sociodemographic characteristics

Following the grouping of academic ranks, the *junior and intermediate-level* of academic staff had 33 respondents, *senior-level* of academic staff had 20 respondents and *professorship-level* had 31 respondents. As depicted in **Table 13**, academic rank groups differed significantly in mean age ($F(1, 2) = 12.06$, $p = <0.01$). Results from the Tukey HSD revealed that professorship academics were significantly older than both junior and intermediate academics ($p = <0.01$) and senior level academics ($p = <0.01$). No statistical differences between academic ranks were found in relation to marital status ($H(2) = 1.3$, $p = 0.52$), number of children ($H(2) = 3.98$, $p = 0.14$), and number of children under the age of 5 years ($H(2) = 0.73$, $p = 0.69$).

Table 13. Descriptive statistics (*M*, ±*SD*) and differences between academic ranks in terms of sociodemographic characteristics, with the level of significant difference set at 0.05. Values marked in red accompanied with an asterisk indicate a significant difference. Superscript (a) indicates the numerically largest mean, superscript (b) indicates the means that are significantly different from (a).

Academic rank Variables	Junior & intermediate (*N* = 33)	Senior (*N* = 20)	Professorship (*N* = 31)	*p*-value
Age (years)	41.16 ± 13.3^{b}	44.1 ± 7.61^{b}	53.65 ± 8.33^{a}	<0.01*
Marital status, n (%)				0.52
Single	12 (36.36)	5 (25)	3 (9.68)	
In a relationship	5 (15.15)	1 (5)	5 (16.13)	
Married	15 (45.46)	13 (65)	20 (64.52)	
Divorced/separated	-	1 (5)	2 (6.45)	
Widowed	1 (3.03)	-	1 (3.23)	
Number of children, n (%)				0.028*
None	18 (54.55)	10 (50)	4 (12.9)	
1	5 (15.15)	1 (5)	10 (32.26)	
2	7 (21.21)	8 (40)	15 (48.39)	
3	1 (3.03)	1 (5)	2 (6.45)	
4	2 (6.06)	-	-	
Number of children under 5 years, n (%)				0.69
0	29 (87.88)	19 (95)	28 (90.32)	
1	4 (12.12)	1 (5)	3 (9.68)	

4.3.2 The effects of academic rank on general health and lifestyle characteristics

As seen in **Table 14**, academic rank groups did not differ significantly based on median BMIs (H(2) = 0.15, *p* = 0.93), smoking status (H(2) = 0.84, p = 0.66) and adherence to WHO physical activity guidelines (H(2) = 1.09, *p* = 0.58). Academic rank did not have an effect on weekday sedentary time (F(1, 2) = 0.56, *p* = 0.57), weeknight screen use (H(2) = <0.01, *p* = 1), weekend night screen use (H(2) = <0.01, *p* = 1), weekday screen time (H(2) = 0.52, p = 0.77), weekend screen time (H(2) = 1.12, p = 0.57), the frequency of weeknight screen time one hour before bed (H(2) = <0.01, *p* = 1) and the frequency of weekend night screen use one hour before bed (H(2) = 2.34, *p* = 0.31). No statistically significant differences were evidenced between groups in relation to caffeine consumption (H(2) = 0.12, *p* = 0.94), alcohol consumption (H(2) = 3.11, *p* = 0.21), the time of last caffeine serving (F(1, 2) = 0.39, *p* = 0.68) as well as the time of last alcohol serving (F(1, 2) = 0.04, *p* = 0.96).

Using descriptive statistics, as seen in **Figure 7**, only senior and professorship academics reported having cancer (4.35%, *N* = 1 and 3.03%, *N* = 1, respectively) and only a junior-level academic reported having diabetes mellitus (2.94%, *N* = 1). As rank levels increased, so did the proportion of obesity (2.94%, *N* = 1, for junior, 4.35%, *N* = 1, for senior and 6.06%, *N* = 2, for professorship academics). The same trend occurred for high blood pressure (5.88% of junior, *N* = 2, 8.7%, *N* = 2 for senior and 9.09%, *N* = 3 for professorship academics) as well as asthma (5.88% for junior, *N* = 2, 8.7% for senior and 12.12%, *N* = 4, for professorship academics). Only junior and intermediate-level and professorship level academics reported arthritis (5.88%, *N* = 2, and 9.09%, *N* = 3, respectively). Senior academics reported the highest proportion of memory problems/forgetfulness (8.7%, *N* = 2) followed by professorship (3.03%, *N* = 1) and junior and intermediate academics (2.94%, *N* = 1). No senior academics reported an enlarged prostate, although 2.94% (*N* = 1) of junior and intermediate and 3.03% (*N* = 1) of professorship academics did. Finally, as academic rank levels increased, the proportion of each ascending group indicating no chronic diseases decreased: 70.59% (*N* = 24) of junior, 65.22% (*N* = 15) of senior and 54.55% (*N* = 18) of professorship academics reported no chronic diseases. The *N* is not represented in the graph but is in the description.

Table 14. Descriptive statistics (*M*, ±*SD* or *Mdn*, *IQR*; 25-75%) as well as differences between academic ranks based on general health and lifestyle information, with the level of significant difference set at 0.05 (p-value). Values marked in red accompanied with an asterisk indicate a significant difference.

Academic ranks / **Variables**	**Junior & intermediate (*N* = 33)**	**Senior (*N* =20)**	**Professorship (*N* = 31)**	***p*-value**
Body mass index (BMI)	26.6 (21.86 – 29.18)	27.3 (23.32 – 29.57)	26.8 (24.44 – 29.57)	0.45
Smoking status, n (%)				0.66
Non-smoker	21 (63.64)	14 (70)	23 (74.19)	
Current smoker	9 (27.27)	1 (5)	2 (6.45)	
Former smoker	3 (9.09)	5 (25)	6 (19.35)	
Meeting physical activity guidelines, n (%)				0.58
Yes	19 (57.58)	14 (70)	21 (67.74)	
No	14 (42.42)	6 (30)	10 (32.26)	
Daily weekday sedentary time (h.min)	8.43 ± 3.07	9.26 ± 3.10	9.21 ± 2.19	0.57
Daily weekday screen time (h.min)	10 (6 – 10.04)	10 (8.30 – 12)	10 (8 – 11)	0.4
Daily weekend screen time (h)	6 (4 – 10)	5 (4 – 10)	6 (4 – 10)	0.81
Screen use 1 h before bed (weeknights), n (%)				0.41
Never	-	1 (5)	1 (3.23)	
Rarely/occasionally	1 (3.03)	-	-	
Once/twice a week	1 (3.03)	1 (5)	2 (6.45)	
Three nights a week	5 (15.15)	1 (5)	7 (22.58)	
Every weeknight	26 (78.79)	17 (85)	21 (67.74)	
Screen use 1 h before bed (weekend nights), n (%)				0.84
Never	-	-	1 (3.32)	
Rarely/occasionally	1 (3.03)	3 (15)	3 (9.68)	
One weekend night	9 (27.27)	4 (20)	6 (19.35)	
All/every weekend night	23 (69.7)	13 (65)	21 (67.74)	
Caffeine consumption (servings/day), n (%)	3 (2 – 4)	3 (2 – 5)	3 (2 – 5)	0.68
Time of last serving (caffeine, hh:mm)	15:29 ± 03:37	15:17 ± 03:49	14:36 ± 03:48	0.68
Alcohol consumptions (drinks/week)	10 (4 – 12)	6 (3 – 10)	7 (2 – 10)	0.4
Time of last serving (alcohol, hh:mm)	20:11 (01:20)	20:12 (01:08)	20:06 (00:48)	0.96

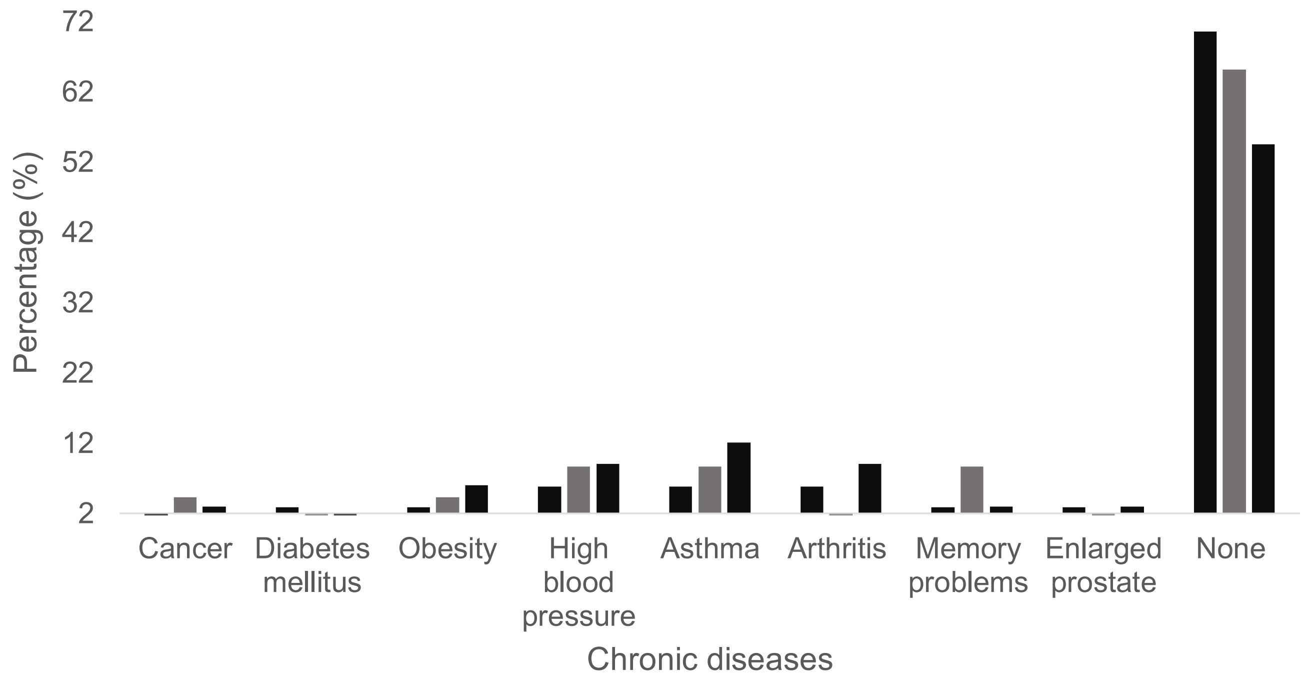

Figure 7. Percentage (%) of academic staff in from junior and intermediate (*N* = 34), senior (*N* = 23) and professorship (*N* = 33) academic rank levels who reported chronic disease(s). Note that there are more responses than the number staff from each academic rank level as some indicated having more than one chronic disease

4.3.3 The effects of academic rank on work-related characteristics

With reference to **Table *15***, academic ranks differed significantly in terms of highest postgraduate qualification (H(2) = 31, p = <0.01) and but did not differ by faculty (H(2) = 0.72, p = 0.7). No significant differences across academic groups were found regarding total weekly work hours (F(1, 2) = 1.162, p = 0.32), weekly work hours (F(1, 2) = 1.19, p = 0.31) weekend work hours (H(2) = 1.88, p = 0.39), the frequency of weekend work (H(2) = 2.34, p = 0.31) as well as daily commute time (H(2) = 3.64, p = 0.16).

Table 15. Descriptive statistics (*M*, ±*SD* or *Mdn*, *IQR*; 25-75%) as well as differences between academic ranks based on work-related characteristics, with the level of significant difference set at 0.05 (*p*-value). Values marked in red accompanied with an asterisk indicate a significant difference.

Academic ranks Variables	Junior & intermediate (*N* = 33)	Senior (*N* = 20)	Professorship (*N* = 31)	*p*-value
Highest postgraduate qualification, n (%)				<0.01*
Diploma	1 (3.03)	-	-	
Honours degree	7 (21.21)	-	-	
Master's degree	15 (45.45)	8 (40)	1 (3.26)	
PhD	10 (30.3)	12 (60)	30 (96.77)	
Faculty, n (%)				0.7
Humanities	9 (27.27)	3 (15)	7 (22.58)	
Science	12 (36.36)	10 (50)	10 (32.26)	
Commerce	2 (6.06)	4 (20)	5 (16.13)	
Pharmacy	1 (3.03)	-	1 (3.23)	
Law	3 (3.03)	1 (5)	2 (6.45)	
Education	6 (18.18)	2 (10)	6 (9.35)	
Total estimated weekly work hours (h.min)	51.47 ± 12.46)	56.17 ± 10.50	53.23 ± 14.10	0.32
Estimated weekly weekday work hours (h.min)	45.25 ± 10.35	48.14 ± 9.32	49.05 ± 9.12	0.31
Estimated weekend work hours (h.min)	5.30 (4 – 8.30)	8 (4 – 10)	6 (5 – 8)	0.39
Frequency of weekend work, n (%)				0.31
Never	1	1 (5)	1 (3.23)	
Rarely/occasionally	7 (24.14)	4 (20)	8 (25.81)	
One day of the weekend	18 (55.17)	9 (45)	10 (32.26)	
Both weekend days	7 (20.69)	6 (30)	12 (38.71)	
Daily commute time (min.sec)	12.30 (5 – 20)	10 (5 – 12.30)	10 (10 – 20)	0.23

4.3.4 The effects of academic rank on sleep-wake behaviours

With reference to **Table *16***, academic rank did not have an effect on reported bedtime ($H(2) = 0.61$, $p = 0.74$), wake time ($F(1, 2) = 1.09$, $p = 0.34$), overall time in bed ($F(1, 2) = 0.09$, $p = 0.91$), estimated sleep duration ($H(2) = 2.1$, $p = 0.35$), time taken to fall asleep ($H(2) = 1.88$, $p = 0.39$), presence of bed partner ($H(2) = 0.16$, $p = 0.92$), sleep efficiency ($H(2) = 3.12$, $p = 0.21$) and subjective sleep quality ratings ($H(2) = 3.42$, $p = 0.18$).

Table 16. Descriptive statistics (*M*, ±*SD* or *Mdn*, *IQR*; 25-75%) as well as differences between academic ranks based on sleep-related characteristics, with the level of significant difference set at 0.05. Values marked in red accompanied with an asterisk indicate a significant difference.

Academic rank **Variable**	**Junior & intermediate (*N* = 33)**	**Senior (*N* = 20)**	**Professorship (*N* = 31)**	***p*-value**
Estimated bedtime (hh:mm)	22:00 (22:00 – 23:00)	22:00 (22:00 – 23:12)	22:00 (22:00 – 23:00)	0.38
Time taken to fall asleep (min.sec)	20 (15 – 45)	22.5 (10 – 47.30)	15 (10 – 30)	0.17
Wake time (hh:mm)	06:50 (01:38)	06:41 (00:57)	06:23 (00:53)	0.34
Estimated sleep duration (h.min)	6 (6 – 7.30)	7 (5.30 – 7)	7 (6.30 – 7.30)	0.096
Time in bed (h.min)	8 (1.29)	7.58 (0.57)	8.06 (1.04)	0.91
Subjective sleep quality, n (%)				0.22
Very good	5 (15.15)	3 (15)	10 (32.26)	
Fairly good	20 (60.61)	9 (45)	15 (48.39)	
Fairly bad	5 (15.15)	8 (40)	6 (19.35)	
Very bad	3 (9.09)	-	-	
Sleep efficiency (%)	87.5 (73.3 – 92.3)	85.25 (73.35 – 90.6)	88.9 (82.4 – 94.1)	0.23
Presence of bed partners, n (%)				0.57
No bed partner/roommate	12 (36.36)	5 (25)	8 (25.81)	
Partner/roommate in other room	1 (3.03)	1 (5)	1 (3.26)	
Partner/roommate in same room, different beds	-	-	-	
Partner/roommate in same room, same bed	20 (60.61)	14 (70)	22 (70.97)	

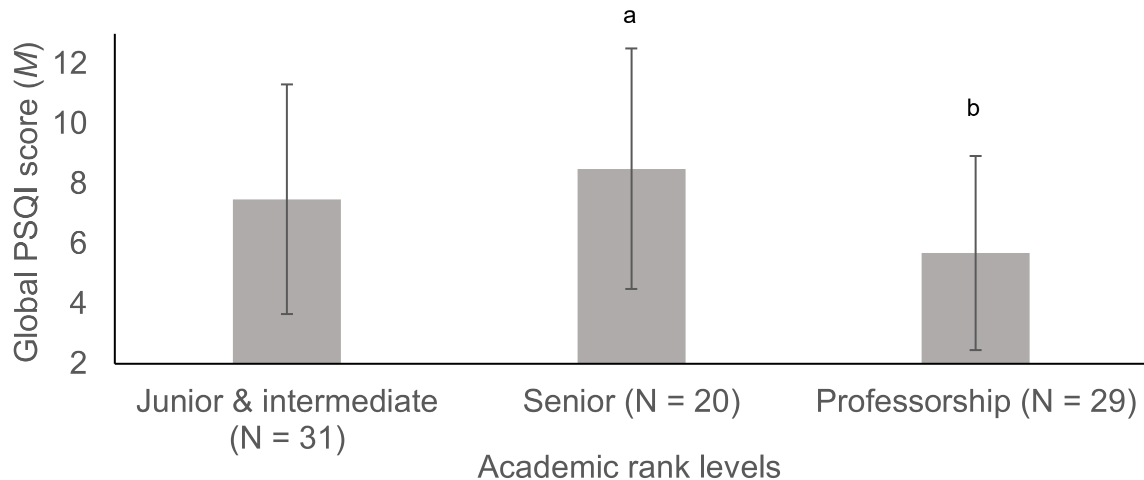

Figure 8. Differences between junior & intermediate (*N* = 31), senior *(N* = 20) and professorship (*N* = 29) academics based on global PSQI scores (*M*, ±*SD*), with the level of significant difference set at 0.05. Superscript (a) indicates the mean that is significantly different from (b).

4.3.5 The effects of academic rank on sleep quality

Reflected in **Figure 8**, academic ranks differed significantly in terms of the mean global PSQI score ($F(1, 2) = 3.77$, $p = 0.028$). The mean global PSQI was as follows: 7.48 ± 3.83 for junior, 8.5 ± 4.01 for senior and 5.64 ± 3.24 for professorship academics. Senior level academics had a significantly poorer sleep quality compared to professorship academics ($p = 0.03$) but not junior academics ($p = 0.15$).

As shown in **Figure 9**, the percentage of poor sleepers for each group was 61.29% for junior and intermediate rank, 80% for senior rank and 41.38% for professorship rank. Academic rank groups did not differ significantly in terms of their proportions of good vs poor sleeper types ($H(2) = <0.01$, $p = 1$).

4.3.6 The effects of academic rank on proportion of good and bad quality sleepers

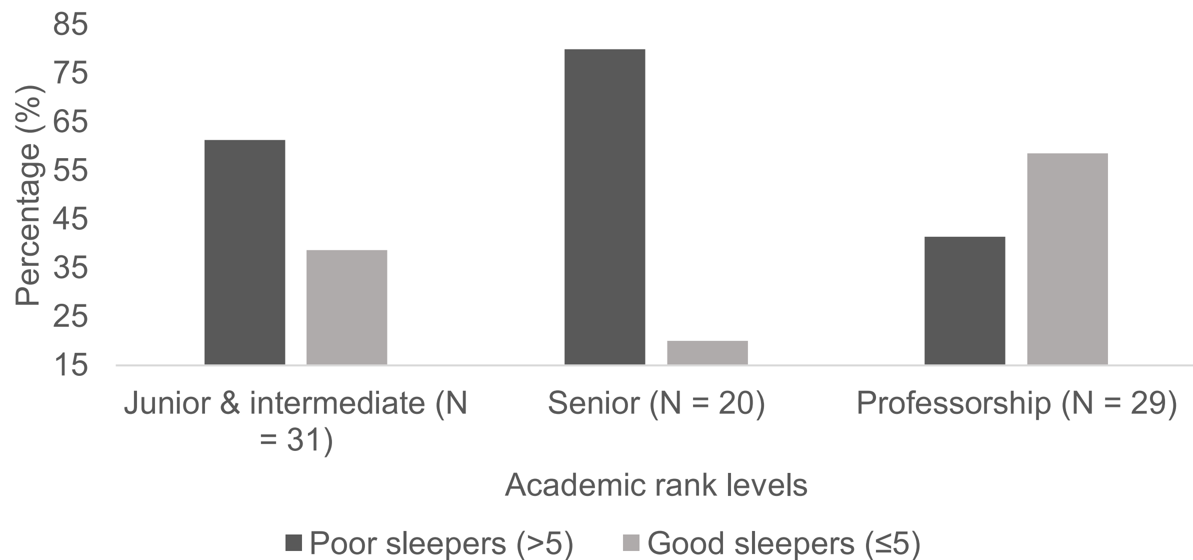

Figure 9. Percentage (%) of good and poor sleepers between junior & intermediate (*N* = 31), senior (*N* = 20) and professorship (*N* = 29) academics. Obtaining global scores five or more (≥5) classifies participants as poor sleepers and indicates the clinical cut-off point for potential sleep disorders. Note that the *p*-value was 1, indicating no statistically significant difference in these proportions, hence it is not illustrated in the graph directly. *P*-value for statistical significance was set at 0.05.

4.3.7 The effects of rank on the frequency of sleep disturbances

Academic staff had to rate the frequency of various sleep disturbances or disruptions over the prior one month. With reference to **Table 17**, the Kruskal-Wallis test revealed no significant differences between academic rank groups, with the statistics as follows: *I cannot get to sleep within 30 min* (H(2) = 5.05, *p* = 0.08); *I wake up in the middle of the night or early morning* (H(2) = <0.01, *p* = 1); *I have to use the bathroom* (H(2) = 2.63, *p* = 0.27); *I cannot breathe properly when I sleep* (H(2) = 3.23, *p* = 0.2); *I cough or snore loudly* (H(2) = 2.2, *p* = 0.33); *I feel too cold* (H(2) = 1.51, *p* = 0.47); *I feel too hot* (H(2) = 1.1, *p* = 0.58); *I have bad dreams* (H(2) = 0.56, *p* = 0.75); *I have pain* (H(2) = 3.57, *p* = 0.17); and *other reasons* (H(2) = 0.71, *p* = 0.7).

Table 17. Differences between academic ranks in terms of self-reported frequencies of sleep disturbances of the prior month, with the level of significant difference set at 0.05.

Frequency, n (%)	**Not during the past month**	**Less than once a week**	**Once or twice a week**	**Three or more times a week**	***p*-value**
Cannot get to sleep within 30 min					0.07
Junior & intermediate	11 (33.33)	9 (27.27)	5 (15.15)	8 (24.24)	
Senior	6 (30)	6 (30)	1 (5)	7 (35)	
Professorship	16 (51.61)	10 (32.26)	2 (6.45)	3 (9.68)	
Wake up in the middle of the night or early in the morning					0.88
Junior & intermediate	3 (9.09)	4 (12.12)	7 (21.21)	19 (57.58)	
Senior	2 (10)	3 (15)	5 (25)	10 (50)	
Professorship	3 (9.86)	5 (16.13)	5 (16.13)	18 (58.06)	
Have to get up to use the bathroom					0.46
Junior & intermediate	7 (21.21)	2 (6.06)	7 (21.21)	17 (51.52)	
Senior	3 (15)	3 (15)	7 (35)	7 (35)	
Professorship	5 (16.13)	2 (6.45)	6 (19.35)	18 (58.06)	
Cannot breathe comfortably					0.21
Junior & intermediate	28 (84.85)	4 (12.12)	1 (3.03)	-	
Senior	20 (100)	-	-	-	
Professorship	27 (87.1)	2 (6.45)	2 (6.45)	-	
Cough or snore loudly					0.25
Junior & intermediate	23 (69.7)	6 (16.18)	1 (3.03)	3 (9.09)	
Senior	12 (60)	4 (20)	1 (5)	3 (15)	
Professorship	16 (51.61)	3 (9.68)	10 (32.26)	2 (6.45)	
Feel too cold					0.3
Junior & intermediate	20 (60.61)	5 (15.15)	5 (15.15)	3 (9.09)	
Senior	14 (70)	2 (10)	2 (10)	2 (10)	
Professorship	22 (70.97)	8 (25.81)	-	1 (3.23)	
Feel too hot					0.88
Junior & intermediate	15 (45.46)	8 (27.56)	6 (20.69)	4 (6.9)	
Senior	12 (60)	1 (5)	4 (20)	3 (15)	
Professorship	15 (48.39)	7 (22.58)	7 (22.58)	2 (6.45)	
Have bad dreams					0.36
Junior & intermediate	15 (45.46)	9 (27.27)	3 (9.09)	6 (18.18)	
Senior	10 (50)	8 (40)	2 (10)	-	
Professorship	17 (54.84)	11 (35.48)	3 (9.68)	-	
Have pain					0.17
Junior & intermediate	26 (78.79)	4 (12.12)	1 (3.03)	2 (6.06)	
Senior	15 (75)	3 (15)	-	2 (10)	
Professorship	18 (58.06)	8 (25.81)	3 (9.68)	2 (6.45)	
Other					0.76
Junior & intermediate	3 (12)	2 (8)	5 (20)	15 (60)	
Senior	2 (15.38)	1 (7.69)	4 (30.77)	6 (46.15)	
Professorship	3 (13.64)	5 (22.73)	5 (22.73)	9 (40.91)	

4.4 RESULTS FROM THEMATIC ANALYSIS: SLEEP DISTURBANCES DESCRIBED BY RESPONDENTS FROM THE PSQI OPEN-ENDED QUESTION

The results from the thematic analyses begin with the thematic analysis of the PSQI open-ended question relating to sleep disturbances. Thereafter, the thematic analysis of the open-ended question relating to changes in work and sleep patterns due to COVID-19 is presented.

The first open-ended question came from the PSQI, which allowed respondents to detail any other experiences of sleep disturbances that the instrument did not mention. For the analyses that examined reasons for sleep disturbances, the final thematic map included main themes and sub-themes (in brackets): (1) *home environment* (attending to pets, attending to young children, partner's sleep behaviour); (2) *neighbourhood* (noise, security concerns); (3) *work* (work demands, work stress); and (4) *mental ill-health* (overthinking, anxiety, worry). The following results will be presented with the thematic maps supplemented with the explanatory text of the themes and their sub-themes. This is displayed in **Figure 10**.

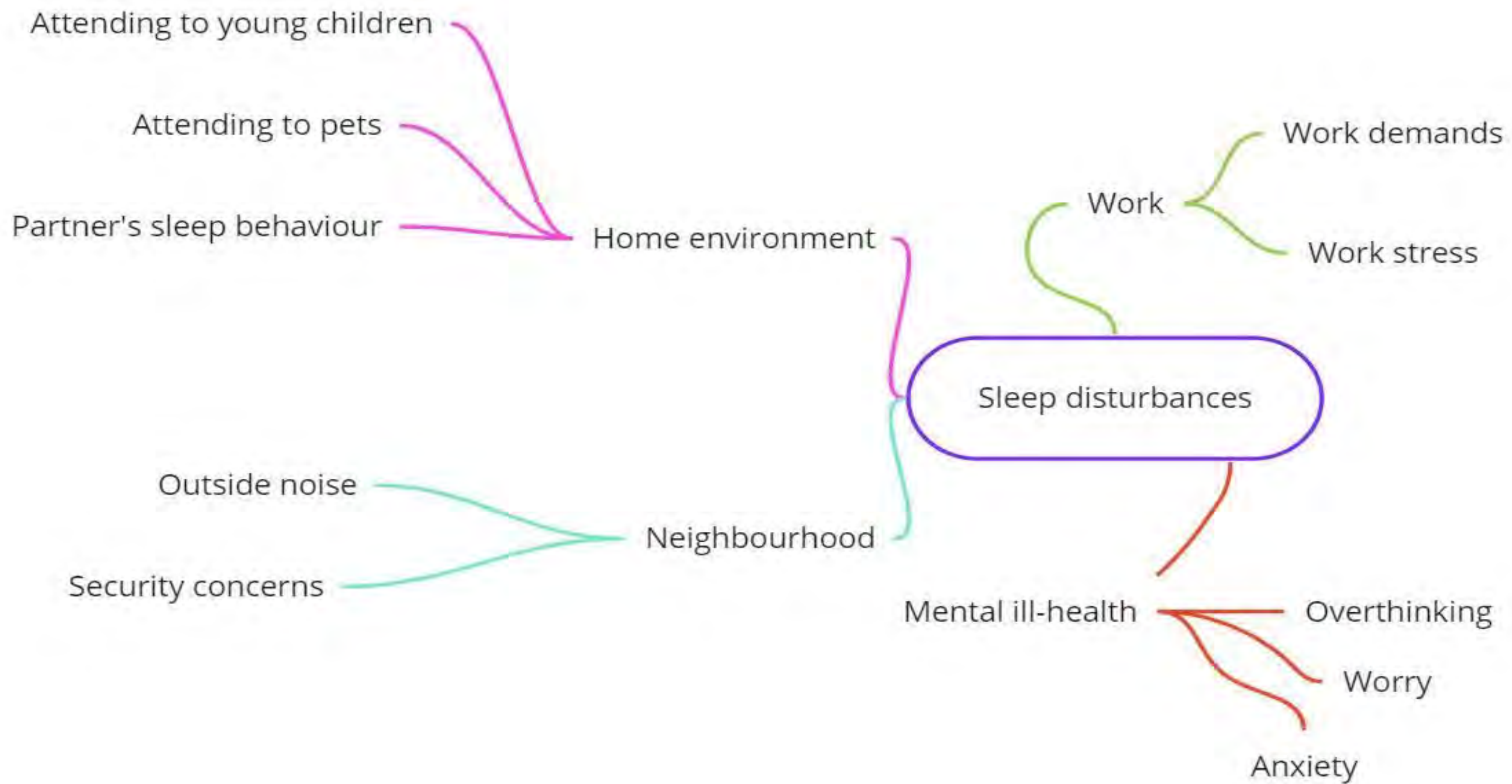

Figure 10. Final thematic map indicating four main themes of self-reported reasons for sleep disturbances over the prior month. Main themes include the *home environment, external neighbourhood, mental health* and *work*.

4.4.1 Main theme 1: Home environment

Figure 11. Main theme of disturbed sleep determined through the PSQI: *the home environment* and its sub-themes.

To begin, *home environment* refers to any sort of occurrences within the home or bedroom itself that have led to sleep interference. Academic staff were primarily disturbed by attending to young children or pets as well as their partners' sleep behaviours.

4.4.1.1 Sub-theme: Attending to young children

Attending to young children emerged as a major sub-theme of the home environment influence. It is clear from the data extracts that babies, toddlers and young children – whether by children waking parents during the night or early in the morning, adapting to new-born care demands or for reasons not explained – played a part in the disturbance of sleep among the pool of academic parents. Some examples where academic staff highlight this include: "*kids wake me up often… even multiple times per night*", "*my son comes to wake me up…*", "*we have a baby so our sleep is disrupted quite regularly"*, "*young child who wakes me up in the night*" and "*toddler feeding*". This was commented on by both male and female respondents, with no striking differences in the amount of male and female respondents who reported this type of sleep disturbance.

4.4.1.2 Sub-theme: Attending to pets

Attending to or having pets in one way or another was frequently mentioned in the data set, of which letting animals/pets out during the night was common. Some academics commented, for example: "*letting animals out*', "*get up to feed cat*", "*I share a bed with a dog and their activities often wake/keep me up*", and "*woken up by dog*".

4.4.1.3 Sub-theme: Partner's sleep behaviour

Partner's bedtime and sleeping behaviours were mentioned frequently throughout the data set. One respondent's partner had sleep problems that ultimately disrupted their sleep schedule and two other respondents specifically highlighted partner snoring as an issue. Another respondent highlighted, "*partner coming to bed an hour after me*" to imply sleep disruption as an outcome of unmatched sleep schedules.

4.4.2 Main theme 2: Neighbourhood

Figure 12. Main theme of disturbed sleep determined through the PSQI: *the neighbourhood* and its sub-themes.

4.4.2.1 Sub-theme: Outside noise

Outside noise refers to any disturbance that may occur as an outcome of neighbourhood noise. Noisy neighbourhoods were often mentioned among the data extracts, with complaints from a number of academic staff related to hearing (loud) noises, barking dogs, traffic, house alarms going off and wind.

4.4.2.2 Sub-theme: Security concerns

A number of respondents mentioned *security concerns*. For example, one mentioned, "*I frequently wake up feeling that I have heard some noise*", while others just mentioned worry for security and break-ins.

4.4.3 Main theme 3: Work

Figure 13. Main theme of disturbed sleep determined through the PSQI: *work* and its sub-themes.

Work involves work demands and work stress. One respondent highlighted that "having uncompleted task[s]" caused sleep disruptions. Another mentioned that "*late working past my bedtime is one reason*" to imply the demands of work overarching the need for sleep. Others briefly mentioned issues of "*work stress*", "*work-related*" and "*thinking of work*" that contributed to their sleep disturbances. Thus, work in general, as well as overthinking about work, were highlighted as reasons for sleep disruption.

4.4.4 Main theme 4: Mental ill-health

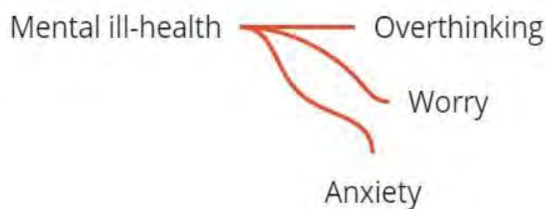

Figure 14. Main theme of disturbed sleep determined through the PSQI: *mental ill-health* and associated sub-themes.

Mental health included experiences such as anxiety, stress and overthinking. Although most respondents mentioned generally without much extension, they reported things like, "*racing mind at night*", "*mind too busy*", "*overthinking*", "*anxiety and restlessness*", "*anxiety*", experiencing an "unusually stressful two months", "*general stress, worrying about students*" and "*stress sometimes with a racy head*". One respondent captured how they were "*prone to anxiety*" that resulted in heart palpitations and trouble breathing which disturbed the onset of sleep or caused earlier morning awakenings. Anxiety and worry were predominantly reported by females.

4.5 RESULTS FROM THEMATIC ANALYSIS: CHANGES TO WORK AND/OR SLEEP PATTERNS DURING THE COVID-19 LOCKDOWN

The final thematic map in **Figure 15**, represents the two main themes and sub-themes (in brackets) that related to changes in sleep and included: (1) *sleep timing and duration* (delayed bedtime and/or wake times, longer sleep durations and improved/inconsistent sleep schedule); and (2) *change in qualitative sleep characteristics* (change in sleep quality, dreams and difficulty falling sleep). Lastly, while it was not the focus of the question, several respondents discussed the effects of COVID-19 on their mental health. Therefore, an additional theme of *emotional impact* was included, which spoke of *worry, anxiety and stress* (sub-themes). The final thematic map represents three main themes and sub-themes (in brackets) that related to changes in work and included: (1) *work hours and work routine* (evening and late-night work, increased work hours and lack of routine); (2) *work environment* (household/childcare demands, blending home and work boundaries, increased/reduced productivity and motivation); and (3) *online teaching and communication* (increased expectations and reachability, workloads and demands on time and inability to disengage). In the following sections, the main themes of change to sleep and their associated sub-themes are presented first. This is followed by the themes related to changes in work and their associated sub-themes.

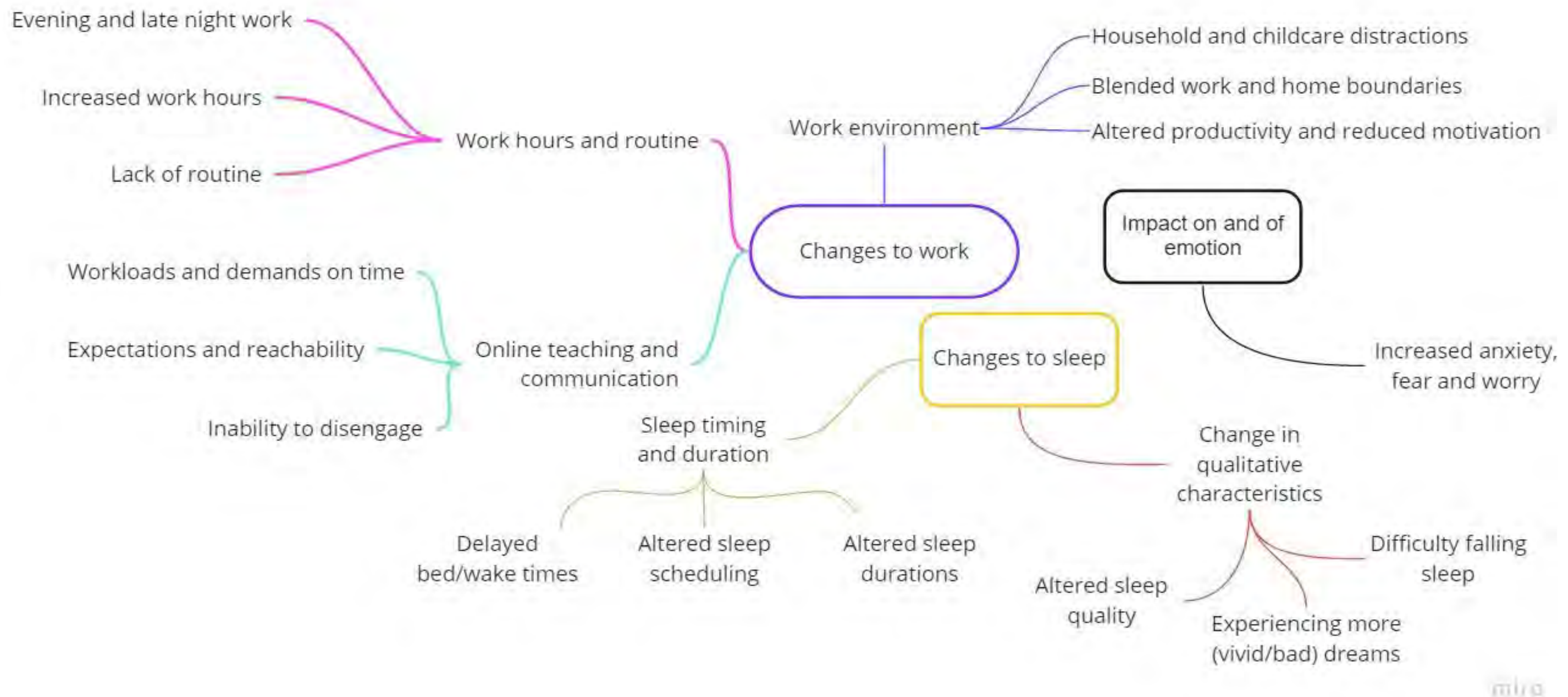

Figure 15. Final thematic map indicating five main themes of change to sleep and work during COVID-19 (*work hours and work routine*; *work environment; online teaching and communication; sleep timing and duration; change in qualitative characteristics; impacts on and of emotion*) and their associated sub-themes.

Changes to sleep during COVID-19

4.5.1 Main theme 1: Sleep timing and duration

Figure 16. Main theme of sleep-related change during COVID-19: *sleep timing and duration* and its sub-themes.

This overall theme refers to the changes in sleep length, the delay of time to go to sleep and/or wake up each day and night, sleeping at consistent times each night as well as those who embraced the flexibility inherent in the context to sleep at times that best suited them. It was common for bedtimes and/or wake times to be delayed, meaning that respondents tended to go to sleep later and/or wake up later. Further, changes in sleep duration were experienced with a mix between increased and decreased durations – although longer sleep durations were more frequently reported.

4.5.1.1 Sub-theme: Delayed bed/wake times

Delayed bedtime and/or wake time refers to when participants reported going to bed later than usual, waking up later than usual or both. Going to bed later than usual and waking up later than usual was common among the academic sample. In some cases, respondents went to bed later but woke up at the same time. Examples of extracts that illustrated delayed bedtimes, wake times or both included, "*I now tend to go to bed later, but am waking up at the same times that I used to*", "*I have been going to bed much later because I don't need to get up to take the children to school*", "*I go to sleep much later, I get up much later*", "*I used to get to bed by 22:00 or so but now I get to bed much later*" and *"I go to bed at the same time but am able to sleep 45 min longer in the morning because of the lack of commute and school rush*". It appears that academic staff tended to go to bed later and wake up later. The former was largely attributed to having to conduct academic activity late at night, whereas the latter attributed to the reduced responsibility and greater flexibility of morning hours in not having to, for example, take children to school or be physically present at work.

4.5.1.2 Sub-theme: Altered sleep durations

This sub-theme speaks to how some academic staff experienced either an increase or decrease in their sleep durations.

4.5.1.2.1 Longer sleep durations

Longer sleep durations refers to the increase in sleep durations. Respondents reported sleeping longer durations during the COVID-19 lockdown. However, shorter sleep durations were also indicated. Examples of extracts suggesting an increase in sleep length include, "*I get more hours of sleep as I get up later in the morning*", "*I find that I sleep for longer*", "*I am able to sleep longer because I am not in the office*" and, "*sleep pattern is about an hour longer per night*".

4.5.1.2.2 Shorter sleep durations

Data extracts that exemplified shortened sleep durations include, "*I now tend to go to bed later, but am waking up at the same times I used to*", "*prior to online learning, I could get 7 to 8 hours a night… In the last two months especially, I rarely get those hours… Today I got 3 hrs and 38 minutes of sleep*" and "*I sleep shorter hours*".

4.5.1.3 Sub-theme: Altered sleep scheduling

Altered sleep scheduling speaks to the academics who used either the flexibility to time sleep when it suited them or the academics who struggled to maintain consistency in their sleep routine.

4.5.1.3.1 Improved sleep scheduling

Data extracts that exampled sleeping at preferred times (each quotation representing a different respondent) include, "*naturally I am a night owl, so with no need to be up to face people at 9 in the morning I go to bed when the owl in me feels sleepy*", "*I have slept better during COVID-19 because I go to bed when I want and wake up when I want*", "*working from home has allowed me to return to a more natural sleeping pattern, letting me work in the early mornings (04h00 onwards) through to mid-afternoons (15h00 to 16h00)"* and "*the flexibility this offers I find that in some cases I start work well into the night and this means that I sleep during the next day*". The last quotation speaks to both sleeping at preferred times as well as sleeping at inconsistent times.

4.5.1.3.2 Inconsistent sleep scheduling

Responses from academic staff that revealed inconsistency of sleep times include, "*I have a more sedentary routine, and often lose track of time – resulting in fluctuating bedtimes, and fluctuating wakeup times*" and "*I think my sleep patterns have definitely been more uneven during COVID*". One academic who did not have a consistent sleep routine explained, "*I go to bed at sunrise and sleep during the day, other times I go to bed at 2 or 3 and wake up at 7*". Lastly, another academic commented they had to try get their sleep routine "*under control*" and that "*it has been terrible".* The sub-theme effectively illustrates that flexibility and being void of time-based obligations (i.e. going into office, dropping children at home) was beneficial to some and disadvantageous for others where, for some, they were able to operate routinely at times that suited them whereas, for others, they struggled to maintain a structured sleeping routine.

4.5.2 Main theme 2: Change in qualitative characteristics of sleep

Figure 17. Main theme of sleep-related change during COVID-19: *qualitative characteristics of sleep* and its sub-themes.

The main theme of *change in qualitative sleep characteristics* refers to the frequently reported experiences of change in sleep quality in general, nightmares or bad dreams and difficulty initiating sleep.

4.5.2.1 Sub-theme: Altered sleep quality

There was a mixture of academic staff either reporting a good or improved sleep quality or a poorer sleep quality. However, overall, the more frequent reports indicated that sleep quality characteristics were negatively changed during the time of study. Experiences of good sleep quality were highlighted by some academics, for example, one academic mentioned, "*I sleep shorter hours but mostly sleep well*". Another respondent mentioned, "*at first my sleep was disrupted… but now I'm back to sleeping*

really well". Additionally, a different academic reported that they "*sleep more soundly*". Two academics asserted that they slept better as a result of the exhaustion experienced at the end of the day. The one respondent explained, "*… [I'm] sleeping better because I am so exhausted at the end of the day*" and the other accentuated, "*I sleep more and deeper (but a kind of "dead" sleep) – very exhausted from the screen work and less activity*".

Regarding poorer sleep quality, an academic mentioned that they struggle to obtain it: "*I never get 'quality' sleep*". On the same note, one academic highlighted, "*I am finding that I am sleeping less and poorly now*" where another respondent similarly pointed out, "*I find that I sleep longer, but do not actually get a restful sleep*".

4.5.2.2 Sub-theme: Experiencing more (bad or vivid) dreams

Dreams refers to the reports of academics who experienced either alarming, bad or vivid dreams – or of any/more having dreams at all compared to usual. One academic mentioned that it was usual for them to experience "*alarming dreams*" in the face of the global pandemic. Another highlighted, "*Sleep is pretty much the same apart from the odd bad dream*". One respondent highlighted that they would "*sometimes have bad dreams*" where another described their experience of having "*much more vivid dreams*". Lastly, one academic discussed that during the beginning of lockdown that, "*at first my sleep was disrupted, with lots of dreams*". All responses related to this sub-theme came from females, except for one from a male respondent.

4.5.2.3 Sub-theme: Difficulty falling asleep

This sub-theme speaks to the difficulty that a number of academics experienced in initiating sleep. One academic, when commenting on how COVID-19 had affected sleep patterns, complained of "*usually struggling to get to sleep*". Another respondent said, "*There is a lot more 'screen time' and I noticed before COVID-19 I didn't struggle as much to fall off to sleep*". Likewise, an academic who spoke to the negative news of COVID-19 related deaths and cases said it had affected their sleep in that it took them "slightly longer to fall asleep". "*I find it very difficult to get to sleep*" was mentioned by one respondent and another highlighted, "*trouble going to sleep has worsened*" whereas a different academic mentioned, "*I have always had a difficult time falling asleep*".

4.5.3 Main theme 3: Impact on and of emotion

Figure 18. Additional theme that regards the impact of COVID-19 on and of respondent's emotional well-being.

4.5.3.1 Sub-theme: Increased anxiety, fear and worry

Impact on emotion and of emotion speak to the reports of anxiety, stress and worry that academic staff experienced during the COVID-19 lockdown. Although outside of the scope of the research objectives, the emotional impact of COVID-19 lockdown is reported. Firstly, because these experiences matter and, secondly, because these experiences can impact on sleep and work performance. Academics have mentioned experiencing "*'cabin fever' – a sense of monotony and feeling of being confused*" as well as a lot of worry "*about COVID-related stuff (e.g. getting sick, losing family members, losing my job, financial security, the future of SA in general, crime, etc.)".* By extension, one academic mentioned the experienced anxiety and worry "*especially from negative news of COVID-19 related deaths and cases*", another simply mentioned, "*anxiety and fear*" and a different respondent explained the experience of "*some generalized anxiety at the beginning of shutdown*". One academic described the context of COVID-19, the shift to online learning and increased reachability as a "*constant tyranny*" they needed to try to protect themselves from. A different respondent highlighted, "*I miss the interactions with my colleagues and students which gave me energy and interest in my day. I feel stuck in Grahamstown… I am afraid to go out and meet other people because of having been inside for so long*". It was highlighted, "*There isn't enough time to unwind and relax*", of which the respondent mentioned feeling "*tired, burnt out, demotivated*". While many respondents only indicated their emotional experiences, some highlighted how this particularly impacted on their sleep and sleep quality indicators. Furthermore, while male academics

reported feeling worry, a greater number of females' responses spoke to feeling a greater sense of anxiety and fear.

Changes to work during COVID-19

4.5.4 Main theme 1: Work hours and work routine

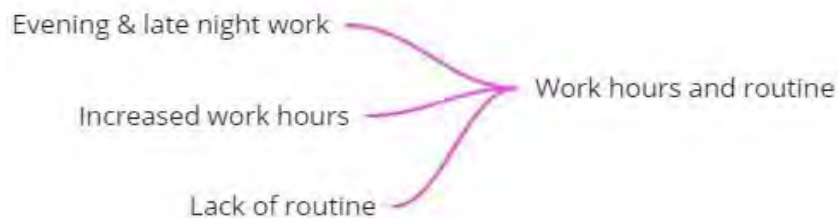

Figure 19. Main theme of work-related change during COVID-19: *work hours and work routine* and its sub-themes.

One of the main themes of change was the change to work hours and work routine. The three emergent sub-themes of change included: (1) work hours that increased; (2) the changing of work by way of the increased evening and late-night work; and (3) work that lacked routine.

4.5.4.1 Sub-theme: Increased working hours

Increased working hours was frequently reported by participants as captured by several academic staff members, for example, that wrote: "*I also work for longer periods of time a day than I normally would have*", "*I am working longer hours as there is more work to do*" and, "*I usually work at least one day of the weekend and sometimes the entire weekend*" (to manage workload).

4.5.4.2 Sub-theme: Evening and late night work

A predominant change to the scheduling of work particularly emphasized the increase in *evening and late-night work.* Some respondents, although not all, have highlighted different reasons for this, some of which included having more flexibility to "*work well into the night*", especially where sleep was delayed and wake times were later. One respondent mentioned adjusting their work pattern because "*that is the time certain students are reachable*". A frequent pattern that emerged was the tendency of academic parents to postpone work for later where time was lost to childcare or child supervision and housework. For example, one respondent highlighted, "*I have needed to do more housework and supervise my children so that I have needed to do some*

of my academic work in the evenings". One academic parent mentioned that their work was conducted late at night (between 8pm and 1am) where "*childminding duty*" could be done in the day. This was reported by more female academics than male academics from the study.

4.5.4.3 Sub-theme: Lack of routine

The last sub-theme, *lack of routine*, focuses on the ability of some academic staff to maintain a routine from day-to-day (i.e. even though their schedules have changed, has the new schedule been consistent?). Some participants highlighted having poor structure within their daily lives expressing that, "*my routine is disrupted*", "*I don't actually have a routine anymore*" and, "*my days are not structured or organised as they were prior to COVID*". Another said, "*I have tried to maintain a work routine but find I am lacking motivation and feel fatigued by mid-day*". In sum, the data revealed that, day-to-day, some academics worked longer hours and/or struggled to maintain consistent routines in conjunction with varying their work schedules (particularly due to reports of balancing work and home environments).

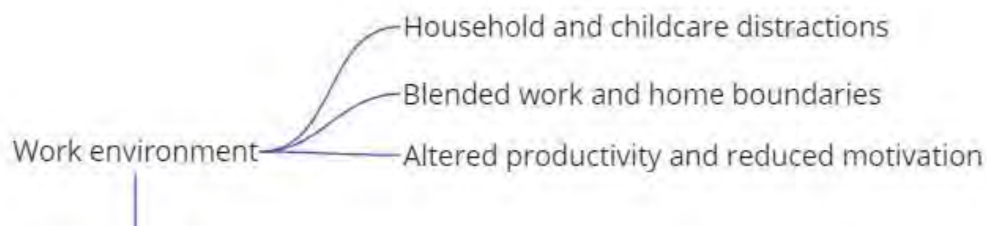

Figure 20. Main theme of work-related change during COVID-19: *work environment* and its sub-themes.

4.5.5 Main theme 2: Work environment

Working environment refers to the change in the workplace from being on campus to solely working from home. Due to COVID-19 lockdown regulations, most occupational groups, including academic staff at the University, had to operate from home. The emergent sub-themes that spoke to the changes in work environments were: (1) more time dedicated to household and childcare responsibilities due to working from home; (2) how the changes to the working environment resulted in blended work and home boundaries; and (3) that productivity and/or motivation was impacted by the working environment.

4.5.5.1 Sub-theme: Household and childcare distractions

The sub-theme of *household and childcare responsibilities* speaks to the increase in household and childcare demands or distractions that came with working from home, the shutdown of schools as well as having no domestic assistance. This sub-theme does not speak directly to the increase in child-minding duties that are related specifically to doing more work in the evenings or at night. Instead, it is about the increase in the household and childcare demands overall. There were reports from the academic sample who reported that household work, home-schooling and supervision of children demanded significant amounts of daytime hours. This is especially the case in scenarios where children would have otherwise been occupied at school. This is highlighted by a number of academics that have mentioned or detailed these demands in different ways, saying, "*Working from home is complicated. My children often disrupt me*", "*my kid's school routine has been disrupted…*", which consequently disrupted the parent, "*…dealing with the baby, doing shopping, housework, dealing with various issues in the home*", "*child-rearing, household chores, leisure and academic work are all blended*", and dealing with "*family distractions*". These extracts indicate that academics were notably more distracted by responsibilities to their families and households during their working hours during the COVID-19 lockdown. Additionally, these issues were reported more by females than males.

4.5.5.2 Sub-theme: Blended work and home boundaries

Blended work and home boundaries refer to the weakened or indistinct separations between personal and professional spheres. This sub-theme involves respondents who may not have been parents, however, includes the respondents who mentioned blending between their work and home in general. Some participants commented on this saying, "*I am always at work", "there is no distinction between work and home*", "*I have noticed that work seeps into what was 'home' relaxation time*", experience of "*indistinct boundaries between my work time and my personal time" and "trouble [when] working normal hours (boundaries)"* due to family demands and, "*the major activities of my life happen in my bedroom*". There were, however, a small set of academics who reported attempting to actively create structure similar to their pre-COVID-19 operations or otherwise attempting to create structure to settle into their new, COVID-19 permitting routines – especially to develop balance between newly blended home and work spheres. One academic said, "*I try to stop work by 6pm to*

separate home and work life" while another stated, "*I do not look at email after 5pm, to protect myself from constant tyranny*". One mentioned, "*I try very hard to ensure that my work does not go beyond 5pm (but there are many times when this is not possible and I've worked to 10pm on occasion*". The results illustrate that some academic staff set clear intentions to develop structure and normality where the context of COVID-19 provoked swift environmental and behavioural changes.

4.5.5.3 Sub-theme: Altered productivity and reduced motivation

Altered productivity speaks to positive or negative effects that COVID-19 had on productivity, with some individuals experiencing increased productivity while working from home and others experiencing a decrease.

4.5.5.3.1 Increased productivity

For some individuals, working from home improved their productivity. This was afforded by fewer disruptions from students and colleagues in their departments as well as having greater flexibility and choice over work schedules. One academic who was on sabbatical at the time commented, "*If anything I work harder and get more done because I don't have interactions with people in the office*". Another respondent with a similar experience highlighted, "*I work much more uninterruptedly from beginning to end of day. Much more productively*". An academic who enjoyed going to bed and waking up when it suited them explained, "*Sleeping until a bit later (if I feel like it) makes me feel better and more productive the whole day*". One respondent explained that despite work routines being affected, "*I have found that I have been equally effective, if not more so*".

4.5.5.3.2 Decreased productivity

Some respondents, on the other hand, experienced reductions in their productivity. This was mostly reported due to the change of academics' working environment, associated responsibilities of having to deal with home and childcare responsibilities and questioning if the amount of work done was sufficient enough. A respondent mentioned, "*I'm very stressed about my own productivity*" and another, with a similar sentiment said, "*I do worry slightly about whether the amount of work I do is sustainable*". Additionally, one academic highlighted, "*I am someone who is more productive in the office at all times, working from home never works for me*". Lastly, one respondent mentioned, "*I am finding it hard to work consistently on one task when*

working from home" and another said, "*difficulty focusing on one task at hand*", which suggested a stunt in focus and productivity. The reports of hindered productivity were relatively balanced between male and female academics from the sample. In terms of motivation, academic staff mostly complained about the lack thereof. Similarly, some experienced less stress where others experienced notably increased levels of stress.

4.5.5.3.3 Reduced motivation

With regard to motivation, respondents only mentioned reductions of this outcome. One respondent mentioned, "*I am lethargic and uninterested in my work*", another mentioned "*less motivation*", and a different academic said, "*I tend to find it harder to motivate myself to work*". One academic explained that their work motivation had worsened and was "*exacerbated by COVID-related bereavement*". A respondent highlighted that operating within the context of COVID-19 resulted in them feeling "*tired, burnt out and demotivated*". Similarly, a different academic explained, "*I am lacking motivation and feel fatigues by mid-day*". Lastly, an academic who struggled to work outside of the office said, "*I feel lazy and just sleep… I feel demotivated working from home*". Overall, the findings suggest that academic staff from the study experienced a mixture of benefits and losses in terms of their productivity, whereas motivation predominantly reduced.

4.5.6 Main theme 3: Online teaching and communication

Figure 21. Main theme of work-related change during COVID-19: *online teaching and communication* and its sub-themes.

Solely conducting teaching (among all other academic activities) as well as communicating through online platforms resulted in responses and sub-themes that concentrated on the consequences of online teaching and learning for the current sample. These mainly involved: (1) perceived increases in workloads and demands; (2) academic staff being at constant reach to students and other staff as well as the

expectation that academic staff must be responsive at all hours of the day and night; and (3) due to work being online, work demands seeming greater and having unguarded access to work, that academic staff struggled to disengage from their work.

4.5.6.1 Sub-theme: Workloads and demands on time

Changes to *workloads and demands on time* is a sub-theme and effectively speaks to the increase in workloads that were accompanied with the transition to online teaching and learning. A swift transition to online operations meant that academic staff had to learn how to effectively conduct work in new ways, yet in a very short space of time, thus increasing the demands on time. To explain, one academic highlighted that familiarizing themselves with course material online "*has required additional time that would not have otherwise been required*". Similarly, another respondent explained their frustration where "*one has to do the same things in three different ways and on various platforms to reach people*", suggesting online communication demanded more time than conventional face-to-face interactions. Additionally, it was mentioned that working hours have increased due to "*prepping for online teaching, creating notes or lecture slides that have more detail than normal because of the lack of contact with most students*". The same respondent went on to say, "*I spend more time consulting through email and WhatsApp with a lot more back and forth than normal… Marking online also takes me longer than working with hard copies*". A different academic reiterated a similar experience where they said, "*I spend an inordinate amount of time in Zoom meetings, literally become a Zoombie. A lot of time communicating via email, which isn't effective as details are sometimes missed*". In agreement, another academic mentioned that "*more time is spent on the phone and laptop screen answering emails and making assessments*". Further, a different academic described their workload as "*immense*" and attributed this to "*the shift to online learning*". One respondent commented that with more online meetings, they seemed to "*require more sleep to recover*" which hints that the online communication was more taxing or demanding compared to pre-COVID-19 working conditions.

4.5.6.2 Sub-theme: Expectations and reachability

Expectations and reachability refer to the change and increase in reach that academic staff had between themselves, their students and colleagues. An outcome of online communication, as well as communication via multiple platforms, was academics'

constant availability to students and other staff members. To a degree, expectations of some students (and staff) were that academics are available, almost instantly, and should therefore attend to their demands at speed. Two academics' responses captured the issue where the one commented, "*Now with COVID-19 the students have more access to us as the lecturer either [on] email/WhatsApp/Ruconnected forum. Since they study the best time that suits them they would reach out and contact us the lecturers that time as well*." The second example highlighted by another academic said, "*Your inbox is packed with emails from students and other staff and often a response is expected on the same day… You are engaging with students on Ruconnected and then they also send you emails about technical issues, library access, their personal issues, etc.… It often feels as though it is forgotten that staff are also living through the pandemic, facing their own struggles, not just students*". One academic adjusted their schedule to work late at night because that was "*the time certain students are reachable*" and another respondent commented, "*I have meetings via WhatsApp with my co-facilitator at all hours of the day and night. It is 20h42 now and we are having a meeting in five minutes*". Overall, it is evident that online learning and communication created contributed to the dissolve of clear work and home spheres.

4.5.6.3 Sub-theme: Inability to disengage

The third sub-theme of *inability to disengage* related to themes such as *work hours and routine, reachability and expectations* as well as *work environment*. It relates to boundaries between home and work becoming indistinct, where work time and hours had changed and where academic staff were always reachable and expected to act as such. The *inability to disengage* speaks to the lack of separation from one's work and how academic staff could not sufficiently remove themselves from work. Conducting academic work late at night, being available online on multiple platforms at any time of the day or night, managing increasing workload and work hours makes disengagement from work particularly challenged among this sample. One academic commented, "*I'm always at work. Very hard to have non-work time*" and another similarly uttered, "*[it was] more difficult to switch off from work*". Lastly, a different respondent highlights that, "*Most of the major activities of my life happen in my bedroom, so I feel like sleep is just part of work*".

CHAPTER V

5 DISCUSSION

5.1 LAYOUT

The chapter discuss the key findings in relation to the initial research objectives and relevant literature. The first research objective was to characterize the sleep behaviours, sleep quality, general health and lifestyle and work characteristics of the sample. Thus, the discussion begins with the sleep-related findings of the overall sample, after which the effects of gender and rank are discussed. This will be followed by the work-related findings and then the lifestyle-related findings. Similarly, within these sections, findings related to the general sample followed by the gender and rank effects will be presented. Throughout the discussion, the findings from the thematic analyses are integrated to support the interpretation of the results.

5.2 SUMMARY OF FINDINGS

To the best of the authors' knowledge, this is one of a few studies that have characterized sleep behaviours and sleep quality among academic staff. The current study found that academic staff reported lower than the average recommended sleep duration, did not obtain adequate quality sleep and had a large proportion of poor sleepers compared to good sleepers. Academics from this study also worked long hours and frequently worked over the weekend. Furthermore, academic staff had poor health indicators that included high median body mass (BMI), with over one third reporting to not meet the PA guidelines, which was accompanied by extended screen use and sedentary behaviours. These variables, however, were studied under the context of the COVID-19 pandemic, which had major effects on sleep and work, as suggested by recent research. The findings from the qualitative data highlight the impact of COVID-19 by considering if and how patterns of sleep and work were affected during this period. In terms of the effects of gender, females were significantly poorer sleepers, spent a longer time in bed and experienced more bad dreams.

The gender effects on lifestyle showed that males had their last serving of alcohol later than females, although this was only the effect gender had on lifestyle behaviours. Thus, there were no differences between genders in any of the other variables including BMI, smoking status, PA, weekday sedentary time, weekend sedentary time,

weekday screen time, frequency of screen use one hour before bed on weeknights and weekend nights, alcohol and caffeine consumption and time of last serving of caffeine. In terms of work, females reported working significantly less hours than men on weekdays and over the total week (week and weekend hours combined), as has been found in previous studies. All other measures (i.e. highest qualification, rank, faculty, weekend work hours, frequency of weekend work and commute time) did not differ between males and females. Academic rank had an effect on less variables compared to gender: professorship-level academics were much older than junior-level academics and rank had an overall effect on the number of children, professorship-level academics had a significantly higher level of postgraduate qualification and senior-level academics (mid-career) were significantly poorer sleepers compared to other ranks.

5.3 SLEEP CHARACTERISTICS OF THE GENERAL SAMPLE

5.3.1 Sleep quality and sleep duration

The sleep-wake behaviours characterized in this discussion focus on self-reported bedtime and wake time. The median bedtime and average wake time were similar to findings from a recent study on university academic staff (Ahmed, 2019), although the current sample went to bed and woke up slightly earlier. Moreover, a main objective of the study was to characterize academic staff based on their sleep behaviours and sleep quality. One of the major findings is that current academic staff was above the clinical cut-off point (>5) or poor sleep quality based on the average PSQI global score. Additionally, the majority were categorized as poor sleepers (58.75%), suggesting that over half of the respondents had a global PSQI score of over 5. While research is limited, it appears that the current sample exhibited a worse PSQI global score outcome than what has been found in academic or university staff previously (Ahmed, 2019; Freitas *et al.*, 2019).

Sleep quality of the current sample may be worse than other studies conducted in the academic context, in part, as a result of effects of COVID-19 and the associated impact that the various levels of lockdown had on lifestyle, sleep, movement and work-related activities. This is supported by recent research on COVID-19 and sleep conducted in general populations, which have found their samples reporting poorer sleep quality during the pandemic (Innocenti *et al.*, 2020; Sañudo *et al.*, 2020; Casagrande *et al.*,

123 2020; Cellini *et al.*¸2020; Cellini *et al.*, 2021; Lin *et al.*¸2021). Studies show that this may be due to a number of factors, such as poor sleep hygiene practices (Marelli *et al.*, 2020), changes in lifestyle behaviours (Arora & Grey, 2020 Sañudo *et al.*, 2020), changes in external circadian cues (Cellini *et al.*, 2020; Altena *et al.*, 2020), increases in screen time (Gupta *et al.*, 2020) and stress, anxiety or depression (Gupta *et al.*, 2020; Lin *et al.*, 2021; Mandelkorn *et al.*, 2021). This is relevant for the current sample who reported extended screen use and often using screens prior to bedtime. In addition, results from the thematic analysis showed that sleep schedules and work routines (possible social cues) were inconsistent and that anxiety, fear and worry increased during the pandemic. Thus, some of the factors driving poor sleep quality in other studies are inherent in the current study and may have contributed to poor sleep quality among academic staff. However, this was not studied directly.

Furthermore, the current sample exhibited a large variation in the global PSQI score (7.09 ±3.8), evidenced in academic/university staff outside of SA (Molina-Torres *et al.*, 2020). This variation in sleep quality, which has been reported in healthy adults previously (Van Dongen *et al.*, 2005), implies that a number of academic staff from the current study had good sleep quality and others did not. This is supported in the results of the thematic analysis that related to changes in sleep during COVID-19. Some respondents from this study reported an improvement in their sleep quality, while others reported their sleep quality getting worse. This is contrary to research in general populations that reported that sleep quality got worse during COVID-19 (Gupta *et al.*, 2020; Innocenti *et al.*, 2020; Marelli *et al.*, 2020; Sañudo *et al.*, 2020; Casagrande *et al.*, 2020; Cellini *et al.*¸2020; Cellini *et al.*, 2021; Lin *et al.*¸2021). However, an improvement in sleep has been related to working from home (Leone *et al.*, 2020). The COVID-19 lockdowns meant that some individuals spent less time in stores and commuting in general (Altena *et al.*, 2020). It may have also provided individuals with an opportunity to align with their circadian rhythm by going to bed and waking up at times that felt more natural, thus supporting and improving their sleep quality (Altena *et al.*, 2020). This was revealed in the thematic analysis, from which the sub-theme of improved sleep scheduling emerged. Some of the respondents indicated that the lockdown period afforded them more flexibility to sleep at times that were most preferred. For example, a respondent mentioned, “I go to bed when the owl in me feels sleepy”, indicating a more natural sleep-wake rhythm. An improvement in sleep quality

could benefit the work performance (Ratcliff & Van Dongen, 2009; Orzel-Gryglewska, 2010; Gibson & Shrader, 2014; Gingerich *et al.*, 2018) of academics under the working context of the pandemic. However, the effects of sleep (for those who experienced improvements or decrements) on work performance and the reasons for sleep quality were not explored in this study, warranting further research on this topic.

Based on the average self-reported sleep duration, the current sample fell below the recommended average of at least 7 hours of sleep a night (Watson *et al.*, 2015). This supports previous findings on academic and/or university staff outside of SA who reported insufficient sleep (Yeshaw & Mossie, 2017; Özgül & Polat, 2018; Freitas *et al.*, 2019). However, in relation to broader population studies that characterized sleep-wake behaviours during the pandemic, academic staff from the current study reported sleeping shorter durations compared to these previous studies (Sultana *et al.*, 2020; Mandelkorn *et al.*, 2021; Shillington *et al.*, 2021). In addition, results from the thematic analysis on changes to sleep during COVID-19 revealed how academics from this study reported either longer or shorter sleep durations compared to normal. Sleeping longer than usual could be explained by the reduction in time-based morning obligations, such as going to work or dropping children at school (Altena *et al.*, 2020; Leone *et al.*, 2020), which allowed academics to sleep longer overall. The reported reduction in sleep duration could also be, albeit partly, explained by the increasing workloads experienced by academic staff globally (Corbera *et al.*, 2020). To explain, the onset of COVID-19 meant that academics around the world had to deal with swift changes in the nature of their work and increases in work demands (Sahu, 2020; Zuccoli & Teruggi, 2020; Soibah *et al.*, 2020), which may have compromised extending sleep durations to a healthy average. Among the current sample, the thematic analysis reveals reports of an increase in workload and demands on time due to a shift to online learning and teaching students remotely away from campus. The thematic analysis revealed that academic staff worked in the evenings and late at night (especially due to the increase in childcare and household responsibilities), that some areas of work (such as marking and lecture preparation) took much longer than usual, that all meetings were screen-based and that academic staff were expected to be virtually reachable almost all day and night. In addition, findings from the sleep disturbance thematic analysis illustrate that work demands and work stress impacted some academic staff's ability to get undisturbed sleep. This may suggest that sleeping at

least 7 hours on average might have been difficult to achieve due to an increased demand on academics' time and that much of this time was spent on screens day and night. Considering the work demands that academic staff were under during the pandemic, reporting a low average sleep duration may have implications on their alertness and cognitive performance (Van Dongen *et al.*, 2003; Belenky *et al.*, 2003), work effectiveness and motivation (Orzel-Gryglewska, 2010) and overall mental health (Gosling *et al.*, 2014), comprising work during the pandemic even further. However, the effects of sleep duration were not the focus of the current study and would need to be studied in further research.

In addition, academic staff from this study spent considerable time in bed and time in bed not sleeping. On average, academics from this study slept roughly 6 h 41 min per night, although they spent an average of 8 h 01 min in bed. Thus, the sample reportedly spent roughly 1 h 20 minutes in bed awake. This supports the findings from other general population studies that highlight an extended time in bed during the pandemic (Cellini *et al.*, 2020; Li *et al.*, 2020; Wright *et al.*, 2020; Cellini *et al.*, 2021). Spending a longer time in bed has been reported as a response related to stress (Massar *et al.*, 2017; Padmaja *et al.*, 2018), which was reported among general populations during the pandemic (Stanton *et al.*, 2020; Meyer *et al.*, 2020; Gupta *et al.*, 2020; Mandelkorn *et al.*, 2021). Similarly, findings from the thematic analysis indicate that academic staff from the current study reported an increase in anxiety, fear and worry due to the pandemic, which could have contributed to their time in bed. However, this was not studied directly. Furthermore, a longer time in bed could be linked to the changes in screen-based behaviours associated with COVID-19. In other research, an increase in screen time has been observed in general populations (Smith *et al.*, 2020), especially through reading the news or being on social media at night (Lin *et al.*, 2021), watching television and being on one's phone in bed (Lin *et al.*, 2021) during the pandemic. Similarly, although the purpose for screen use was not determined, a large proportion of academic staff used screens one hour before bed most weeknights and weekend nights, which may have contributed to a longer time in bed. Again, however, this was not studied directly. Nonetheless, these kinds of behaviours can influence sleep duration and sleep quality, which may be problematic for the current sample who have reported short sleep duration and poor sleep quality.

5.3.2 Sleep disturbances

Over half of the current cohort reported that using the bathroom during sleep hours (i.e. nocturia) (Dani *et al.*, 2016) and waking up in the middle of the night or early morning disturbed their sleep three or more times per week. Involuntary night-time awakenings may be explained in the current sample as it has been related to aging (Vaz Fragoso & Gill, 2007; Pearson, 2017; Jonasdottir *et al.*, 2021) and the majority of the sample were 40 to 49 and 50 to 59 years old. Although increasing age is associated with increased nocturia (Yoshimura *et al.*, 2004; Boongird *et al.*, 2010; Dani *et al.*, 2016; Soysal *et al.*, 2020), it is common in adult populations of all ages (Dani *et al.*, 2016; Soysal *et al.*, 2020). In general, though, sleep tends to worsen with natural aging (Grandner, 2017) as sleep physiology undergoes significant changes (Vaz Fragoso & Gill, 2007), resulting in an increased risk of reporting sleep disturbances associated with age (Åkerstedt *et al.*, 2002). Additionally, the thematic analysis relating to sleep-related changes due to COVID-19 revealed sub-themes of experiencing bad or vivid dreams and experiencing difficulties falling asleep as common sleep quality-related issues. Both difficulty falling asleep (Innocenti *et al.*, 2020) and experiencing dreams (Innocenti *et al.*, 2020; Schredl & Bulkeley, 2020; Mandelkorn *et al.*¸ 2021; Gorgoni *et al.*, 2021; Scarpelli *et al.*, 2021) during the pandemic have been reported elsewhere. This may be related to the heightened stress, anxiety and depression associated with the pandemic, which, in turn, affects sleep (Stanton *et al.*, 2020; Meyer *et al.*, 2020).

For the current sample of academics, poor sleep quality, short sleep durations and sleep disruptions may have implications on their work. To explain, research done in other contexts illustrates that suboptimal and insufficient sleep negatively impact on sleepiness, fatigue (Goel *et al.*, 2014), tiredness, irritability (Orzel-Gryglewska, 2010), daytime dysfunction (Mandelkorn *et al.*, 2021), self-regulation and self-control (Barnes *et al.*, 2011; Barnes *et al.*, 2015) cognitive performance (Durmer & Dinges, 2005; Ratcliff & Van Dongen, 2009) and work effectiveness overall (Orzel-Gryglewska, 2010). These are important components for academic work and highlights the implications of sleep quality on academics given the cognitive nature of their work, especially during COVID-19. However, the impact of sleep disturbances on work and well-being were not explored in this study. Thus, additional research is required.

5.4 THE EFFECTS OF GENDER ON SLEEP

5.4.1 Poor sleep quality and bad dreams

Female academics from this study, 60.87% of which were poor sleepers, scored a significantly higher, therefore significantly worse, average global PSQI measure compared to males (7.83 for females, 6 for males). Therefore, female academics from the current cohort were poorer quality sleepers compared to males. This supports previous research in general populations (Fatima *et al.*, 2016; Jonasdottir *et al.*, 2021). Moreover, the finding that female academics from this study had a poorer sleep quality than male academics is similar to other population-based studies done elsewhere (Hung *et al.*, 2013; Fatima *et al.*, 2016; Tang *et al.*, 2017; Hinz *et al.*, 2017).

While not explored in the current study, one of these general population studies mentioned that psychosocial disparities such as depression might contribute to gender differences in sleep quality given that affective disorders are greater in women (Fatima *et al.*, 2016). In addition, mental health has been reportedly worse among females compared to males in several population-based studies during the COVID-19 pandemic (Casagrande *et al.*, 2020; Gualano *et al.*, 2020; Liu *et al.*, 2020; Barros *et al.*, 2020). This may be relevant for the female academics from the current study who, compared to their male counterparts and based on the thematic analysis of sleep disturbances, had more reports of worrying and anxiety with regard to sleep disturbance. Furthermore, while the mechanism of gender-based sleep differences in sleep quality is unknown (Hung *et al.*, 2013), it may be related to the influence of hormones and gender-specific responses to environmental stress (Hung *et al.*, 2013). By extension, gendered age-related changes such as menopause (Krishnan & Collop, 2006) have been attributed to poor quality sleep or reporting greater disruption to sleep. While beyond the scope of this study, this may have impacted female staff, given that their average age (45.96 years) is around the age where these hormonal changes can occur. The implications of poor sleep quality are discussed below, following the findings that relate to sleep disturbances.

5.4.2 Sleep disturbances

The thematic analysis of sleep disturbances showed that male and female academics from this study equally reported attending to young children as a sleep disturbance. This is contrary to previous research, which highlights that having young children

impacts sleep disturbance indicators of women with children and that gender-based caretaking norms may disproportionately interrupt sleep of female parents (Jonasdottir *et al.*, 2021). Further, this finding from the current study is contrary to previous research, showing that female academics tend to provide more of their time compared to males attending to these roles (Mason & Goulden, 2004; Bezuidenhout & Cilliers, 2011; Obers, 2014). This finding may reflect that male academic parents from this study shared the child-caring responsibilities with their partners. On the contrary, it may reflect the limited nature of the use of self-reports in this study. To elaborate, female academic parents may have complained less about their child-caring responsibilities, given that they tend to deal with these responsibilities regularly outside of the pandemic context.

Moreover, female respondents from the current study reported experiencing bad dreams more frequently than their male counterparts. This supports the observation of previous studies in the general population in which females reported a higher frequency of dreams during the COVID-19 lockdowns (Schredl & Bulkeley, 2020; Gorgoni *et al.*, 2021; Scarpelli *et al.*, 2021). Increased stress (Solomonova *et al.*, 2021), depression and anxiety (Solomonova *et al.*, 2021; Gorgoni *et al.*, 2021; Scarpelli *et al.*, 2021) can impact the experiences of dreams at night. While beyond the scope of what was explored in this study, recent research shows that females' mental health was more affected by the pandemic (Schredl & Bulkeley, 2020) and they tended to experience more dreams, especially dreams that were vivid or bizarre (Gorgoni *et al.*, 2021), negative (Schredl & Bulkeley, 2020) or dreams that involved nightmares (Solomonova *et al.*, 2021; Scarpelli *et al.*, 2021). In the current study, findings from the thematic analysis revealed a sub-theme of increased anxiety, fear and worry. While male academics reported experiencing worry, a number of female's responses spoke to feeling a greater sense of anxiety and fear. In addition, one of the main emergent themes was changes in qualitative characteristics of which a sub-theme of experiencing more (bad or vivid) dreams emerged. All but one of the responses that made up this sub-theme came from female academics in the study. This indicates that female academics from the current study reported experiencing heightened feelings of fear and anxiety and bad or vivid dreams that were linked to the COVID-19 pandemic. More research is necessary to understand these relationships.

Overall, poor sleep quality can impact the performance of cognitive work and work productivity overall. Thus, for the female academics from this study, the implications of having a poor sleep quality may be a reduction in work performance and productivity. This may be problematic, given that research indicates that the productivity of female academics has already been affected due to the pandemic (Gabster *et al.*, 2020; Oleschuk, 2020; Langin, 2021).

5.4.3 Time in bed

Female academic staff reported a significantly longer time in bed, a finding reported in previous research (Custers & Van den Bulck, 2012) as well as a very recent and large (n = 69 650) global-scale study (Jonasdottir *et al.*, 2021). Additionally, studies conducted during the COVID-19 lockdowns showed that males spent a significantly shorter time in bed than their female counterparts (Wright *et al.*, 2020; Cellini *et al.*, 2021). Studies have shown that time in bed and sleep efficiency (which is composed of a time in bed measure) may be the result of having to deal with stress (Massar *et al.*, 2017; Padmaja *et al.*, 2018). Stress can impact cortisol and blood pressure levels, which has shown to negatively correlates with sleep efficiency (Padmaja *et al.*, 2018). The thematic analysis revealed that female respondents from current sample experienced a lot of worry and anxiety, similar to general population findings (Gualano *et al.*, 2020; Casagrande *et al.*, 2020; Barros *et al.*, 2020; Lin *et al.*, 2021), which could contribute to a longer time in bed. However, this was not studied directly. Additionally, there was a reduction in time-based morning obligations. Not having to get physically ready for a working day or preparing children for school, as examples, may have afforded female academics more time than usual to stay in bed. However, the reasons for time spent in bed were not explored in the current study and warrants further investigation.

5.4.4 Lack of gender differences

There were many sleep measures that males and females did not differ on, such as self-reported sleep duration, bed and wake times, sleep quality rating, sleep efficiency, sleep onset latency and the majority of sleep disturbances listed in the PSQI. This contradicts previous findings from general population literature on gender differences. These have found that males report later bedtimes (Custers & Van den Bulck, 2012; Burgard & Ailshire, 2013) and that females report more sleep disturbances (Åkerstedt

et al., 2002; Grandner *et al.*, 2012; Burgard & Ailshire, 2013), longer sleep durations (Burgard & Ailshire, 2013; Knutson, 2013; Basner *et al.*, 2014) and worse subjective sleep quality ratings (Knutson, 2013). However, the findings of the current study are in line with other studies showing no gender differences on measures of sleep duration (Voderholzer *et al.*, 2003; Magee *et al.*, 2009; Kalak *et al.*, 2015; Madrid-Valero *et al.*, 2017; Farah *et al.*, 2019), wake time (Custers & Van den Bulck, 2012), sleep latency (Voderholzer *et al.*, 2003; Ursin *et al.*, 2005) and sleep efficiency (Voderholzer *et al.*, 2003). It has been argued that the effect of gender on measures such as bedtimes, sleep onset latency and duration dissipate with age and may be greater among younger adult age groups (Luca *et al.*, 2015). This is important as the majority of the sample were beyond young adulthood (i.e. older than 35 years) and age or life stage may have acted as a homogenizing factor in this regard. However, this was not tested directly.

Another homogenizing factor could have been the work context of the participants. Experiencing similar involvement in paid work can contribute to similarities between genders in sleep duration and time available for sleep (Burgard & Ailshire, 2013). Both male and female academics from the current study were involved in paid work, came from the same institution, were similar in rank and had similar levels of education. In addition, during the time of the study, both male and female academics had to work from home. Therefore, both groups had to deal with similar changes to work-life interactions and their work environment overall. These similarities in their work may have counteracted potential gender-based differences in some reported sleep behaviours. Again, however, this did not undergo direct study and is merely speculative.

Further, it is important to acknowledge the reliance of self-reported data, particularly the use of the PSQI. In their systematic review and meta-analysis of the PSQI as a screening tool for clinical and non-clinical samples, Mollayeva and colleagues (2016) showed inconsistent findings when gender or sex differences are explored. While this provides a better understanding that gender differences may not be expected, the reasons for gender differences were not apparent and this warrants further investigation to understand if and why male and female academics are similar on measures of reported sleep.

5.5 THE EFFECTS OF ACADEMIC RANK ON SLEEP

5.5.1 Poor sleep quality experienced by senior academic staff members

The only variable that academic rank had an effect on was the mean global PSQI score. The senior-level academics (consisting of senior lecturers and senior researchers), who are in the middle of their careers, had a significantly poorer sleep quality than junior/intermediate as well as professorship-level academics. To the best of the authors' knowledge, no direct studies have measured the differences in reported sleep behaviours and sleep quality between academic ranks. Nevertheless, the mid-career's unique and challenging work experiences (i.e. grouped within senior-level rank in the current study) and associated high workloads may help to explain their significantly poorer sleep quality score. To elaborate, high workloads and occupational stress are common in the mid-career phase (Randall, 2006; Kwiek & Antonowicz, 2013) and high workloads negatively impact sleep (Åkerstedt *et al.*, 2002; Winwood & Lushington, 2007) and stress (Marquié *et al.*, 1999; Dahlgren *et al.*, 2005; Vgontzas *et al.*¸2008; Bixler, 2009; Youngstedt *et al.*, 2016). While these workloads have not been determined or quantified in the current study, higher workloads may be due to being on a tenure-track (Canale *et al.*, 2013), being in the most productive phase of academic work-life (Abramo *et al.*, 2011; Mishra & Smth, 2013), assuming more leadership roles (Randall, 2006) and reporting greater stress (Kwiek & Antonowicz, 2013). Nevertheless, poor sleep quality has negative implications and influence on work productivity (Gibson & Shrader, 2014; Gingerich *et al.*, 2018) and overall well-being (Matricciani *et al.*, 2017; Grandner, 2017; Zaki *et al.*, 2018; Palagini *et al.*, 2019). Senior-ranked academics reported the worst sleep quality and research elsewhere indicates that poor sleep quality can have adverse influence on work. Thus, the findings from this study may imply that the sleep quality and possibly work productivity of senior-level academics were more vulnerable. However, further study into the direct impact of sleep on work productivity and well-being in academic staff is required.

5.5.2 A lack of rank-related differences

Academic rank had no effect on self-reported sleep duration, bed and wake times, time taken to fall asleep, time in bed, subjective sleep quality rating, sleep efficiency, presence of bed partners, frequency of sleep disturbances and proportions of good and bad sleepers. Although studies have not investigated the effects of academic rank on sleep before, the findings of the current study may be contrary to previous research.

To explain, professorship-level academics, despite still mostly being working age, were significantly older than junior and senior level academics. Studies show that sleep measures experience a gradual worsening as one gets older and may therefore be different from younger groups (Espiritu, 2008; Porkka-Heiskanen *et al.*, 2013; Pearson, 2017). Thus, one might have expected professorship-level academics to report worse or different sleep measures compared to other groups. This is based on previous research which has found that age is associated with changes to sleep-wake behaviours such that older adults tend to go to bed earlier (Pearson, 2017), wake up earlier (Gradisar *et al.*, 2013; Luca *et al.*, 2015), sleep shorter durations (Hume *et al.*, 1998; Bixler *et al.*, 2005; Espiritu, 2008; Porkka-Heiskanen *et al.*, 2013; Pearson, 2017), have poorer sleep quality (Hume *et al.*, 1998; Ohayon *et al.*, 2004; Espiritu, 2008; Pearson, 2017), report more sleep disturbances (Åkerstedt *et al.*, 2002; Vitiello *et al.*, 2002; Stranges *et al.*, 2012; Salfi *et al.*, 2020) and are more likely to have sleep disorders (Vaz Fragoso & Gill, 2007).

Firstly, a lack of differences in sleep may be explained by the fact that all academic staff from the current study, irrespective of rank, were pursuing their academic activities in the context of a lockdown, which had adverse impacts on sleep for individuals in general populations (Gupta *et al.*, 2020; Innocenti *et al.*, 2020; Marelli *et al.*, 2020; Sañudo *et al.*, 2020; Casagrande *et al.*, 2020; Cellini *et al.*¸2020; Lin *et al.*¸2021). Thus, a lack of differences may be observed due to all academic staff operating from home, limiting travel and being exposed to potential changes to their sleep as a result of the pandemic. Furthermore, research shows that reporting poor sleep measures often relates to poor health among older adult groups (Foley *et al.*, 2004; Vaz Fragoso & Gill, 2007; Ancoli-Israel, 2009; Grandner *et al.*, 2012). All rank groups reported no differences in health and lifestyle measures, which may have acted as a homogenizing factor and contributed to the similarity in sleep measures. However, the relationship between lifestyle and sleep was not explored in this study. In addition, previous research has found that respondents with lower levels of education report differences in their sleep compared to those with higher levels of education (Grandner, 2010; Whinnery *et al.*, 2014; Tang *et al.*, 2017). Since the majority of academic staff from all ranks had a Master's degree level of education or higher, education may have reduced the variability between groups. However, this was not explored directly and therefore warrants further study.

5.6 WORK CHARACTERISTICS OF ACADEMIC STAFF

5.6.1 Work hours, work demands and ICTs

Academic staff from the current study reported working similar work hours reported in previous international (Bentley & Kyvik, 2011; Mkumbo, 2014; Samad *et al.*, 2015; Cannizzo & Osbladiston, 2016; Opstrup & Pihl-Thingvad, 2016) as well as national research (Barkhuizen *et al.*, 2014) done on academic staff. The current sample reported working beyond the South Africa's (SA) statutory limitation of 45 hours per week, detailed in Section 9.1(a) of the *Basic Conditions of employment Act, 1997* (Republic of South Africa, 1997). This, however, is similar to previously studied cohorts in other countries. Nonetheless, working longer hours could have been attributed to working online. In the thematic analysis, *increased work hours* emerged as a sub-theme to changes in *work hours and routine* as a result of working in the COVID-19 context. Respondents report how having to work online created more demands on time in terms of communicating and consulting with students and colleagues, preparation for teaching, and marking of tests and assignments. This has also been reported in previous research from other countries that focused on the use of information and communication technologies (ICTs) in the academic context (Menzies & Newson, 2007; Heijstra & Rafnsdóttir, 2010). Previous research in the context of academic work demonstrates that the use of ICTs increases the load placed on time by increasing academics' susceptibility to distractions (Menzies & Newson, 2007) and having to solve technical problems that can take a considerable proportion of time (Heijstra & Rafnsdóttir, 2010).

Thus, reporting an increase in working hours may have been due to the abrupt shift to online learning, which required academic staff had to redesign their methods of teaching and learning, supervision and administration while relying on their application of technology to do so (Majeed, 2020; Corbera *et al.*, 2020; Motala & Menon, 2020; Sahu, 2020). This was reflected by the current cohort in the thematic analysis. One of the main themes related to the reported changes in work during COVID-19 was *online teaching and communication*, for which a sub-theme of *workloads and demands on time* emerged. This increase in workload could have contributed to long working hours for the current sample, although this was not studied directly. Moreover, research highlights that SA academic staff may have had limited training, skills and knowledge, which could slow down them down and deter their execution of online teaching

methods to some extent (Muftahu, 2020). Thus, working on and conducting all academic activities online could have resulted in the perception of increased work hours among academics from this study. However, this surpasses the scope of this study and would need to be researched further.

Academic staff from the current study did not report working much more than what has been previously recorded in other countries (Bentley & Kyvik, 2011; Mkumbo, 2014 Barkhuizen *et al.*, 2014; Samad *et al.*, 2015; Cannizzo & Osbladiston, 2016; Opstrup & Pihl-Thingvad, 2016). Tight (2010), who reported on how work hours in academics had not changed since 1994, highlights that working beyond a 50-hour week cannot arguably be tolerated by the modern workforce. Thus, despite academic workload reportedly increasing, it may not have been possible to increase work hours past a tolerable point. However, the degree of variation indicates that some academic staff from the current study did work over 50 hours a week. Working long hours is problematic, as it often requires a greater recovery period (Virtanen *et al.*, 2009). In addition, long working hours can negatively impact sleep quality (Sekine *et al.*, 2006; Virtanen *et al.*, 2009; Afonso *et al.*, 2017) and sleep duration (Kronholm *et al.*, 2006; Virtanen *et al.*, 2009; Afonso *et al.*, 2017). Thus, long working hours may challenge the current sample who likely need sufficient sleep to adequately recover from work, but whose work hours may compromise sleep. However, direct investigation on the impact of work hours on sleep in academic staff is needed.

Moreover, the estimation of work hours may have been limited by the self-reported nature of the study in conjunction with having to work in blended working environments. To elaborate, academic staff from the current study experienced a lack of routine in their work, which emerged as a sub-theme to the main theme of change in *work hours and routine*. Academic staff highlighted how they struggled to maintain a sense of routine, that there was a lack of structure and that routines were disrupted due to working at home. Further, blurring and blending work and house or childcare chores may have made it difficult for academics to work within their normal time boundaries and this may therefore have interfered with the perception of working hours. Overall, the lack of definitive work routine distinctions may have possibly influenced the estimation of working hours.

Furthermore, the perception of working hours may be influenced by the fact that academics often undertake invisible labour, duties and roles which may not necessarily be assumed or accounted for as work as they are often not considered a fprimary role (Fanghanel & Trowler, 2008). This was evident among the current sample, especially in the thematic analysis which, with reference to *online teaching and* communication, included sub-themes of *workloads and demands on time* and *expectations and reachability*. Within these sub-themes, respondents mentioned having to "*[create] notes and lecture slides that have more detail than normal*", "*spend more time consulting… with a lot more back and forth*", that students tend to, "*send you emails about technical issues, library access, their personal issues…*" and that, "*one has to do the same things in three different ways and on various platforms to reach people*". These are examples of peripheral tasks and since examples like these may surpass primary roles of academics, they may not necessarily be assumed or accounted for as work (Fanghanel & Trowler, 2008).

In terms of weekend work, finding that the current sample reported frequent weekend work corresponds with previous research on SA academic staff who extended work hours into the weekend to deal with the loads of their work (Barkhuizen & Rothmann, 2008). Research shows that academic staff work long hours during the week, although they may not always complete their week's workload. In this case, research shows that academics tend to push work onto weekends to cope with their workloads (Bryson, 2004; Kinman & Jones, 2008; Hunter & Leahey, 2010; Cannizzo & Osbaldiston, 2016). Weekend work is often facilitated by different forms of ICTs, which are used to conduct academic work from home during leisure or relaxation time (Gappa *et al.*, 2005; Heijstra & Rafnsdottir, 2010; Currie & Eveline, 2011). Overall, though, academic staff worked long hours during the week and frequently worked over the weekend. Working long hours could have negative impacts on academic staffs' health and well-being as it can lead to insufficient sleep (Van der Hulst, 2003; Sekine *et al.*, 2006; Härmä, 2006; Kronholm *et al.*, 2006; Virtanen *et al.*, 2009; Afonso *et al.*, 2017). In the academic context, it may also limit the time available to rest, recovery from work (Freitas *et al.*, 2019) and partake in health-promoting activities such as exercise (Leicht & Sealey, 2013; Cooper & Barton, 2016).

5.6.2 Working with e-technology and engagement with work

While the usefulness of ICTs in academe is realized (Boswell & Olson-Buchanan, 2007; Heijstra & Rafnsdóttir, 2010), it can promote a 24-7 work environment (Fenner & Renn, 2010) for a group of employees who are characteristically intrinsically motivated by (Kenny & Fluck, 2017) and struggle to disengage from their work (Currie & Eveline, 2011). This emerged in the thematic analysis as well, where the use of ICTs (such as WhatsApp, Zoom and Microsoft Teams) meant that academics in the study were virtually almost always at work. The thematic analysis highlighted that academic staff experienced greater demands on time due to constantly being online. This was captured by one respondent who mentioned they spent so much time in Zoom meetings that they, "*… literally become a Zoombie*". Additionally, working online made it difficult for academics to disengage from their work, as revealed in the thematic analysis. Some academics from the study struggled to have non-work time and felt they could not distinguish between their work and home spheres, making it feel that they were always at work. Further, having ICTs meant that students expected academics to be often available and reachable. This is especially reflected in an extract from one of the respondents who said, "*It often feels as though it is forgotten that staff are also living through the pandemic… not just students*".

Although the reported working hours of academics from the current study were similar to reported hours of academics outside of the COVID-19 context, the current study revealed an intensification of academics' work, which could have influenced perceptions of work hours. In addition, having constant access to work via ICTs may be a problem for a group like academics who are intrinsically motivated by their work (Kenny & Fluck, 2017) and who will likely do work if it needs to be done – even during times where leisure, recovery and sleep are more important.

5.7 THE EFFECTS OF GENDER ON WORK

5.7.1 Work hours

Female academic staff from the current study reported working significantly less weekday work hours and total weekly work hours when compared to male participants. This supports recent research on academic staff performed in other countries during the pandemic, which found male academics to work longer hours compared to their female counterparts (Oleschuk, 2020; Gabster *et al.*, 2020; Langin, 2021; Minello *et*

al., 2021). These studies highlight that female academics increased their domestic labour (Corbera *et al.*, 2020) and that the pre-existing caring responsibilities increased under the emotional strain of the pandemic (Oleschuk, 2020), which likely compromised their research (Minello *et al.*, 2021) and productivity overall (Hedding *et al.*, 2020). In the current study, one of the sub-themes from the thematic analysis relating to changes to the work environment during COVID-19 was *household and childcare distractions*. While both males and females reported having to undertake child-minding duties, more females from the current study reported doing so while working from home. Additionally, more females reported having to work in the evenings or at night to make up for the lost time during the day due to childcare, which relates to previous studies that found male academics to be productive. Thus, female academic staff from the current study may have had less opportunity to work as many hours as males due to the home-based roles that they had to fulfil. However, the reasons for differences in work hours are not apparent in the current study, warranting further study on this topic.

5.8 THE EFFECTS OF ACADEMIC RANK ON WORK

5.8.1 Lack of differences between academic ranks

When the effects of rank on work variables were explored, the current study found that academic ranks only differed in terms of their highest postgraduate qualification. Thus, there were no differences between ranks regarding faculty, daily commute, hours worked on weekdays, weekend work hours, frequency of weekend work and total weekly work hours. This finding corresponds with previous research, which suggests that differences in work experiences between different ranks are not always found (Lissoni *et al.*, 2011; Mishra & Smyth, 2013; Price *et al.*, 2015; Cannizzo & Osbaldiston, 2016). For example, some researchers suggest that earlier career academics experience high workloads and constant pressures to publish (Lissoni *et al.*, 2011; Price *et al.*, 2015) where others highlight work at this level being less stressful, more rewarding and more reasonably demanding (Bexley *et al.*, 2011) compared to academics in the later phases of their careers. Nonetheless, a lack of differences in the current study may have had to do with all academic staff, irrespective of their rank, having to work long hours and over the weekend to manage the intensification of work associated with the COVID-19 pandemic. Alternatively, a lack of differences may reflect the limited nature of self-reported work hours.

5.9 GENERAL HEALTH AND LIFESTYLE CHARACTERISTICS OF ACADEMIC STAFF

5.9.1 Positive health indicators

Good indications for health among the academic sample were that two-thirds did not suffer from chronic disease and the majority were non-smokers. The low proportion of smokers in the current sample supports many studies conducted on academics from both SA (Madzaga, 2017; Reddy & Naidoo, 2018) and other countries (Sookpeng *et al.*, 2005; Pirinçci *et al.*, 2009; Khruakhorn *et al.*, 2010; Mulenga & Siziya, 2013; Yeshaw & Mossie, 2017; Esaiyas *et al.*, 2018 Amanyire *et al.*, 2019) which report a low prevalence of smoking in their samples. The current sample consumed a median of 3 cups per day in terms of their caffeine consumption and had their last serving just after 15:00. Although research is limited, the current sample consumed more caffeine daily than research done on other academic or university staff (Sookpeng *et al.*, 2005; Bryan *et al.*, 2012; Khwanchuea *et al.*, 2012). Since caffeine improves wakefulness, alertness and performance (Shochat, 2012) and academics were working under increased workloads within the context of COVID-19 (Zuccoli & Teruggi, 2020; Sobaih *et al.*, 2020; Majeed, 2020), caffeine may have been used to boost wakefulness and performance during the workday. Alternatively, academics may have consumed more caffeine due working from home and having easy access to caffeinated products. This, however, was not studied directly and no previous consumption prevalence was explored. Nevertheless, the current sample consumed less daily caffeine than what is shown to have negative sleep-related impacts among general populations (Janson *et al.*, 1995; Ban & Lee, 2001; Ohayon, 2004; Ergün *et al.*, 2017). Further, respondents reported consuming their last serving of caffeine at 15:06 on average. Thus, the current sample did not consume caffeine in the evenings, which is also shown to impact sleep negatively (Irish *et al.*, 2015; Burke *et al.*, 2015).

5.9.2 Body mass index

The median BMI of the sample classified academic staff as pre-obese based on World Health Organization (WHO) BMI categories (WHO, 2000), similar to previous findings of academic or university staff falling within the same classification (Khruakhorn *et al.*, 2010; Hajichehasae *et al.*, 2017; Ahmed, 2019; Molina-Torres *et al.*, 2020). However, BMI of the current sample appears higher than some reports in other university contexts (Leicht *et al.*, 2013; Ahmed, 2019; Redondo-Flórez *et al.*, 2020; Faghy *et*

al.¸2021). Having a higher BMI is problematic, especially for groups such as the current sample, as it is associated with poor sleep measures (Taheri *et al.*, 2004; Magee *et al.*, 2011) and simultaneously promotes poor sleep measures as well (Åkerstedt *et al.*, 2002). This current study, however, did not investigate the relationship between BMI and self-reported sleep measures, therefore necessitating further research on this topic.

5.9.3 Physical activity

Over a third of the sample reported not meeting the WHO PA guidelines of 150 minutes of moderate- to vigorous-level activity per week. This finding supports previous research that report issues of poor PA among university staff (Hogan *et al.*, 2002; Khruakhorn *et al.*, 2010; Turkmen *et al.*, 2015; Faghy *et al.*, 2021). Achieving inadequate PA for academic or university staff has previously been a problem due to a reported lack of time (Cooper & Barton, 2016) or energy (Leicht *et al.*, 2013), little opportunity for movement during working hours at their HEIs (Leicht *et al.*, 2013; Faghy *et al.*, 2021) as well as work and family commitments (Leicht *et al.*, 2013).

During the period of data collection, all academic and other university staff members had to work from home due to COVID-19 lockdowns. As a result, PA may have decreased, which has been identified as a consequence of COVID-19 related confinement (Meyer *et al.*, 2020; Stanton *et al.*, 2020) and work demands that were largely screen-based (Corbera *et al.*, 2020). It is therefore challenging to determine if over a third of the current sample would still not meet WHO recommendations under normal conditions. However, there were limitations with how PA prevalence was determined in this study which was through a yes/no answer. There are more detailed methods of measuring PA, such as the International Physical Activity Questionnaire (IPAQ) (Craig *et al.*¸2003) which explores time and intensity of PA. Thus, there is an opportunity for future research to consider PA of academic staff using more detailed tools. Nevertheless, the proportion of those who did not participate in PA was high. Having low rates of PA may be problematic, for both the current sample and general population, as studies outside of the academic context show that PA has positive influences on areas of sleep such as sleep quality (Youngstedt *et al.* 1997; Hoefelmann *et al.*, 2012; Yang *et al.*, 2012; Kredlow *et al.*, 2015; Rayward *et al.*, 2017), sleep duration (Youngstedt *et al.*, 1997; Schoenborn & Adams, 2008; Bixler, 2009;

Park *et al.*, 2010), both which were suboptimal in the current sample. Additionally, a recent study highlighted that PA modified the effect of work-related stress associated with poor sleep quality in university professors (Freitas *et al.*, 2019). Thus, it may be argued that increasing rates of PA among academic staff of the current sample could be an effective lifestyle adjustment to reduce poor sleep quality. However, this association was not made in the current stay and warrants further research.

5.9.4 Sedentary and screen use behaviours

5.9.4.1 *Daily sedentary time*

Academic staff reported spending just less than 10 hours per day being sedentary. This suggests that a significant proportion of their waking hours were spent engaging in sedentary behaviours, similar to previous findings among university or academic staff (Khruakhorn *et al.*, 2010; Leicht *et al.*, 2013; Faghy *et al.*, 2021). However, the average reported sedentary time of the current sample was higher than some of the previous reports on academic/university staff who reported roughly 6 to 8 hours of daily sedentary time (Leicht *et al.*, 2013; Ahmed, 2019; Faghy *et al.*¸2021). Further, time spent being sedentary in the current sample exceeded previous sedentary time averages reported in international-, national- amd population-based studies (Matthews *et al.*, 2008; Baumann *et al.*, 2011; Bennie *et al.*, 2013; Mielke *et al.*, 2014; Van Dyck *et al.*, 2015), by up to almost 5 hours a day.

Being sedentary or inactive is part of academic work (especially during COVID-19), such that cognitive work conducted on a compute or laptop typically demands being seated. Further, research among academic staff done elsewhere has shown that being sedentary is associated with the little time that academics have available for PA due to their work commitments, family commitments and lack of energy (Leicht *et al.*, 2013). During the data collection period, respondents were operating from their home base and all academic activities (e.g. teaching, supervision, meetings) were conducted online. This offered little opportunity for movement and a greater likelihood of lowered activity (Cellini *et al.*, 2020), increased sitting time (Sañudo *et al.*, 2020; Fukushima *et al.*, 2021; Stockwell *et al.*, 2021) and extended screen time (Qin *et al.*, 2020; Smith *et al.*, 2020) (discussed below). In addition, tasks such as providing lectures, tutorials, laboratories, seminars, consultations and conferences – which would typically require some degree of movement – were done within each academic's home, typically behind

their desks, creating extensive opportunities to increase sedentary behaviours. Having an extended sedentary time is related to perceived poor sleep quality and sleep problems (Foley *et al.*, 2004) and increases the likelihood of using screens (Sañudo *et al.*, 2020). This may have negative health-related implications for the current sample who reported suboptimal sleep quality, short sleep durations and used screens for large proportions of their day and late at night late.

5.9.4.2 *Week and weekend screen use behaviours*

The change to the working environment due to COVID-19 demanded that academic tasks and roles were executed through ICTs. To the best of the authors' knowledge, limited studies have measured the amount of screen time exposure among academic staff previously. Respondents from the current study reported extended screen time use during week and weekend days (9 h 24 min and 5 h 30 min, respectively), higher than that of a previous finding on academic staff (Ahmed *et al.*, 2019) as well as in studies with general or population samples (Patterson *et al.*, 2016; Christensen *et al.*, 2016; Wang & Vella-Brodrick, 2018). This supports recent literature, which shows that smartphone use increased significantly under lockdown among young adults (Sañudo *et al.*, 2020) and bedtime screen use in middle-aged and older adults was/is growing during the pandemic (Grigg-Damberger & Yeager, 2020).

Further, a large proportion of staff used screens one hour before bed on week and weekend nights very frequently. Compared to other studies, a greater proportion of academic staff from this study reported frequently using screens before bed (Levenson *et al.*, 2017; Exelmans & Scott, 2019; Walsh *et al.*, 2020). Home confinement accompanied with an increased focus on and application of technologies may have provided a pathway for academics, who are known to struggle with disengagement from work (Currie & Eveline, 2011), to use screens at night for work and leisure. However, screen types and purpose for screen use prior to bedtime were not asked about directly. Thus, it is not possible to confirm if long daily and frequent night-time screen use was attributed to the change of the working context, although it may have contributed somehow. Further study is therefore needed.

Irrespective of the unique context, undertaking academic work at night (which may require screen time at night or near bedtime) and consequently tying professional and personal spheres closer together is a work characteristic that has been observed

among academic staff for many years (Gappa *et al.*, 2005; Currie & Eveline, 2011; Heijstra & Rafnsdottir, 2010; Rafnsdóttir & Heijstra, 2011). However, the current study did not determine if screens were used at night for either work or for other reasons. Regardless, daily screen use was longer when compared to other studies and using screens prior to bedtime was very frequent. Some of the consequences of screen use at night, such interfered recovery from work, (Lanaj *et al.*, 2014), lowered engagement during the following workday (Lanaj *et al.*, 2014), disrupted sleep patterns (Gradisar *et al.*, 2013) and worse sleep quality (Exelmans & Van den Bulck, 2016) and duration (Lanaj *et al.*, 2014) may be unhealthy for the academic sample who already report not sleeping long or well enough.

5.9.5 Alcohol consumption

On average, the current sample consumed a median of 7 drinks per week. While studies considering alcohol consumption in academic or university staff have often not reported weekly or daily doses, the current finding is similar to that of one that has (Awoliyi *et al.*, 2014). Additionally, just over 60% of the current sample reported consuming alcohol, which is similar to proportions of staff that have been reported previously (Hogan *et al.*, 2002; Mulenga & Siziya, 2013; Yeshaw & Mossie, 2017; Reddy & Naidoo, 2018). Moreover, on average, the current sample had their last serving of alcohol less than two hours before the average self-reported bedtime. This could have had negative impacts on maintaining sleep throughout the night given that literature highlights that both high (Shochat, 2012) and low (Ebrahim *et al.*, 2013) doses, administered near bedtime affects sleep (Shochat, 2012; Ebrahim *et al.*¸2013; Irish *et al.*, 2015). The current study did not explore the associations between alcohol consumption behaviours and self-reported sleep measures. Thus, future research on this topic may be necessary.

5.10 EFFECTS OF GENDER ON HEALTH AND LIFESTYLE BEHAVIOURS

The only difference between males' and females' lifestyle behaviours was the time when the last serving of alcohol was consumed, with males reporting having their last serve significantly later compared to females. This supports previous international research, which found universal gender differences in alcohol consumption in general population data of 35 countries (Wilsnack *et al.*, 2009). These include males being more likely to drink larger volumes of alcohol at higher frequencies and are less likely

to stop drinking than females (Wilsnack *et al.*, 2009). Further, multinational studies have reported for it to be more common for men to be heavier drinkers (French *et al.*, 2014; Chaiyasong *et al.*, 2018). Female academics from this study may have stopped drinking alcohol earlier due to their higher tendency to engage in evening and late night work compared to males, as revealed in the thematic analysis. However, the reasons behind lifestyle behaviours such as alcohol consumption were not investigated in the current study and would need to be researched directly.

The finding that males and females did not differ significantly based on other health and lifestyle variables does not support previous research in general populations. Studies of general populations have also shown women to sit significantly less (Santos *et al.*, 2009; Bennie *et al.*, 2013) or be less sedentary (Mielke *et al.*, 2014), report significantly lower (Hulme *et al.*, 2003; French *et al.*, 2014; Cooper & Barton, 2016) or higher (Macniven *et al.*, 2016) rates of PA, to have a lower BMI (Santos *et al.*, 2009; Khwancheua *et al.*, 2012), for men to be smokers (Lin *et al.*, 2019) and drink significantly more alcohol (French *et al.*, 2014; Lin *et al.*, 2019). Notwithstanding, there are some studies to suggest non-significant gender effects on lifestyle behaviours such as smoking status (Zarini *et al.*, 2014), coffee consumption (Chang & Choi, 2016), sedentary behaviour (Matthews *et al.*, 2008), bedroom screen/media use (Custers & Van den Bulck, 2012) PA (Leicht & Sealey, 2013; Lin *et al.*, 2014) and overall health-promoting behaviours (Ammouri *et al.*, 2008), which is similar to the current findings. However, the context under which the current sample was studied could have homogenized these measures.

To explain, most individuals in general populations (irrespective of their gender) experienced changes to their overall lifestyle during COVID-19 lockdowns (Arora & Grey, 2020). This was expressed in reductions in physical activity (Arora & Grey, 2020; Meyer *et al.*, 2020; Stanton *et al.*, 2020; Cellini *et al.*, 2020), increased sedentary behaviours (Meyer *et al.*, 2020), increased use of electronic devices (Voitsidis *et al.*, 2020), working from home (Gupta *et al.*, 2020). This was facilitated by or resulted from home confinement (Cellini *et al.*¸2020) which all academic staff, irrespective of their gender, were subject to during the time of the study. Thus, the lack of differences in lifestyle behaviours may reflect the similarities in day-to-day contexts and working contexts of academic staff from this study. However, the reasons for various lifestyle

behaviours were not explored in the current study and would require additional research.

5.11 EFFECTS OF ACADEMIC RANK ON GENERAL HEALTH AND LIFESTYLE

Academic rank groups did not differ on any measures of health and lifestyle behaviours (i.e. BMI, smoking status, PA, weekday sedentary time, weekend and weekday screen time, frequency of screen use one hour before bed on weekend and weekday nights and caffeine and alcohol consumption behaviours). Considering that academic rank groups in this study were significantly different in terms of their age, the finding that these groups did not differ in their lifestyle behaviours contradicts previous research. By extension, age effects are reported extensively throughout literature in terms of health and lifestyle behaviours, particularly in BMI (Rayward *et al.*, 2017), alcohol abstinence (French *et al.*, 2014), being a smoker (French *et al.*, 2014), sedentary behaviours (Bauman *et al.*, 2011; Bennie *et al.*, 2013; Mielke *et al.*, 2014) and screen time (Christensen *et al.*, 2016), to name a few. However, the majority of academic staff from the sample had high levels of education. This is important as individuals from higher levels of education may have similar self-rated health, whether it is poor or good (von dem Knesebeck *et al.*, 2006; Cutler & Lleras-Muney, 2012), which may infer a homogeneity between groups in terms of their lifestyles. Similarities in lifestyle behaviours may also reflect the similarities in day-to-day, work-related and overall lifestyle circumstances due to home confinement, which were experienced by general populations (Arora & Grey, 2020; Meyer *et al.*, 2020; Stanton *et al.*, 2020; Cellini *et al.*, 2020; Leone *et al.*, 2020; Voitsidis *et al.*, 2020) and academic staff (Corbera *et al.*, 2020; Majeed, 2020; Sahu, 2020; Zuccoli & Teruggi, 2020) during the COVID-19 pandemic. Despite this, the reasons for various lifestyle behaviours were not explored in the current study and would require additional research.

5.12 RECOMMENDATIONS

5.12.1 Recommendations for academic staff

While there are recommendations on how much and how well to sleep, the practices that actually improve sleep and target ways to meet the recommendations are known as sleep hygiene (Gupta *et al.*, 2021). While these recommendations are applicable for the whole sample, they are important for female and senior academics, as their sleep quality was poorer than their comparative groups. Although the sleep quality of

these two subgroups was the most vulnerable, there are no separate sets of recommendations. This is because the current study did not investigate the causes of poor sleep quality and, therefore, cannot make specific recommendations that surpass the scope of the study.

Academics from the current study reported poor sleep quality and short sleep duration in general. To improve this, firstly, since the thematic analysis revealed staff reported inconsistent sleep schedules, academic staff should try to keep a regular bedtime and wake time schedule in order to bring structure into the day (Altena *et al.*, 2020) and to regulate circadian rhythm. In addition, it is recommended that the sleep schedule prioritizes getting enough sleep. This can be achieved by staff avoiding the use of social media and working or communicating on screens near to bedtime, which was commonly reported in this study. Further, it is suggested that academic staff exercise regularly (Irish *et al.*, 2015), preferably in the daylight (Lin *et al.*, 2021), reduce the total amount of alcohol consumed and avoid acute alcohol consumption before bed (Irish *et al.*, 2015). It is especially important for male academics from the current study to have their last serving of alcohol earlier as they tended to consume alcohol significantly later in the evening compared to females. This does not mean that alcohol consumption should be reduced, as the sample did not report a high weekly alcohol consumption. A number of respondents indicated that COVID-19 resulted in increased anxiety, fear and worry and indicated that mental ill-health contributed to sleep disturbances. Since psychosocial stress is linked to pre-sleep arousal and impaired sleep (Irish *et al.*, 2015), academic staff can consider finding stress management techniques and strategies to reduce stress. Alternatively, to reduce stress interfering with sleep at night, schedule short periods (e.g. 15 minutes) throughout the day to reflect on emotions and the situation, write down thoughts and/or talk about them to a partner or friend (Altena *et al.*, 2020). If working from home continues (which at the time of writing this thesis, it has), staff should try to get sun preferably in the morning. If this is not possible, brighten up the home and workspace by opening blinds and curtains and/or having the lights on. It is suggested that academics have structures for social support, especially during a period such as COVID-19, to improve sleep quality (Altena *et al.*, 2020).

The current study found that academics had extended screen time and sedentary times, which may have to do with the nature of their work combined with emergent demands associated with the pandemic context. In order to reduce screen time, it is recommended (wherever possible) to consider working away from screens. This can involve printing readings, assignments and tests to read and/or mark on paper and later scanned and uploaded back onto the computer/laptop to be returned to students or colleagues. In addition, wherever possible or appropriate, schedule face-to-face meetings with students and colleagues. In general, though, try to work in ways that do not involve screens all the time. Large proportions of staff from the current study also reported using screens one hour before bedtime. In order to reduce screen use near bedtime, it is advised that academics consider non-screen-based activities before bed, such as reading, journaling, or meditating.

With regard to sedentary behaviours, it is recommended that academic staff try to reduce sitting time by taking breaks to stand, using the bathroom furthest from the office, do a light stretch between bouts of work and consider investing in a sit-stand workstation. The current study found that over a third of academic staff did not meet World Health Organization (WHO, 2010) PA guidelines. While it is recommended that staff from the current study increase their PA, further research is required to guide more detailed recommendations for PA. This applies to all health and lifestyle factors, such as sedentary time and screen time.

Academic staff from the current study reported high workloads, as reflected in the thematic analysis. Staff should consider planning short meetings (online or in-person) with trusted colleagues and family members to express stress and other emotions as well as work-related concerns. Based on the thematic analysis, it is further recommended that staff try to establish a structured work routine limit working too often in the evening and late at night, especially using screens. Some respondents from the current study highlighted they had to work in the evenings more often as a result of daytime child-minding duties and domestic care. Where possible, academic staff can distribute household and childcare responsibilities with other home members who can handle the responsibilities. In the event that working from home continues, academics can try to ensure that themselves and other members of the household (if living with others), including children, have a structured routine and schedule. This is to ensure

147 that daily rhythms are consistent, which supports sleep (Lopez-Leon *et al.*, 2020). Examples of these structures involve getting ready as if you were going to work, exercising around the same time daily and having designated meal and snack times.

5.12.2 Recommendations for the university

The findings of this study will be articulated to the university and academic staff. The current study highlighted a culture of academia that is shaped by, among many factors, high workloads and long work hours, which were exacerbated by COVID-19 and online learning. Writing this at the end of the thesis, nearly a year after collecting data, academic staff are still having to cope with the impacts of COVID-19, the associated work demands and have had very few opportunities to take breaks from teaching and academic responsibilities. This needs to be carefully considered by the university to ensure staff wellness. Thus, it is recommended that the university consider the difficult sides of working in academia and how these may be alleviated for academic staff. The university can consider an education and awareness program or workshop for academic staff that relates to improving sleep and overall wellness. The university has already begun building ICT capacity by investing in apps and technologies that streamline work to ease to burden of heavy workloads placed on staff. It is recommended that these efforts continue along with sufficient training on these technologies, since the world of work for academic staff will likely focus on the use of ICTs in the extended future.

5.12.3 Recommendations for Higher Education Institutions

While the results from this study are not generalizable to other institutions, it speaks to the narrative in the literature that HE institutions have become increasingly globalized, for which the consequences have been a massification of student numbers, the increased use of ICTs and stressful working environments. The subsequent impacts on academic staff include an intensification of work, unmanageable workloads and difficulties balancing the roles they perform. Additionally, certain elements of their lifestyles (which are important for their health and performance) are being compromised as a result of the demands and pressures associated with modern academic work. For these reasons, it is recommended that there is an increase in formal discussion and debate within the HE sector about how to manage staff workloads in SA, especially if the COVID-19 pandemic continues.

5.12.4 Recommendations for future research

While the abovementioned recommendations are broad, there are several recommendations for future study. Future studies should consider the mechanisms related to, causes of and/or factors that affect sleep among academic staff. In addition, it would be useful to investigate why sleep may be different for specific groups such as gender and rank. The current study made use of self-reported data, which presents limitations. Therefore, in order to gain a better understanding of sleep-wake behaviours in academics, further studies should consider using objective methods for measuring sleep, such as actigraphy. Similarly, lifestyle behaviours such as sedentary time, PA and screen time should be studied objectively among academic staff. Furthermore, as research and the current findings indicate academic staff may consume large volumes of alcohol weekly. Determining weekly alcohol doses in conjunction with determining how much of the weekly dose is consumed during one session of drinking may be relevant to determine the prevalence of binge drinking.

Since the current study used a cross-sectional design, a longitudinal study would be useful to track if there are certain times of the academic year that sleep is improved or worse. It would also be useful to determine which factors impact sleep the most throughout different times of the year and why. Similarly, a longitudinal study is recommended to track the work- and sleep-related changes that occur during and post effects of the pandemic. Future studies should consider investigating sleep, work and lifestyle behaviours among staff cohorts from universities that have had established online teaching practices prior to the pandemic, compared to cohorts who transitioned online as a result of the COVID-19 restrictions.

Future research should investigate work demands and workloads among academic staff in SA and establish ways to reduce or efficiently manage these. In doing so, the culture of academia and how this may drive work demands and workloads should be considered. Furthermore, it would be useful to determine the impact that different interventions have on improving staff wellness. One-year longitudinal studies would be useful to determine the effects that workload management and wellness interventions may have on academic staff and whether they are able to find balance in academic work-life through these interventions. It is recommended that further study investigates the differences in work demands and experiences between academics of

different ranks and genders, why there may be differences and possible strategies to manage workloads. Lastly, given the main theme of childcare in the current study, future study should consider the impact of parenthood on the work and sleep of academic staff. It may be useful to determine if these impacts are different between males and females and why that may be the case.

5.13 LIMITATIONS

The current study comes with several limitations that need to be considered. Firstly, the study is limited by the small sample size that represents only 16.5% of academic staff from the current institution. The participation rates could have been influenced by motivation to respond, comfortability with sharing health-related information (Gupta *et al.*, 2020) and that academics were under a lot of work pressure at the time of the study, making an online questionnaire a low priority. The use of convenience sampling may have limited the study in that the sample unlikely reflects the population of academic staff (Etikan *et al.*, 2016). Thus, the results need to be interpreted with caution since they cannot be generalized to all individuals within the institution or to other institutions across the country. In addition, variability and bias in the sampling process are difficult to measure and control, which can be common with snowball sampling (Acharya *et al.*, 2013). The use of these sampling methods could have resulted in the recruited subjects who were interested in sharing their experiences, many who may have been struggling, but did not participate in the study. Further, the study only distributed the study invitation over email. This could have otherwise included additional online social networks such as Facebook, Twitter or even WhatsApp. Further, the generalizability of the findings to academics in other institutions in SA is limited by the differences in the context and student numbers.

Additionally, the current study was affected by the COVID-19 outbreak, requiring the study invitation and questionnaire to be web-based/online. This could have limited the reach that the survey invitation had and, therefore, the total number of responses. While there was no other option other than online surveys, the questionnaire could have been distributed on email as well as physically to each department head/secretary to distribute to academic staff. However, this was impossible under the pandemic context as all staff were working from home.

In addition, acute disturbances in sleep quality tend to resolve over time (Mandelkorn *et al.*, 2021), so the sleep measures reported in this study may be temporal and may reflect sleep in a unique context such as the pandemic. Further, weekday and weekend sleep tend to show intraindividual differences (Jonasdottir *et al.*, 2021). The current study may be limited such that intraindividual differences and/or differences in sleep between weekdays and weekends were not considered.

Moreover, the study is limited by its cross-sectional design, which makes it challenging to determine causal inferences. This could be overcome in future research using longitudinal study designs. Furthermore, a cross-sectional data collection method and relying on self-reported data is limiting because it depends on the recall of information of participants, which may be biased (Gupta *et al.*, 2020) and it has the potential for common method variance to influence the results (Hogan *et al.*, 2016). Thus, the study may be limited by the lack of objective measures.

CHAPTER VI

6 CONCLUSIONS

The current study aimed to characterize sleep behaviours, sleep quality, lifestyle and work characteristics among academic staff and determine if gender and rank had effects on these measures. To the best of the authors' knowledge, this study is one of a few studies that have characterized sleep behaviours and sleep quality among academic staff and may be one of the first to do so in South Africa (SA). The current study found that participants in this cohort, on average, reported getting insufficient and poor quality sleep during the data collection period, which concurs with previous research, although research is limited. In support of previous literature, this study found that academics reported had a number of unhealthy lifestyle characteristics such as a high body mass index (BMI), low rates of physical activity (PA) and extended screen and sedentary behaviours. In addition, academics from this study reported working long hours and frequently over the weekend, contributing to the body of existing research that shows the nature of academic work to involve working hours that go beyond full-time requirements. Important findings were that female academics reported a worse sleep quality than males and that male academics worked much longer over the week compared to their female counterparts. Furthermore, senior-level academics reported the worst sleep quality among the three academic rank groups and had a significantly poorer sleep quality compared to professorship-level academics.

These findings bring about a number of conclusions. Firstly, sleep and general lifestyle behaviours of academic staff deserves more research attention. This is given the fact that the work that academics do makes important contributions to students, future workforces, the country and higher education (HE) as a whole and yet their sleep, which impacts on the ability to perform this work well, may be insufficient. Secondly, lifestyle behaviours of academics are reportedly unhealthy, which may challenge their sleep given the previous research indicating the impact that poor lifestyle behaviours can have on sleep. Thirdly, senior-level ranked and female academics reported the worst sleep quality, the reasons for which need to be elucidated. Therefore, it is important that future research investigates this. Future research can guide the development of effective strategies and considerations to protect the sleep health and

overall well-being of academics as a whole, but also groups that may be predisposed to being more affected by existing inequalities and/or high expectations. Lastly, the current study highlights the challenging side to academe that is shaped by a culture of performativity, high workloads and long working hours. While research suggests this has been the case for academics prior to the COVID-19 pandemic, operating in the pandemic context exacerbated the work demands and compromised the sleep of staff even further. For some academics from the current cohort, COVID-19 had adverse impacts on sleep and work.

In summary, sleep is critical for well-being and performance, particularly for academics, given the cognitively demanding nature of academic work. Academic staff operate under pressurizing work demands and fulfil multiple roles, therefore provoking a greater need to sleep and recover. Simultaneously, operating within the working culture of academe leaves little time for academics to prioritize sleep. Therefore, in order to support the sleep, overall well-being and potential products of academics' work in the future, the sleep health, nature of work and overall lifestyle of academic staff requires careful monitoring. This is especially given the disruptions that the pandemic has caused to lifestyles, sleep and ultimately what it means to be an academic and fulfil the roles that they do.

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8 APPENDICES

APPENDIX A: JUSTIFICATION FOR QUESTIONNAIRE QUESTIONS

AGE

Sleep needs naturally change across the developmental lifespan – with the common trend inferring a gradual reduction in sleep duration as age increases (Porkka-Heiskanen *et al.*, 2013; Pearson, 2017). Declines in sleep quality are also related to the increase in age: as adults age they tend to go to sleep earlier - although they take longer to fall asleep and experience lighter sleep – supplemented with involuntary awakenings, which may further lead these individuals to reduced sleep efficiency and unintended sleep episodes when awake (Pearson, 2017).

MARITAL STATUS

It appears that men are more likely to have tenure and a family as compared to women in academe. One study found that women who achieve tenure are more than twice as likely as their male academic counterparts to be single after earning their doctoral degree and are more likely to be divorced or separated from their spouses when occupying the same rank or position as men (Mason & Goulden, 2004). Married individuals may have to sacrifice time dedicated to sleep in order to manage and fulfil household responsibilities. Further, unmarried individuals tend to have more flexibility in their sleep schedules, affording greater opportunities to sleep longer or do other things (Hale, 2005). Single individuals are at risk of both short and long sleeping patterns (Hale, 2005). Unmarried individuals are significantly more likely to either be short or long sleepers as compared to their married counterparts (Hale, 2005), and married groups tend to report less excessive daytime sleepiness (Hale, 2005). Non-married groups of men and women have reported the highest likelihood of reporting sleep disturbances as opposed to their married counterparts, with divorced or never married respondents reporting the highest sleep complaints (Grandner, 2010). Arber *et al.*, (2009) evidenced that married and single groups tend to report less sleep problems than their divorced or widowed counterparts (Arber *et al.*, 2009). While divorced individuals tend to experience more sleep complaints compared to married or single individuals, martial disharmony may have a reciprocal relationship with sleep complaints (Grandner, 2010). This suggests that not marital status alone, but also the quality of marriage, influences sleeping behaviours of

individuals. Groups who have never married compared to those married, divorced/separated or widowed have reported higher levels of sleep disturbance (Chen *et al.*, 2005). Widowed and divorced groups have reported shorter sleep durations compared to their married or co-habiting counterparts (Kronholm *et al.*, 2006).

HIGHEST POSTGRADUATE QUALIFICATION

Individuals who have an education level of anything less than a completed college degree were more likely to report short and very short sleep durations (Whinnery *et al.*, 2014). Higher levels of education have been associated with less sleep complaints (Grandner, 2010). Women with higher educational attainment have reported better sleep quality, while men who have higher degrees have reported to have more sleep disturbances at night (Chen *et al.*, 2005).

CHILDREN

One study evidenced that women between 30 and 50 can perform over a hundred hours on caregiving, housework, and professional responsibilities, compared to men with children who may only require 85 hours for these pursuits. This, women in the academic work may be unlikely to have children in their early twenties as their mothers did (Mason & Goulden, 2004). Men who dedicate time with their children and engage in housework are at more risk of obtaining short sleep compared to men who do not, even if the time spent doing such activities are not lengthy (Chatzitheochari & Arber, 2009). A study found that housework and childcare did not influence women's sleep duration. However, the authors highlight that women may report the time estimates of these activities differently to men, and that sleep quality of women may otherwise be affected (Chatzitheochari & Arber, 2009). Nonetheless, married individuals without children have reported the least frequencies of insufficient sleep (Chapman *et al.*, 2012). Being married or in a couple often requires the negotiation of social roles, wherein day-to-day relationships are inferred into the night. Evidence suggests that women are largely responsible for physical and emotional care for young children, with lack of negotiation between men and women on dividing these roles whereby women would attend to issues such as napping changing and settling anxious children without explicit concession on such practices. Hence, women are more susceptible to sacrificing their sleep needs for

those of their family (Venn *et al.*, 2008). However, husbands have reported that poor sleep maintenance is associated with the presence of a young child (Meadows & Arber, 2012). Living in overcrowded homes and living with children, as well as the number of children in the household (Fowler *et al.*, 2014; Chen *et al.*, 2005), influences sleep duration and sleep quality in adults and is a vital component to the self-reports of these individuals (Fowler *et al.*, 2014). In the academic context, having children has been statistically associated with poor quality sleep among university professors (Freitas *et al.*, 2019). Furthers, female academics who were married mothers with children reported, on average, four hours less of work per week compared to single women without children. Further, married mothers are half as likely to work more than sixty hours per week compared to their single childless female counterparts, and married fathers were roughly two-thirds more likely to do so than their single childless counterparts (Jacobs & Winslow, 2004). The number of children in the family has been associated with higher levels of insomnia (Chen *et al.*, 2005).

WORKING HOURS

We Weekly working time has been related with a higher percentage of short than average length sleepers (Kronholm *et al.*, 2006). Working 41-55 hour weeks has been reported to reduce the likelihood of waking up feeling refreshed, and working over 55 hours a week has been associated with shorter sleep durations and greater difficulty falling asleep (Virtanen *et al.*, 2009). Further, those who work more than 55 hours a week may require a greater recovery period compared to those with normal weekly working hours (Virtanen *et al.*, 2009).

A study on 99 UK universities found that 43% of academics indicated more than one-fifth of their overall workload was done during evenings and weekends, with around one-third of their work done during these times (Kinman & Jones, 2008). Majority of these respondents perceived some degree of integration of work and home lives: one in four reported that the boundary between work and home had become virtually indistinct and 39% desired complete separation between the two environments (Kinman & Jones, 2008). Over four-fifths of academics from one university reported that the time spent on work at home had increased in the last 5 years (Currie & Eveline, 2010). Among South African academics, research demonstrates that high

workloads force individuals to extend working hours to the weekend and work longer than what they would choose or desire to (Barkhuizen & Rothmann, 2008).

WEEKEND WORK HOURS

Currie & Eveline (2010) discovered that while majority of respondents report that e-technologies are highly essential and useful, it increases the challenge of ceasing unpaid work as a whole; having it otherwise intrude into home, family and leisure time. Hence, technology has notably compromised when academics choose to work and take breaks where studies demonstrate that a majority of this group now use technologies during the evenings, late at night and on weekends (Eveline & Currie, 2010; Heijstra & Rafnsdottir, 2010; Gappa *et al.*, 2005). Thus, technologies also force academics to compromise their breaks during the evenings and weekends. A study on 99 UK universities found that 43% of academics indicated more than one-fifth of their overall workload was done during evenings and weekends, with around one-third of their work done during these times (Kinman & Jones, 2008). Majority of these respondents perceived some degree of integration of work and home lives: one in four reported that the boundary between work and home had become virtually indistinct and 39% desired complete separation between the two environments (Kinman & Jones, 2008). Over four-fifths of academics from one university reported that the time spent on work at home had increased in the last 5 years (Currie & Eveline, 2010). Among South African academics, research demonstrates that high workloads force individuals to extend working hours to the weekend and work longer than what they would choose or desire to (Barkhuizen & Rothmann, 2008). Further, academics who worked more during the evenings and weekends reported more physical and psychological symptoms, one of those being sleep difficulties (Kinman & Jones, 2008). The sleep that is lost over the work week is further compensated for over weekends through considerably longer sleep episodes (Kantermann, 2013). Academics may not necessarily be able to 'catch-up' on sleep as normatively due to work demands persisting into what would otherwise be time for rest and recovery.

COMMUTING

Trading in sleep to attend work punctually may delay or advance wake-up time (Petrov *et al.*, 2018). Commuting and travelling time has been associated with the increased perception of stress levels, even if personal and workplace characteristics are

controlled for (Gottholmseder *et al.*, 2009). One large study evidenced that travel time was a main waking activity that individuals exchanged for shorter sleep (Basner *et al.*, 2014). Compared to normal sleepers, short sleepers were shown to travel more, started travelling earlier in the morning and stopped later in the evening (Basner *et al.*¸2014).

Commuting has been linked to sleep disturbance, although there is a high complex relationship between commuting, health and other factors (Hansson *et al.*, 2011). In their study, Petrov *et al.* (2018) classified short commute as 1-44 minutes; moderate commute as 45-89 minutes; and long commute as 90-330 minutes). Long commuters were more likely to have shorter sleep durations than shorter commuters. Further, relationship between commute time and sleep duration was apparent: in their study, 15 minutes of sleep duration was lost for every additional hour spent commuting (Petrov *et al.*, 2018). The same trend was evidenced in a recent study, suggesting that sleep duration inversely associated with daily commuting time: as daily commute time increases, daily sleep duration decreases accordingly (Gajani & Ashraf, 2019). Commuting for more than one hour a day has been associated with increases in sleep problems, particularly for those who work for more than 40 hours per week (Halonen *et al.*, 2020).

PHYSICAL ACTIVITY

In a meta-analytic review on the effects of physical activity (PA) on sleep, acute exercise (less than one week of exercise) showed beneficial but small effects on total sleep time, slow wave sleep, sleep onset latency, sleep efficiency, wake time after sleep onset and that it can reduce sleep disturbance (Kredlow *et al.*, 2015). Among individuals with and without sleep complaints, regular exercise (equal to or greater than one week of exercise) offered moderate and robust positive effects on sleep quality overall. Further, it had small benefits to total sleep time and sleep efficiency as well as small-to-moderate effects on sleep onset latency (Kredlow *et al.*, 2015) Hence, behavioural and lifestyle factors such as physical inactivity are linked to suboptimal sleep durations (Youngstedt *et al.*, 1997; Schoenborn & Adams, 2008; Bixler, 2009; Park *et al.*, 2010), poor sleep quality (Youngstedt *et al.* 1997; Hoefelmann *et al.*, 2012; Yang *et al.*, 2012; Kredlow *et al.*, 2015; Rayward *et al.*, 2017) and the experience of sleep problems (Foley *et al.*, 2004) or disturbances (Åkerstedt *et al.*, 2002; Gosling *et*

al., 2010). Additionally, reports of PA are low among in previous studies on academic or university staff (Hogan *et al.*, 2002; Kumar *et al.*, 2014; Turkmen *et al.*, 2015; Cooper & Barton, 2016; Reddy & Naidoo, 2018; Faghy *et al.*, 2021), so it will be useful to know if that is similar among RU academics.

BMI

SCREEN USE BEHAVIOURS

Over-exposure to (artificial) light is particularly problematic because light will undoubtedly change circadian entrainment and, subsequently, alter the timing of sleep (Kantermann, 2013). Hence, electrical lighting is known to lead to late circadian and sleep timing (Wright *et al.*, 2017). Groups who report higher use of technology before bed tend to report the largest amount of sleep problems (Gradisar *et al.*, 2013). The use of technologies before one hour bed is associated with sleep patterns, particularly technologies that are more active and engaging, as these make it more difficult to fall asleep and maintain it (Gradisar *et al.*, 2013). In the academic's context, technology is an important aid to online and offline education delivery, where online platforms offer exciting opportunities to respond to students' needs, enhance learning environments, enrich research activities and supplement labour-intensive, face-to-face processes and tasks (Gappa *et al.*, 2005; Singh & Han, 2005). However, it has notably compromised when academics choose to work and take breaks, with studies demonstrating that a majority of this group now use technologies during the evenings and late at night (Eveline & Currie, 2010; Heijstra & Rafnsdottir, 2010; Gappa *et al.*, 2005).

Work contact using communication technologies outside of regular working hours has been associated with a greater sleep problems, although this may be moderated by work of more challenging and autonomous nature (Schieman & Young, 2013). Young adults (18-30 years) have higher reporting prevalence of using technology before compared to older than 30 years (Gradisar *et al.*, 2013). In the United States, 67% of young adults reported using cellphones before bed, which was significantly greater than middle-aged adults (30-45 years) and older adults (46-64 years) of which 36% and 16% used cellphones before bed, respectively. A similar, significant decline in use of computers/laptops was reported as age increased. In the study,

67% of young adults, 65% of middle-aged adults, and 58% of older adults reported not attaining enough sleep to function properly (Gradisar *et al.*, 2013).

The type of technological device may not necessarily affect weeknight bedtimes to a significant degree, however, difficultly falling asleep has been significantly related to the use of poly-technological use (use of more than one technological device one hour before bed), and the association increased greatly with the use of stimulating technologies such as videogames, consoles, and computers/laptops (Gradisar *et al.*, 2013). Weak effects of passive technologies (e.g. TV, reading) on sleep have been reported (Gradisar *et al.*, 2013). Smartphones have become a useful technology to provide employees with instant access to work-related information and communication outside of the office. It is evidenced that the use of smartphones for work at night is associated with increased depletion the following morning and lowered engagement during the work day, and that smartphone use for work-related activities impairs sleep quantity (Lanaj *et al.*, 2014).

SEDENTARY BEHAVIORS

Sedentary behaviour refers to activities where one sits without being active and can be considered the time spent sitting during an individual's "non-exercise" waking hours (Owen *et al.*, 2009, p. 81). Sedentary behaviours or lifestyles have been associated with having a sleep problem, perceived poor sleep quality, a number of medical conditions (Foley *et al.*, 2004) and short sleep duration (Lakerveld *et al.*, 2016). When it comes to time guidelines for sedentary behaviour, there is no upper or lower threshold that has been established because of the continuous nature of daily activity compositions (Chaput *et al.*, 2020). Although research is limited, university staff have reported sedentary times between roughly 6 to 8 hours daily (Leicht *et al.*, 2013; Faghy *et al.*, 2021). It will be useful to know this behaviour among academic staff from the current institution.

ALCOHOL CONSUMPTION BEHAVIOUR

While alcohol is typically considered as a sleep aid, convincing evidence suggests that it has disruptive effects on sleep homeostasis (Thakkar *et al.*, 2015). Alcohol, of both high (Shochat, 2012) and low (Ebrahim *et al.*, 2013) doses, administered just before or near bedtime affects sleep (Shochat, 2012; Ebrahim *et al.*¸2013; Irish *et al.*, 2015)

It can affect sleep by reducing sleep onset latency (Shochat, 2012; Ebrahim *et al.*¸2013; Irish *et al.*, 2015) and increasing slow wave sleep (Ebrahim *et al.*¸2103; Irish *et al.*, 2015) during the first half of the night which theoretically promotes sleep, initially. However, during the second part of the night, once alcohol is metabolized, sleep becomes markedly lighter thus promoting more or easier arousal from sleep (Irish *et al.*, 2015) and increasing wake times throughout the night (Shochat, 2012). Hence, sleep is more disturbed in the second half of the night (Ebrahim *et al.*¸2013). Alcohol consumption has been linked to negative sleep quality outcomes (Roehrs & Roth, 2001; Lyndon *et al.*, 2016) whereas sleep duration appears less notably affected, although some studies show a slight extended sleep duration associated with alcohol use (Lyndon *et al.*, 2016). Some studies show that measures of sleep quality such as sleep onset latency (Shochat, 2012; Ebrahim *et al.*, 2013) and slow wave sleep in the initial part of sleep (Ebrahim *et al.*, 2013) are affected by alcohol irrespective of the dose. However, a review on the empirical evidence concluded that the effects of alcohol on sleep are dose-dependent and that tolerance to alcohol's effects on sleep occurs within days (Irish *et al.*¸2015).

APPENDIX B: ETHICAL APPROVAL

Human Ethics subcommittee
Rhodes University Ethical Standards Committee
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NHREC Registration no. REC-241114-045

29/06/2020

Dr. Jonathan Davy

Email: j.davy@ru.ac.za

Review Reference: 2020-1432-3549

Dear Dr. Jonathan Davy

Re: Self-reported sleep quality and its association with work and non-work factors: A cross-sectional study among university academic staff

Principal Investigator: Dr. Jonathan Davy

Collaborators: Ms. Sarah-Ann le Grange, Mr. Andrew Todd,

This letter confirms that the above research proposal has been reviewed by the Rhodes University Ethical Standards Committee (RUESC) – Human Ethics (HE) sub-committee and **PROVISIONALLY APPROVED PENDING GATEKEEPER PERMISSION.**

Gatekeeper permission is required from:

a) Rhodes university - Human Resource Director

Once the Gatekeeper permission letter/s have been received please forward it to the Ethics Coordinator, (s.manqele@ru.ac.za) in order to finalize your ethics approval.

Sincerely,

Prof Arthur Webb

Chair: Human Ethics Sub-Committee, RUESC- HE

APPENDIX C: GATEKEEPER PERMISSION LETTER

APPENDIX D: EXAMPLES OF FEEDBACK FOR PILOT QUESTIONNAIRE FROM DEPARTMENT ACADEMIC STAFF

Examples
Academic rank: Should you not include Other as an option for those that may have slightly different positions, like director of an institute or something like that?
For question on sleep quality why is 'fairly good' rated higher than 'good'? If from standard from them I am happy
Last question for partners: simply says during sleep? Seems to be something missing?
On the qualifications question: MSc should read Masters
Commuting - under COVID or normal? Perhaps you should make this explicit at the question itself?
At the end it won't let me submit, even though as far as I can tell I have filled in everything correctly on the last page? Not sure what the problem may be.
Social activity question? In the last month there shouldn't have been any of this? Difficult to manage here?
How often restless in last month? In nights? This question for partner I wasn't sure what "units" you were looking for
Consider including examples of physical activity

APPENDIX E: EMAIL INVITATION TO PARTICIPANTS

Good day,

This email serves as a kind request to all academic staff at Rhodes University to partake in a Human Kinetics and Ergonomics Masters study entitled *Self-reported sleep quality and its association with work and non-work factors: A cross-sectional study among university academic staff* by completing an anonymous online questionnaire. This research has been granted ethical clearance from the Rhodes University Ethics Committee (ref: 2020-1432-3549). Your participation is highly appreciated.

AIMS & OBJECTIVES OF THE STUDY

Recent research has stressed that the balance between an academic's work and home life is disintegrating and that time dedicated to working, personal responsibilities and rest are constantly negotiated. Rest and recovery, including sleep, in particular, is critical for effective well being and performance, particularly for academics, given the cognitively demanding nature of working in academe. Despite the importance of sleep for general health and well being and performance, there have been very few studies that have explored the sleep-wake behaviours of academics. Similarly, studies investigating how work-related and lifestyle-related components of academic life influence sleep among academics are also limited.

In light of this, the purpose of this study is to quantify and report on various components of sleep (sleep quality, specifically) among a sample of academics at Rhodes University, and determine their association with work, lifestyle and sociodemographic factors.

PROCEDURE

Should you be interested in participating, kindly click on the link below where you can read more about the study. This anonymous questionnaire is a combination of questions related to your sociodemographics, work and lifestyle activities as well as the Pittsburgh Sleep

Quality Index (PSQI) which assesses the previous month's sleep and sleep quality. The survey should not take longer than 10 to 15 minutes to complete. The researchers' email addresses are available should you wish to receive feedback from the study.

https://forms.gle/HzF25AseuWYWTWk66

Thank you again for considering to take part in this research study. If you have any queries regarding the research or any of its components, please do not hesitate to email me.

Kind regards

Sarah-Ann le Grange (Masters student; HKE Department: sarahann.legrange@gmail.com)

Dr Jonathan Davy (j.davy@ru.ac.za) and Andrew Todd (a.todd@ru.ac.za) (Supervisors)

APPENDIX F: QUESTIONNAIRE

Self-reported sleep quality and its association with work and non-work factors: A cross-sectional study among university academic staff

Recent research has stressed that the balance between an academic's work and home life is disintegrating and that time dedicated to working, personal responsibilities and rest are constantly negotiated. Rest and recovery, including sleep, in particular, is critical for effective well being and performance, particularly for academics, given the cognitively demanding nature of working in academe. Despite the importance of sleep for general health and well being and performance, there have been very few studies that have explored the sleep-wake behaviours of academics. Similarly, studies investigating how work-related and lifestyle-related components of academic life influence sleep among academics, are also limited.

In light of this, the purpose of this study is to quantify and report on various components of sleep (sleep quality, specifically) among a sample of academics at Rhodes University, and determine their association with work, lifestyle and sociodemographic factors.

PURPOSE OF QUESTIONNAIRE
The purpose of the questionnaire is to quantify and report on various components of sleep quality among a sample of academics at Rhodes University, and determine their association with sociodemographic, work and lifestyle factors. The questionnaire is a combination of questions related to your sociodemographic, work, and lifestyle factors as well as the Pittsburgh Sleep Quality Index (PSQI) which assesses the previous month's sleep and gains a global score of your overall sleep quality.

It should take you between 10 to 15 minutes to complete the questionnaire.

Sociodemographic factors include age, gender, marital status and presence of children.

Work-related factors include: highest qualification, academic rank, faculty, weekly working hours, weekly, weekend work and commute time

Lifestyle factors include the presence of chronic diseases, smoking status, Body Mass Index (BMI), sedentary behaviour, screen time, exercise, and alcohol and caffeine consumption.

PSQI includes: sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbances, medication use for sleeping aid, daytime dysfunction, and having a bed partner.

RIGHTS RELATED TO PARTICIPATION
- The questionnaire is anonymous such that none of your responses can be linked to your personal identity. All questionnaires are handled by the researchers only. Your participation will not be revealed to any person who is not involved in this research should you make contact relating to any queries or feedback.

- In order to obtain a full data set from respondents, all questions are required to be answered unless stated otherwise. If you do not want to answer any of the questions for any reason, you may withdraw from the study at any point.

- Should you have any queries, you may contact the researchers directly.

- Should this research study be published, the confidentiality and anonymity of your participation will be maintained.

- Data collected in the study will be held available within the Human Kinetics and Ergonomics Department at Rhodes University for a 5-year period, for teaching and research purposes only.

If you would like to receive feedback from the study, please do not hesitate to contact the researchers with the contact details provided below:

Sarah-Ann le Grange
Department of Human Kinetics and Ergonomics
Rhodes University
Email: sarah.annlegrange@gmail.com
Phone: 079 559 4434

OR

Dr Jonathan Davy
Department of Human Kinetics and Ergonomics
Rhodes University
Email: j.davy@ru.ac.za
Phone: 046 603 8693

This study has been cleared by the Rhodes University Ethical Standards Committee (ref: 2020-1432-3549). Should you have any questions or concerns, please feel free to contact the Ethics Coordinator using the contact details provided below:

Mr Siyanda Manquele
Ethics Coordinator
Rhodes University
Email: s.manqele@ru.ac.za
Phone: 046 603 7727

Please read this information carefully before consenting to participate in the study. If you wish to partake, thereby providing consent to participation, please click 'Next' to begin answering questions.

Section 2 of 6

Socio-demographic information

This section includes 5 questions that gain information relating to your age, gender, martial status, and presence of children.

What is your age? *

Short answer text

What is your gender? *

- Female
- Male
- Non-binary
- Prefer not to say

What is your marital status? *

- Single
- In a relationship
- Married
- Divorced/Separated
- Widowed

How many children do you have (If not applicable, type 0)? *

Short answer text

If you have children, how many are UNDER the age of 5 years (If not applicable, type 0)? *

Short answer text

Section 3 of 6

Work-related information

The following section includes 7 questions relating to your academic qualification, academic rank, faculty, weekend and weekday work hours as well as commute time.

Highest postgraduate qualification *

- Diploma
- Honours/Bachelor's degree
- Master's degree
- PhD

Academic rank *

- Junior researcher
- Junior lecturer
- Researcher
- Lecturer
- Senior researcher
- Senior lecturer
- Associate professor
- Professor
- Distinguished professor
- Teaching assistant
- Other position

Faculty *

- Humanities
- Science
- Commerce
- Pharmacy
- Law
- Education

What are your estimated WEEKLY (Monday to Friday) working hours? This estimation should include the work you do at home/out of office or in the evenings, or outside of normal office hours (i.e. 9am to 5pm) but should NOT include work on the weekends. *

Short answer text

How often do you do work over the weekend (Saturday & Sunday)? *

- Never
- Rarely/Occasionally
- One day of the weekend

One day of the weekend

Both weekend days

If you do work over weekends, how many hours of work would you estimate you do in total (If not applicable, type 0)? *

Short answer text

Under usual circumstances (i.e. not within the context of the Covid-19 pandemic) how long (minutes) do you spend commuting to work each day on average? *

Short answer text

Section 4 of 6

General health status & lifestyle information

The following questions relate to general health and lifestyle information that tend to have influence on or relationship with sleep. This sections includes 14 questions relating to your height and weight (to calculate Body Mass Index), the presence or diagnoses of chronic diseases, smoking status, sedentary behaviours, screen time, physical activity, and caffeine and alcohol consumption.

What is your stature/height (in cm)? *

Stature/height will be used to calculate your Body Mass Index.

Short answer text

What is your mass (in kg)? *

Weight will be used to calculate your Body Mass Index.

Short answer text

Do you suffer from or have you been diagnosed with any of the following chronic diseases? Please select all that apply. *

- Coronary/Cardiovascular disease
- Stroke
- Cancer
- Diabetes mellitus
- Obesity
- High blood pressure
- Asthma
- Arthritis
- Memory problems/forgetfulness
- Enlarged prostate (men only)
- None of the above

What is your smoking status? *

CURRENT smoker: have smoked 100 cigarettes or more in your lifetime and currently smoke every day or some days; FORMER smoker: have smoked at least 100 cigarettes or more in your lifetime but do not currently smoke at all; NON-smoker: have never smoked 100 cigarettes or more in your lifetime

Current smoker

Former smoker

Non-smoker

Do you meet the weekly guidelines for physical activity? *

The weekly guidelines are 150 minutes per week of moderate-intensity physical activity OR 75 minutes per week of vigorous-intensity physical activity OR a combination of moderate and vigorous physical activity. MODERATE intensity: involves heavy breathing and an increased heart rate but still able to hold a conversation; VIGOROUS intensity: involves heavy breathing, an increased heart rate and is hard enough that you are unable to talk. EXAMPLES of physical activities include leisure-time physical activity, sports, household activities, gardening, walking/jogging, carrying loads.

- Yes
- No

On an average weekday, how many hours per day do you estimate you spend sitting? *

This is to understand your sedentary behaviour. Sedentary behaviour is essentially the time you spend seated during your waking hours. Examples of sedentary behaviours include: sitting, jobs requiring prolonged sitting in occupational environments, watching TV or other screen viewing, computer use, playing (video) games, reading, transportation or driving, lying down or sedentary social interactions with friends or family.

Short answer text

On WEEKDAYS (Monday to Friday), how many hours per day do you typically spend on screens for work and non-work-related activities? *

Examples of screens include: phone, laptop, tablet, TV, gaming console

Short answer text

On WEEKENDS (Saturday & Sunday), how many hours per day do you typically spend on screens for work and non-work-related activities? *

Example of screens include: phone, laptop. tablet, TV, gaming console

Short answer text

On WEEKNIGHTS (Monday to Friday), how often do you use screens at least one hour before bed? *

Example of screens include: phone, laptop, tablet, TV, gaming console

- Never
- Rarely
- Once or twice a week
- Three nights a week
- Every weeknight

On WEEKEND nights (Saturday & Sunday), how often do you use screens at least one hour before bed? *

Example of screens include: phone, laptop, tablet, TV, gaming console

- Never
- Rarely/Occasionally
- One weekend night
- All/every weekend night

On average, how many servings of caffeine (e.g. coffee, Ceylon tea, dark chocolate) do you have each day? *

1. I don't usually consume caffeine
2. 1
3. 2
4. 3

4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10
12. 10 or more

On average, what time do you usually have your LAST serving of caffeine for the day? *

1. I don't usually consume caffeine
2. 01h00
3. 01h30
4. 02h00
5. 02h30
6. 03h00
7. 03h30
8. 04h00
9. 04h30
10. 05h00
11. 05h30
12. 06h00
13. 06h30
14. 07h00
15. 07h30
16. 08h00
17. 08h30
18. 09h00
19. 09h30
20. 10h00
21. 10h30
22. 11h00
23. 11h30
24. 12h00
25. 12h30
26. 13h00
27. 13h30
28. 14h00
29. 14h30
30. 15h00
31. 15h30
32. 16h00
33. 16h30
34. 17h00
35. 17h30
36. 18h00

37. 18h30
38. 19h00
39. 19h30
40. 20h00
41. 20h30
42. 21h00
43. 21h30
44. 22h00
45. 22h30
46. 23h00
47. 23h30
48. 00h00
49. 00h30

How many standard drinks of alcohol do you usually have per week? *

A standard drink of alcohol is: 375ml of beer OR 148ml (just under a cup) wine OR 44ml of distilled spirits

1. I don't usually consume alcohol
2. 1
3. 2
4. 3
5. 4
6. 5
7. 6
8. 7
9. 8
10. 9
11. 10
12. 11
13. 12
14. 13
15. 14
16. 15
17. 16
18. 17
19. 18
20. 19
21. 20
22. More than 20

On average, what time do you usually have your LAST serving of alcohol? *

1. I don't usually consume alcohol
2. 01h00
3. 01h30
4. 02h00
5. 02h30
6. 03h00

7. 03h30
8. 04h00
9. 04h30
10. 05h00
11. 05h30
12. 06h00
13. 06h30
14. 07h00
15. 07h30
16. 08h00
17. 08h30
18. 09h00
19. 09h30
20. 10h00
21. 10h30
22. 11h00
23. 11h30
24. 12h00
25. 12h30
26. 13h00
27. 13h30
28. 14h00
29. 14h30
30. 15h00
31. 15h30
32. 16h00
33. 16h30
34. 17h00
35. 17h30
36. 18h00
37. 18h30
38. 19h00
39. 19h30
40. 20h00
41. 20h30
42. 21h00
43. 21h30
44. 22h00
45. 22h30
46. 23h00
47. 23h30
48. 00h00
49. 00h30

Section 5 of 6

The Pittsburgh Sleep Quality Index (PSQI)

The PSQI was developed by Buysse et al. (1989) and has been used extensively in self-reported sleep studies. It includes 21 questions related to the PREVIOUS MONTH and gains information about your sleep quality, sleep duration, sleep latency, sleep efficiency, sleep disturbances, medication use for sleeping aid, daytime dysfunction, and having a bed partner.

During the past month, what time have you usually gone to bed? *

Please type answer using a 24-hour clock format (e.g. 22h15).

Short answer text

During the past month, how long (in minutes) has it usually taken you to fall asleep each night? *

Short answer text

During the past month, what time have you usually gotten up in the morning? *

Please type answer using a 24-hour clock format (e.g. 08h10).

Short answer text

During the past month, how many hours of actual sleep did you get each night (this may be different than the number of hours you actually spend in bed)? *

Short answer text

Please select the one best response that applies to you: *

	Not during the past...	Less than once a w...	Once or twice a we...	Three or more time...
"I cannot get to sle...	○	○	○	○
"I wake up in the mi...	○	○	○	○
"I have to get up to ...	○	○	○	○
"I cannot breathe p...	○	○	○	○
"I cough or snore lo...	○	○	○	○
"I feel too cold whe...	○	○	○	○
"I feel too hot when...	○	○	○	○
"I have bad dreams...	○	○	○	○
"I have pain when I ...	○	○	○	○

Please state and describe any other reason(s) your sleep may be disturbed or disrupted:

SKIP if this does not apply to you.

Long answer text

Based on the previous question, how often during the past month have you had trouble sleeping because of this?

- Not in this past month
- Less than once a week
- Once or twice a week
- Three or more times a week
- No other reason(s) is/are disrupting or disturbing my sleep

During the past month, how would you rate your sleep quality overall? *

	Very good	Fairly good	Fairly bad	Very bad
Sleep quality scale:	○	○	○	○

During the past month, how often have you taken medicine (prescribed or 'over the counter') to help you sleep? *

- Not during this past month
- Less than once a week
- Once or twice a week
- Three or more times a week

During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity? *

- Not during this past month
- Less than once a week
- Once or twice a week
- Three or more times a week

During the past month, how much of a problem has it been for you to keep up enthusiasm to get things done? *

- No problem at all
- Only a very slight problem
- Somewhat of a problem
- A very big problem

Do you have a bed partner or roommate? *

- No bed partner/roommate
- Partner/roommate in other room
- Partner/roommate in same room but different beds
- Partner/roommate in the same room and same bed

If you do have a roommate or partner, please ask them how often in the past month you have had:

SKIP this question if you do not have a bed partner/roommate or if they are not currently with you.

	Not during the past...	Less than once a w...	Once or twice a we...	Three or more time...
Loud snoring	○	○	○	○
Long pauses betwe...	○	○	○	○
Legs twitching or je...	○	○	○	○
Episodes of disorie...	○	○	○	○

If you do have a roommate or partner, please ask them to state and describe how often in the past month you have had any other restlessness while you sleep:

For example, how many nights in the past month have you been restless? Are you restless during the entire night of sleep or during certain phases of sleep during the night? SKIP this question if you do not have a bed partner/roommate or if they are not currently with you.

Long answer text

If there are other reasons for restlessness while you sleep, how often in the past month did they occur?

SKIP this question if you do not have a bed partner/roommate or if they are not currently with you.

- Not during this past month
- Less than once a week
- Once or twice a week
- Three or more times a week

Section 6 of 6

Academics in the context of Covid-19

As the nation has been swept with change due to Covid-19, academic staff have had to adapt to working from home and become familiar with online learning applications more so than ever. This next section is optional, although your input will be highly appreciated.

Has Covid-19 affected your normal work routines and sleep patterns? If so, how?

Long answer text

APPENDIX G: DETAILED STEPS TAKEN FOR THEMATIC ANALYSES

Thematic analyses

Method of thematic analyses for qualitative data

The first qualitative question came from the PSQI in which respondents could detail any other sleep disturbances that the PSQI did not list specifically. The second qualitative question pertained to the changes in work and sleep patterns as a result of impact of COVID-19.

Analyses of the two open-ended questions was performed through thematic analyses. Braun and Clarke (2006) provide a set of guidelines for which to identify, analyse and report patterns within the data. The guidelines included six main phases: (1) familiarizing with the data; (2) generating initial codes; (3) searching for themes; (4) reviewing themes; (5) defining and naming themes; (6) producing the report. The method of analysis for both questions relied on steps 1 to 4 as steps 5 and 6 take place in the discussion chapter. The final thematic maps were modelled using an online website called Miro (https://miro.com/mind-map/) which offers free and easy-to-use mind mapping software. Maps were developed on the website and were exported and saved as JPG image files.

The following provides a brief overview of the phases by Braun and Clarke (2006). In addition, it includes the main examples from both open-ended questions on how the phases were applied to the analyses of qualitative data in the current study:

1. *Familiarizing with the data* involved repeated reading and taking notes or writing out ideas of any notable meanings or patterns. Individual entries were organized into a table format (column 1) and read over three times prior to formal coding. The focus was to become familiar with all aspects of the data. Next to the responses, a second column (column 2) was created for the researcher to write out notes and ideas that emerged from reading over the data. These notes supplemented later stages.

Change to work and sleep patterns under COVID-19 lockdown: The question, "Has covid-19 affected your normal work and sleep patterns" is effectively asking about two concepts (work and sleep) in one sentence and 'yes' or 'no' as to whether or not these two concepts were affected by Covid-19 in any way. Individual extracts

were read a third time to determine if the response addressed changes in sleep, in work or in both. Thus, in column 2, “yes” or “no” was entered if the extract implied change in *either* sleep, work or both. If a participant mentioned no changes to their sleep patterns yet changes to their work routines then the following was entered: “No – Sleep. Yes – Work”. If a participant indicated changed in both their sleep and work then the following was entered: “Yes – work and sleep”.

Reasons for sleep disturbance: Following three read-throughs, notes such as ‘mental health’ and ‘having pets’ were written down.

2. *Generating initial codes* involved going through each response, giving equal attention to each data item and writing out initial codes in a new column (column 3). The purpose of the initial codes was to identify basic features of the data, include what was most interesting to the analyst and begin organizing the data into meaningful groups. These codes were meant to be broader than the actual themes that would be identified in later steps. The coding process was data-driven as opposed to theory-driven meaning that codes and themes did not depended upon a pre-existing hypothesis but otherwise depended on the data directly. It was key that as many potential patterns or themes were coded for, that the codes maintained context from the data extracts and that individual extracts included as many different themes it could possibly be coded into to gage patterns of repeatability. When codes were repeated or a pattern of similar codes was identified, they were colour-coded. Colour-coding was performed by highlighting words or parts of sentences of the initial codes in column 3 where repetitions or patterns throughout the entire data set were identified.

Change to work and sleep patterns under COVID-19 lockdown: One participant wrote, “I now tend to go to bed later” for which an initial code of “later bedtime” was inserted into column 3. One participant’s response was, “I have had to work more at night to make up for time lost during the day to childcare and other domestic activities”. Initial codes for this response included: ‘work schedule has changed’, ‘working later or at night’, ‘increased household/childcare responsibilities’ and ‘work-life imbalance’.

Reasons for sleep disturbance: One extract/response was, “Letting animals out. My mind is too busy. Stressing all the time”. In the ‘coded for’ column, ‘having pets’, ‘stress’ and ‘worrying/overthinking’ were included.

3. *Searching for themes* involved identifying broader themes by sorting the different codes into potential themes. All initial codes were colour-coded and sorted into potential themes by determining how different codes might combine to form an overarching theme and sub-themes. Paper-based draft mind-maps were developed during this stage to visually represent grouped codes under broader themes. The phase ended with all data extracts being coded and a collection of candidate themes and sub-themes developed.

Change to work and sleep patterns under COVID-19 lockdown: Themes were identified for changes in work and sleep, respectively. Two candidate sleep-related themes and their sub-themes (in brackets) included: (1) *changes in timing and duration of sleep* (increased/decreased sleep durations, later sleep and wake times, natural sleep timing); and (2) changes in qualitative sleep characteristics (improved/worsened sleep quality, dreams, difficulty falling asleep). Two major candidate themes as well as their sub-themes (in brackets) were identified for work-related changes, including: (1) *work hours and work scheduling* (working hours, working later or earlier, and routine disruption or improved routine fit); (2) *work environment* (increased household/child caring responsibilities, online teaching and communication, productivity and motivation, merge of home and work boundaries and disengagement). Another set of codes were generated for responses that did not speak to work or sleep directly, but rather to the effects – whether mental or occupational - of the Covid-19 pandemic. A candidate theme of *emotional effects* was developed with candidate sub-themes that included anxiety, fear and worry as well as feeling isolated or stuck.

Reasons for sleep disturbance: Any patterns found among the data set were highlighted in respective colours. For example, the neighbourhood/external environment was mentioned a couple of times in different ways (e.g. neighbourhood, barking dogs, traffic) and those words were highlighted in red to suggest some sort of theme. The reasons for sleep disturbance among this sample reflected broad codes in: having/attending to children, pets, partner’s sleeping behaviours/activities, mental health, physical health, stress (work and general), overthinking/worry/restlessness, work, neighbourhood/external environment, sleep/internal (home) environment, fear of security and sleep disorders. All patterns were colour-coded for visual

representation of repeated trends. The following step involved investigating which of the abovementioned codes could be sorted into different themes, so as to determine main overarching themes and the sub-themes within them. Some codes became main themes whereas others became sub-themes. Candidate themes and sub-themes (in brackets) were identified: (1) *internal environment* (partner's sleeping activity, pets, attending to young children); (2) *external environment*(dogs barking, traffic, donkeys, wind, alarms going off, concern for security); (3) *mental health* (anxiety, depression, overthinking, restless, general stress); and (4) *work* (work demands, work stress).

4. *Reviewing themes* involved refining the candidate themes identified in phase 3. This phase was focused on ensuring that the data within the themes make sense being grouped together whilst maintaining clear and distinguishable boundaries between themes. During this phase, some themes may be removed, some might collapse together or may have to be separated. Reviewing themes involved refinement of candidate themes by, firstly, reading over individual extracts that have been coded to ensure that the content of data truly does fit within a pattern and therefore within that code. Secondly, it involved a phase of re-reading the entire data set to guarantee that the themes 'work' in relation to the overall data set. It also provided an opportunity to code any additional data that could have been missed in earlier stages.

Change to work and sleep patterns under COVID-19 lockdown: Using the example of *work environment*, the researcher had to read through all the data extracts coded within the theme to ensure that the data appropriately fit the theme. After reading each data extract and reviewing the themes themselves, some changes were made the candidate themes and sub-themes generated in Step 3. *Online teaching and communication* was separated from the candidate theme of *work environment* and became its own as there was sufficient data to support this. Thus, various initial codes in the 'coded for' column (column 3) created at step 2 that fit within theme of online teaching and communication were made notes of and were reorganized within the new theme. 'Productivity and motivation' were captured under the theme *work hours and work scheduling* which was moved under the theme of *work environment.* This was because majority of respondents who mentioned a lack or gain of productivity

and/or motivation related it to the context of being at home and their direct work environment.

Reasons for sleep disturbance: No major changes were made expect that the labels of themes or sub-themes were changed. For example, ‘dogs barking, traffic, donkeys, wind, alarms going off, was placed under an umbrella of ‘neighbourhood noise’. ‘Internal environment’ became ‘home environment’ and ‘external environment’ became ‘neighbourhood’.

5. *Defining and naming themes* was the process of identifying the essence of what each theme was about. This involved accompanying the organized themes and sub-themes with a narrative of what was of interest and why. Essentially, the phase detailed the ‘story’ that each theme tells and how it fit within the overall story that the data was telling. At the end of this phase, researchers were able to define what the themes were and what they were not. In the current study, this phase was blended into the Results section.

APPDENIX H: TABULATED RESPONSES OF ‘PREFER NOT TO SAY’ PARTICIPANT

Table H1. Self-reported sociodemographic information of respondent whose gender they ‘prefer not to say’.

Variables	*Response*
Age	52
Marital status	In a relationship
Number of children	None
Number of children under 5 years	None

Table H2. Self-reported health and lifestyle information of respondent whose gender they ‘prefer not to say’.

Variables	*Response*
Body Mass Index (BMI)	30.1
Chronic conditions	None
Smoking status	Non-smoker
Meeting physical activity guidelines	Yes
Weekday sedentary time (h.min/day)	10
Weekday screen time (h.min/day)	15
Weekend screen time (h.min/day)	10
Screen use 1 h before bed (weeknights)	Every weeknight
Screen use 1 h before bed (weekend nights)	One weekend night
Caffeine consumption (servings/day)	4
Time of last serving (hh:mm)	14:30
Alcohol consumptions (drinks/week)	3
Time of last serving (hh:mm)	20:30

Table H3. Self-reported work information of respondent whose gender they ‘prefer not to say’.

Variables	*Response*
Highest postgraduate qualification	PhD
Academic rank	Senior lecturer
Faculty	Humanities
Estimated weekday work hours (h.min)	62.30
Estimated daily weekend work hours (h.min)	10
Total estimated weekly work hours (h.min)	72.30
Frequency of weekend work	Both weekend days
Daily commute time (min.sec)	25

Table H4. Self-reported sleep behaviour information from respondent whose gender they 'prefer not to say'.

Variable	*Response*
Estimated bedtime (hh:mm)	00:30
Time taken to fall asleep (min.sec)	50
Wake time (hh:mm)	07:00
Estimated sleep duration (h.min)	6
Time in bed (h.min)	6.30
Subjective sleep quality	Fairly good
Sleep efficiency (%)	92.3
Presence of bed partners	Partner in same room, same bed
Global PSQI score	9
Sleeper type	Poor

Table H5. Self-reported frequency of sleep disturbances from respondent whose gender they 'prefer not to say'.

Sleep disturbance	*Response*
Cannot get to sleep within 30 min	Three or more times a week
Wake up in the middle of the night or early in the morning	Less than once a week
Have to get up to use the bathroom	Not during the past month
Cannot breathe comfortably	Not during the past month
Cough or snore loudly	Once or twice a week
Feel too cold	Not during the past month
Feel too hot	Not during the past month
Have bad dreams	Less than once a week
Have pain	Not during the past month
Other reasons	None

APPENDIX I: STATISTICAL TO DETERMINE GENDER EFFECTS

SOCIODEMOGRAPHIC DATA

Age – gender

Variable	T-tests; Grouping: Gender (CODED DATA in Workbook6_(Recovered)) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
Age	45.95833	47.17647	-0.458984	80	0.647490	48	34	12.86585	10.20241	1.590273	0.164073

Age categories – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
B	1937.000	1466.000	761.0000	-0.512965	0.607976	-0.527259	0.598014	48	34	0.609860

Marital status – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered)) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
6 status	1904.000	1582.000	728.0000	-1.02818	0.303864	-1.15614	0.247624	48	35	0.305645

No of children - gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered)) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
No. of children	2008.000	1478.000	832.0000	-0.069160	0.944862	-0.073165	0.941675	48	35	0.945172

Children under 5 years – gender

Statistic	Statistics: No. under 5yrs(2) x Gender(2) (CODED DATA in Workbook6_(Recovered))		
	Chi-square	df	p
Pearson Chi-square	.2226508	df=1	p=.63703
M-L Chi-square	.2202021	df=1	p=.63889
Yates Chi-square	.0090781	df=1	p=.92409
Fisher exact, one-tailed			p=.45585
two-tailed			p=.71587

McNemar Chi-square (A/D)	19.31429	df=1	p=.00001
(B/C)	31.68750	df=1	p=.00000

GENERAL HEALTH AND LIFESTYLE DATA

BMI – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
BMI	1935.000	1551.000	759.0000	-0.742322	0.457893	-0.742361	0.457869	48	35	0.459972

BMI categories – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
O	1878.500	1524.500	750.5000	-0.670308	0.502662	-0.717303	0.473187	47	35	0.501754

Smoking status – gender

Statistic	Statistics: Gender(2) x Smoking status(3) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101)		
	Chi-square	df	p
Pearson Chi-square	.1007206	df=2	p=.95089
M-L Chi-square	.1001239	df=2	p=.95117

Gender	2-Way Summary Table: Observed Frequencies (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Marked cells have counts > 10		
	Smoking status 1	Smoking status 2	Row Totals
1	30	5	35
2	42	6	48
Totals	72	11	83

Adherence to PA guidelines – gender

Gender	2-Way Summary Table: Observed Frequencies (CODED DATA - RANK CODED in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Marked cells have counts > 10		
	Meeting PA Guidelines 1	Meeting PA Guidelines 2	Row Totals
1	23	12	35
2	30	18	48
Totals	53	30	83

Statistic	Statistics: Gender(2) x Meeting PA Guidelines(2) (CODED DATA - RANK CODED in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101)		
	Chi-square	df	p
Pearson Chi-square	.0906065	df=1	p=.76341
M-L Chi-square	.0908135	df=1	p=.76315

Weekday sedentary time - gender

Variable	T-tests; Grouping: Gender (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
Weekday sedentary time	9.166667	9.032353	0.208786	80	0.835146	48	34	3.013257	2.652468	1.290541	0.445166

Weekday screen time – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA + PSQI SCORES in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Weekday screen time	1883.000	1520.000	707.0000	-1.02122	0.307149	-1.03783	0.299352	48	34	0.308977

Weekend screen time – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Weekend screen time	2003.000	1318.000	757.0000	0.331608	0.740185	0.335061	0.737579	48	33	0.741599

Weeknight screen frequency – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Weeknight screen time frequency	2090.500	1395.500	765.5000	0.682383	0.494997	0.912848	0.361323	48	35	0.494153

Weekend night frequency – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Weekend night screen time frequency	2217.000	1269.000	639.0000	1.848888	0.064475	2.293849	0.021800	48	35	0.064260

Daily caffeine consumption – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Daily caffeine	2069.500	1416.500	786.5000	0.488734	0.625031	0.527515	0.597836	48	35	0.623579

Time of last caffeine serving – gender

Variable	T-tests; Grouping: Gender (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
Time of last serve	15.47500	14.61667	0.951144	68	0.344900	40	30	3.780771	3.675838	1.057909	0.885630

Weekly alcohol consumption – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Daily alcohol	1854.500	1631.500	678.5000	-1.48464	0.137639	-1.57049	0.116302	48	35	0.137007

Time of last alcohol serving - gender

Variable	T-tests; Grouping: Gender (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
Time of last serve	19.85000	20.60000	-2.48720	48	0.016404	30	20	0.983922	1.130906	1.321085	0.487310

WORK-RELATED DATA

Highest postgrad qualification – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Qualification	2005.500	1480.500	829.5000	-0.092214	0.926528	-0.106956	0.914824	48	35	0.923298

Academic ranks – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Academic rank	1943.000	1543.000	767.0000	-0.668551	0.503783	-0.715456	0.474328	48	35	0.505837

Faculty – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Faculty	1926.000	1560.000	750.0000	-0.825314	0.409194	-0.858071	0.390854	48	35	0.411247

Total weekly work hours – gender

Variable	T-tests; Grouping: Gender (CODED DATA - RANK CODED in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
TOTAL WEEKLY	51.43085	57.13571	-2.30513	80	0.023751	47	35	10.92647	11.29539	1.068667	0.823764

Weekday work hours – gender

Variable	T-tests; Grouping: Gender (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances

Week hours	45.39894	49.70714	-2.00804	80	0.048014	47	35	9.439547	9.834753	1.085487	0.786093

Weekend hours – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Weekend work hours	1605.000	1476.000	615.0000	-1.33514	0.181831	-1.349550	0.177160	44	34	0.182899

Frequency of weekend work – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Weekend work frequency	1878.500	1607.500	702.5000	-1.26333	0.206471	-1.35031	0.176918	48	35	0.206020

Commute time – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Commute time	2138.500	1264.500	634.5000	1.757802	0.078782	1.804438	0.071164	47	35	0.077926

SLEEP-RELATED DATA

Bedtime – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Bed time	1862.500	1623.500	686.5000	-1.41087	0.158283	-1.45429	0.145866	48	35	0.157716

Time to fall asleep – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Time to fall asleep	2103.500	1299.500	704.5000	1.044755	0.296137	1.056821	0.290594	48	34	0.295738

Wake time – gender

Variable	T-tests; Grouping: Gender (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
Wake time	6.696042	6.528571	0.600374	81	0.549933	48	35	1.258785	1.249664	1.014651	0.977437

Actual sleep hours – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Actual sleep hours	1899.000	1341.000	746.0000	0.345508	0.729713	0.354248	0.723153	46	34	0.731169

Time in bed – gender

Variable	T-tests; Grouping: Gender (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS) Group 1: 2 Group 2: 1										
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
Time in bed	8.284792	7.733143	2.097153	81	0.039099	48	35	1.104544	1.284559	1.352516	0.334312

Subjective sleep quality rating – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Sleep quality	1876.500	1609.500	700.5000	-1.28177	0.199923	-1.39330	0.163529	48	35	0.199459

Sleep efficiency – gender

	Mann-Whitney U Test (w/ continuity correction) (CODED DATA + PSQI SCORES in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000

variable	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
AG	1659.000	1501.000	578.0000	-1.79427	0.072772	-1.79667	0.072388	46	33	0.072644

Bed partners – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Presence of bed partner	1972.000	1514.000	796.0000	-0.401130	0.688324	-0.485806	0.627105	48	35	0.689902

PSQI global score – gender

Variable	T-tests; Grouping: Gender (CODED DATA + PSQI SCORES in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Group 1: 2 Group 2: 1									
	Mean 2	Mean 1	t-value	df	p	Valid N 2	Valid N 1	Std.Dev. 2	Std.Dev. 1	F-ratio Variances	p Variances
PSQI global score	7.826087	6.000000	2.142713	77	0.035295	46	33	4.062317	3.221025	1.590594	0.171456

Good vs poor sleepers – gender

Statistic	Statistics: Gender(2) x TYPE OF SLEEPER(2) (CODED DATA + PSQI SCORES in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101)		
	Chi-square	df	p
Pearson Chi-square	.1350035	df=1	p=.71330
M-L Chi-square	.1348747	df=1	p=.71343

Gender	2-Way Summary Table: Observed Frequencies (CODED DATA + PSQI SCORES in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Marked cells have counts > 10		
	TYPE OF SLEEPER 1	TYPE OF SLEEPER 2	Row Totals
1	15	18	33
2	19	27	46
Totals	34	45	79

SLEEP DISTURBANCES

“I cannot fall asleep within 30 min” – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000								
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I cannot get to sleep within 30 minutes	2133.000	1353.000	723.0000	1.074292	0.282693	1.132110	0.257589	48	35	0.284379

”I wake up in the middle of the night or early in the morning” – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000								
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I wake up in the middle of the night or early morning"	2081.000	1405.000	775.0000	0.594780	0.551991	0.662206	0.507840	48	35	0.553975

“I have to use the bathroom” – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000								
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I have to get up to use the bathroom"	2109.500	1376.500	746.5000	0.857589	0.391120	0.929552	0.352604	48	35	0.390603

“I cannot breathe properly” – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000								
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I cannot breathe properly when I sleep"	1924.500	1561.500	748.5000	-0.839146	0.401388	-1.55579	0.119759	48	35	0.400846

“I cough or snore loudly” – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000								
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p

"I cough or snore loudly when I sleep"	1839.500	1646.500	663.5000	-1.62296	0.104598	-1.86038	0.062832	48	35	0.103848

"I feel too cold" – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I feel too cold when I sleep"	2075.000	1411.000	781.0000	0.539451	0.589576	0.636839	0.524230	48	35	0.591475

"I feel too hot" – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I feel too hot when I sleep"	2074.500	1411.500	781.5000	0.534841	0.592760	0.575878	0.564698	48	35	0.591475

"I have bad dreams" – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I have bad dreams when I sleep"	2295.000	1191.000	561.0000	2.568157	0.010225	2.810716	0.004943	48	35	0.009700

"I have pain" – gender

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I have pain when I sleep"	2155.500	1330.500	700.5000	1.281773	0.199923	1.588173	0.112248	48	35	0.199459

variable	Mann-Whitney U Test (w/ continuity correction) (CODED DATA - RANK CODED in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000

	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
"I have pain when I sleep"	2155.500	1330.500	700.5000	1.281773	0.199923	1.588173	0.112248	48	35	0.199459

"Other reasons" – gender

variable	All Groups Mann-Whitney U Test (w/ continuity correction) (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) By variable Gender Marked tests are significant at p <.05000									
	Rank Sum Group 1	Rank Sum Group 2	U	Z	p-value	Z adjusted	p-value	Valid N Group 1	Valid N Group 2	2*1sided exact p
Frequency of other reported disturbances	1712.000	989.0000	583.0000	0.527524	0.597830	0.551352	0.581393	45	28	0.600056

APPENDIX J: STATISTICAL ANALYSES TO DETERMINE RANK EFFECTS

SOCIODEMOGRAPHIC DATA

Age – rank

Effect	Univariate Tests of Significance for Age (CODED DATA in Workbook6_(Recovered)) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	169975.6	1	169975.6	1569.649	0.000000
Academic rank	2611.6	2	1305.8	12.058	0.000026
Error	8663.1	80	108.3		

Cell No.	Tukey HSD test; variable Age (CODED DATA in Workbook6_(Recovered)) Approximate Probabilities for Post Hoc Tests Error: Between MS = 108.29, df = 80.000			
	Academic rank	{1} 41.156	{2} 44.100	{3} 53.645
1	1		0.583858	0.000130
2	2	0.583858		0.005667
3	3	0.000130	0.005667	

Age categories – rank

Depend.: B	Kruskal-Wallis ANOVA by Ranks; B (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 83) =18.41195 p =.0001			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	32	1008.000	31.50000
2	2	20	741.000	37.05000
3	3	31	1737.000	56.03226

Dependent: B	Median Test, Overall Median = 3.00000; B (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Chi-Square = 11.47690 df = 2 p = .0032			
	1	2	3	Total
<= Median: observed	24.00000	14.00000	11.00000	49.00000
expected	18.89157	11.80723	18.30120	
obs.-exp.	5.10843	2.19277	-7.30120	
> Median: observed	8.00000	6.00000	20.00000	34.00000
expected	13.10843	8.19277	12.69880	
obs.-exp.	-5.10843	-2.19277	7.30120	
Total: observed	32.00000	20.00000	31.00000	83.00000

Marital status – rank

Depend.: Marital status	Kruskal-Wallis ANOVA by Ranks; Marital status (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =6.198189 p =.0451			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1172.000	35.51515
2	2	20	881.000	44.05000
3	3	31	1517.000	48.93548

Dependent: Marital status	Median Test, Overall Median = 3.00000; Marital status (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 1.304137 df = 2 p = .5210			
	1	2	3	Total
<= Median: observed	32.00000	19.00000	28.00000	79.00000
expected	31.03571	18.80952	29.15476	
obs.-exp.	0.96429	0.19048	-1.15476	
> Median: observed	1.00000	1.00000	3.00000	5.00000
expected	1.96429	1.19048	1.84524	
obs.-exp.	-0.96429	-0.19048	1.15476	
Total: observed	33.00000	20.00000	31.00000	84.00000

No of children – rank

Depend.: No. of children	Kruskal-Wallis ANOVA by Ranks; No. of children (CODED DATA in Workbook6_(Recovered)) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =7.168255 p =.0278			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1191.500	36.10606
2	2	20	794.000	39.70000
3	3	31	1584.500	51.11290

Dependent: No. of children	Median Test, Overall Median = 2.00000; No. of children (CODED DATA in Workbook6_(Recovered)) Independent (grouping) variable: Academic rank Chi-Square = 3.978442 df = 2 p = .1368			
	1	2	3	Total
<= Median: observed	23.00000	11.00000	14.00000	48.00000
expected	18.85714	11.42857	17.71429	
obs.-exp.	4.14286	-0.42857	-3.71429	
> Median: observed	10.00000	9.00000	17.00000	36.00000
expected	14.14286	8.57143	13.28571	
obs.-exp.	-4.14286	0.42857	3.71429	

Total: observed	33.00000	20.00000	31.00000	84.00000

Children under 5 years – rank

Depend.: No. under 5yrs	Kruskal-Wallis ANOVA by Ranks; No. under 5yrs (CODED DATA in Workbook6_(Recovered)) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.7254814 p =.6958			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1438.500	43.59091
2	2	20	812.000	40.60000
3	3	31	1319.500	42.56452

Dependent: No. under 5yrs	Median Test, Overall Median = 1.00000; No. under 5yrs (CODED DATA in Workbook6_(Recovered)) Independent (grouping) variable: Academic rank Chi-Square = .7342221 df = 2 p = .6927			
	1	2	3	Total
<= Median: observed	29.00000	19.00000	28.00000	76.00000
expected	29.85714	18.09524	28.04762	
obs.-exp.	-0.85714	0.90476	-0.04762	
> Median: observed	4.00000	1.00000	3.00000	8.00000
expected	3.14286	1.90476	2.95238	
obs.-exp.	0.85714	-0.90476	0.04762	
Total: observed	33.00000	20.00000	31.00000	84.00000

GENERAL HEALTH AND LIFESTYLE

BMI – rank

Depend.: BMI	Kruskal-Wallis ANOVA by Ranks; BMI (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 83) =1.590215 p =.4515			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	32	1229.500	38.42188
2	2	20	829.000	41.45000
3	3	31	1427.500	46.04839

BMI categories – rank

Depend.: O	Kruskal-Wallis ANOVA by Ranks; O (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 83) =1.756260 p =.4156			
	Code	Valid N	Sum of Ranks	Mean Rank

1	1	32	1232.000	38.50000
2	2	20	828.000	41.40000
3	3	31	1426.000	46.00000

Smoking status – rank

Dependent: Weekday screen time	Median Test, Overall Median = 10.0000; Weekday screen time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = .5157365 df = 2 p = .7727			
	1	2	3	Total
<= Median: observed	23.00000	13.00000	23.00000	59.00000
expected	22.74699	14.21687	22.03614	
obs.-exp.	0.25301	-1.21687	0.96386	
> Median: observed	9.00000	7.00000	8.00000	24.00000
expected	9.25301	5.78313	8.96386	
obs.-exp.	-0.25301	1.21687	-0.96386	
Total: observed	32.00000	20.00000	31.00000	83.00000

Depend.: Smoking status	Kruskal-Wallis ANOVA by Ranks; Smoking status (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.2631001 p =.8767			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1432.500	43.40909
2	2	20	865.000	43.25000
3	3	31	1272.500	41.04839

PA adherence - rank

Depend.: Meeting PA Guidelines	Kruskal-Wallis ANOVA by Ranks; Meeting PA Guidelines (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =1.079862 p =.5828		
	Valid N	Sum of Ranks	Mean Rank
1	33	1495.500	45.31818
2	20	802.000	40.10000
3	31	1272.500	41.04839

Dependent: Meeting PA Guidelines	Median Test, Overall Median = 1.00000; Meeting PA Guidelines (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 1.092873 df = 2 p = .5790			
	1	2	3	Total

<= Median: observed	19.00000	14.00000	21.00000	54.00000
expected	21.21429	12.85714	19.92857	
obs.-exp.	-2.21429	1.14286	1.07143	
> Median: observed	14.00000	6.00000	10.00000	30.00000
expected	11.78571	7.14286	11.07143	
obs.-exp.	2.21429	-1.14286	-1.07143	
Total: observed	33.00000	20.00000	31.00000	84.00000

Weekday sedentary time – rank

Effect	Univariate Tests of Significance for Weekday sedentary time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	6658.361	1	6658.361	818.2776	0.000000
Academic rank	9.097	2	4.549	0.5590	0.573990
Error	650.964	80	8.137		

Weekday screen time – rank

Depend.: Weekday screen time	Kruskal-Wallis ANOVA by Ranks; Weekday screen time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 83) =1.832983 p =.3999			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	32	1255.500	39.23438
2	2	20	962.500	48.12500
3	3	31	1268.000	40.90323

Dependent: Weekday screen time	Median Test, Overall Median = 10.0000; Weekday screen time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = .5157365 df = 2 p = .7727			
	1	2	3	Total
<= Median: observed	23.00000	13.00000	23.00000	59.00000
expected	22.74699	14.21687	22.03614	
obs.-exp.	0.25301	-1.21687	0.96386	
> Median: observed	9.00000	7.00000	8.00000	24.00000

expected	9.25301	5.78313	8.96386	
obs.-exp.	-0.25301	1.21687	-0.96386	
Total: observed	32.00000	20.00000	31.00000	83.00000

Weekend screen time - rank

Depend.: Weekend screen time	Kruskal-Wallis ANOVA by Ranks; Weekend screen time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 82) =.4209318 p =.8102			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	31	1268.000	40.90323
2	2	20	786.000	39.30000
3	3	31	1349.000	43.51613

Weeknight screen time frequency – rank

Depend.: Weeknight screen time frequency	Kruskal-Wallis ANOVA by Ranks; Weeknight screen time frequency (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =1.801262 p =.4063			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1443.000	43.72727
2	2	20	913.000	45.65000
3	3	31	1214.000	39.16129

Dependent: Weeknight screen time frequency	Median Test, Overall Median = 5.00000; Weeknight screen time frequency (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 0.000000 df = 2 p = 1.000			
	1	2	3	Total
<= Median: observed	33.00000	20.00000	31.00000	84.00000
expected	33.00000	20.00000	31.00000	
obs.-exp.	0.00000	0.00000	0.00000	
> Median: observed	0.00000	0.00000	0.00000	0.00000
expected	0.00000	0.00000	0.00000	
obs.-exp.	0.00000	0.00000	0.00000	
Total: observed	33.00000	20.00000	31.00000	84.00000

Weekend night screen frequency – rank

Depend.: Weekend night screen time frequency	Kruskal-Wallis ANOVA by Ranks; Weekend night screen time frequency (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.3475027 p =.8405			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1439.000	43.60606
2	2	20	806.500	40.32500
3	3	31	1324.500	42.72581

Dependent: Weekend night screen time frequency	Median Test, Overall Median = 4.00000; Weekend night screen time frequency (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 0.000000 df = 2 p = 1.000			
	1	2	3	Total
<= Median: observed	33.00000	20.00000	31.00000	84.00000
expected	33.00000	20.00000	31.00000	
obs.-exp.	0.00000	0.00000	0.00000	
> Median: observed	0.00000	0.00000	0.00000	0.00000
expected	0.00000	0.00000	0.00000	
obs.-exp.	0.00000	0.00000	0.00000	
Total: observed	33.00000	20.00000	31.00000	84.00000

Daily caffeine serving – rank

Depend.: Daily caffeine	Kruskal-Wallis ANOVA by Ranks; Daily caffeine (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 70) =.7649115 p =.6822			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	29	963.5000	33.22414
2	2	16	572.0000	35.75000
3	3	25	949.5000	37.98000

Time of last caffeine serving – rank

Effect	Univariate Tests of Significance for Time of last serve (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	15706.53	1	15706.53	1122.463	0.000000
Academic rank	10.79	2	5.40	0.386	0.681511
Error	951.52	68	13.99		

Time of last alcohol serving – rank

Effect	Univariate Tests of Significance for Time of last serve (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	20420.86	1	20420.86	16574.95	0.000000
Academic rank	0.11	2	0.05	0.04	0.957311

Error	59.14	48	1.23		

WORK-RELATED INFORMATION

Highest postgrad qualification – rank

Depend.: Qualification	Kruskal-Wallis ANOVA by Ranks; Qualification (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =30.90324 p =.0000			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	928.500	28.13636
2	2	20	866.000	43.30000
3	3	31	1775.500	57.27419

Dependent: Qualification	Median Test, Overall Median = 4.00000; Qualification (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Chi-Square = 0.000000 df = 2 p = 1.000			
	1	2	3	Total
<= Median: observed	33.00000	20.00000	31.00000	84.00000
expected	33.00000	20.00000	31.00000	
obs.-exp.	0.00000	0.00000	0.00000	
> Median: observed	0.00000	0.00000	0.00000	0.00000
expected	0.00000	0.00000	0.00000	
obs.-exp.	0.00000	0.00000	0.00000	
Total: observed	33.00000	20.00000	31.00000	84.00000

Faculty – ranks

Dependent: Faculty	Median Test, Overall Median = 2.00000; Faculty (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Chi-Square = .7208243 df = 2 p = .6974			
	1	2	3	Total
<= Median: observed	21.00000	13.00000	17.00000	51.00000
expected	20.03571	12.14286	18.82143	
obs.-exp.	0.96429	0.85714	-1.82143	
> Median: observed	12.00000	7.00000	14.00000	33.00000
expected	12.96429	7.85714	12.17857	
obs.-exp.	-0.96429	-0.85714	1.82143	

Total: observed	33.00000	20.00000	31.00000	84.00000

Depend.: Faculty	Kruskal-Wallis ANOVA by Ranks; Faculty (CODED DATA in Workbook6_(Recovered) - work book includiing socio statistica) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.2974021 p =.8618			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1361.000	41.24242
2	2	20	835.500	41.77500
3	3	31	1373.500	44.30645

Total weekly work hours – rank

Cell No.	Academic rank; Unweighted Means (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Current effect: F(2, 80)=1.1624, p=.31796 Effective hypothesis decomposition					
	Academic rank	TOTAL WEEKLY Mean	TOTAL WEEKLY Std.Err.	TOTAL WEEKLY -95.00%	TOTAL WEEKLY +95.00%	N
1	1	51.78788	1.996207	47.81530	55.76046	33
2	2	56.28750	2.564174	51.18463	61.39037	20
3	3	55.15833	2.093640	50.99186	59.32481	30

Effect	Univariate Tests of Significance for TOTAL WEEKLY (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	234478.2	1	234478.2	1783.106	0.000000
Academic rank	305.7	2	152.9	1.162	0.317958
Error	10520.0	80	131.5		

Week work hours – rank

Cell No.	Academic rank; Unweighted Means (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Current effect: F(2, 80)=1.1890, p=.30985 Effective hypothesis decomposition					
	Academic rank	Week hours Mean	Week hours Std.Err.	Week hours -95.00%	Week hours +95.00%	N
1	1	45.40909	1.714380	41.99737	48.82082	33
2	2	48.23750	2.202161	43.85506	52.61994	20
3	3	49.09167	1.798057	45.51342	52.66991	30

Effect	Univariate Tests of Significance for Week hours (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition

	SS	Degr. of Freedom	MS	F	p
Intercept	179293.0	1	179293.0	1848.567	0.000000
Academic rank	230.6	2	115.3	1.189	0.309847
Error	7759.2	80	97.0		

Weekend work hours – rank

Depend.: Weekend work hours	All Groups Kruskal-Wallis ANOVA by Ranks; Weekend work hours (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 79) =2.210225 p =.3312			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	32	1179.000	36.84375
2	2	19	883.500	46.50000
3	3	28	1097.500	39.19643

Dependent: Weekend work hours	All Groups Median Test, Overall Median = 6.00000; Weekend work hours (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 1.883528 df = 2 p = .3899			
	1	2	3	Total
<= Median: observed	19.00000	8.00000	17.00000	44.00000
expected	17.82278	10.58228	15.59494	
obs.-exp.	1.17722	-2.58228	1.40506	
> Median: observed	13.00000	11.00000	11.00000	35.00000
expected	14.17722	8.41772	12.40506	
obs.-exp.	-1.17722	2.58228	-1.40506	
Total: observed	32.00000	19.00000	28.00000	79.00000

Weekend work frequency – rank

Depend.: Weekend work frequency	Kruskal-Wallis ANOVA by Ranks; Weekend work frequency (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.5086518 p =.7754			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1335.000	40.45455
2	2	20	855.000	42.75000

3	3	31	1380.000	44.51613

Dependent: Weekend work frequency	Median Test, Overall Median = 3.00000; Weekend work frequency (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 2.341796 df = 2 p = .3101			
	1	2	3	Total
<= Median: observed	26.00000	14.00000	19.00000	59.00000
expected	23.17857	14.04762	21.77381	
obs.-exp.	2.82143	-0.04762	-2.77381	
> Median: observed	7.00000	6.00000	12.00000	25.00000
expected	9.82143	5.95238	9.22619	
obs.-exp.	-2.82143	0.04762	2.77381	
Total: observed	33.00000	20.00000	31.00000	84.00000

Commute time – rank

Depend.: Commute time	All Groups Kruskal-Wallis ANOVA by Ranks; Commute time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 83) =2.971609 p =.2263			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1489.000	45.12121
2	2	20	683.500	34.17500
3	3	30	1313.500	43.78333

Dependent: Commute time	All Groups Median Test, Overall Median = 10.0000; Commute time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 3.638289 df = 2 p = .1622			
	1	2	3	Total
<= Median: observed	16.00000	15.00000	18.00000	49.00000
expected	19.48193	11.80723	17.71084	
obs.-exp.	-3.48193	3.19277	0.28916	
> Median: observed	17.00000	5.00000	12.00000	34.00000
expected	13.51807	8.19277	12.28916	
obs.-exp.	3.48193	-3.19277	-0.28916	
Total: observed	33.00000	20.00000	30.00000	83.00000

SLEEP-RELATED INFORMATION

Bedtime – rank

Dep end.: Bed time	Kruskal-Wallis ANOVA by Ranks; Bed time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =1.954265 p =.3764			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1523.000	46.15152
2	2	20	870.000	43.50000
3	3	31	1177.000	37.96774

Time to fall asleep – rank

Depend.: Time to fall asleep	Kruskal-Wallis ANOVA by Ranks; Time to fall asleep (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 82) =3.495897 p =.1741			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1522.000	46.12121
2	2	20	862.500	43.12500
3	3	29	1018.500	35.12069

Dependent: Time to fall asleep	Median Test, Overall Median = 20.0000; Time to fall asleep (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 1.879600 df = 2 p = .3907			
	1	2	3	Total
<= Median: observed	19.00000	10.00000	20.00000	49.00000
expected	19.71951	11.95122	17.32927	
obs.-exp.	-0.71951	-1.95122	2.67073	
> Median: observed	14.00000	10.00000	9.00000	33.00000
expected	13.28049	8.04878	11.67073	
obs.-exp.	0.71951	1.95122	-2.67073	
Total: observed	33.00000	20.00000	29.00000	82.00000

Wake time – rank

Effect	Univariate Tests of Significance for Wake time (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	3516.540	1	3516.540	2280.487	0.000000

Academic rank	3.373	2	1.687	1.094	0.339862
Error	124.903	81	1.542		

Sleep duration

Depend.: Actual sleep hours	Kruskal-Wallis ANOVA by Ranks; Actual sleep hours (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 81) =4.669825 p =.0968			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	31	1152.500	37.17742
2	2	20	723.500	36.17500
3	3	30	1445.000	48.16667

Time in bed – rank

Effect	Univariate Tests of Significance for Time in bed (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	5150.928	1	5150.928	3427.902	0.000000
Academic rank	0.270	2	0.135	0.090	0.914252
Error	121.714	81	1.503		

Sleep quality rating – rank

Depend.: Sleep quality	Kruskal-Wallis ANOVA by Ranks; Sleep quality (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =3.066689 p =.2158			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1351.000	40.93939
2	2	20	739.500	36.97500
3	3	31	1479.500	47.72581

Dependent: Sleep quality	Median Test, Overall Median = 3.00000; Sleep quality (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 3.422513 df = 2 p = .1806			
	1	2	3	Total
<= Median: observed	28.00000	17.00000	21.00000	66.00000
expected	25.92857	15.71429	24.35714	
obs.-exp.	2.07143	1.28571	-3.35714	
> Median: observed	5.00000	3.00000	10.00000	18.00000
expected	7.07143	4.28571	6.64286	

obs.-exp.	-2.07143	-1.28571	3.35714	
Total: observed	33.00000	20.00000	31.00000	84.00000

Sleep efficiency – rank

Depend.: SLEEP EFFIECIENCY	Kruskal-Wallis ANOVA by Ranks; SLEEP EFFIECIENCY (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 80) =2.952372 p =.2285			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	31	1193.000	38.48387
2	2	20	707.500	35.37500
3	3	29	1339.500	46.18966

Dependent: SLEEP EFFIECIENCY	Median Test, Overall Median = 87.5000; SLEEP EFFIECIENCY (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 3.115476 df = 2 p = .2106			
	1	2	3	Total
<= Median: observed	18.00000	14.00000	13.00000	45.00000
expected	17.43750	11.25000	16.31250	
obs.-exp.	0.56250	2.75000	-3.31250	
> Median: observed	13.00000	6.00000	16.00000	35.00000
expected	13.56250	8.75000	12.68750	
obs.-exp.	-0.56250	-2.75000	3.31250	
Total: observed	31.00000	20.00000	29.00000	80.00000

Presence of bed partners – rank

Depend.: Presence of bed partner	Kruskal-Wallis ANOVA by Ranks; Presence of bed partner (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =1.128063 p =.5689			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1308.000	39.63636
2	2	20	897.500	44.87500
3	3	31	1364.500	44.01613

Dependent: Presence of bed partner	Median Test, Overall Median = 2.00000; Presence of bed partner (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = .1573296 df = 2 p = .9243			
	1	2	3	Total
<= Median: observed	32.00000	19.00000	30.00000	81.00000

expected	31.82143	19.28571	29.89286	
obs.-exp.	0.17857	-0.28571	0.10714	
> Median: observed	1.00000	1.00000	1.00000	3.00000
expected	1.17857	0.71429	1.10714	
obs.-exp.	-0.17857	0.28571	-0.10714	
Total: observed	33.00000	20.00000	31.00000	84.00000

PSQI global score – rank

Effect	Univariate Tests of Significance for BE (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Sigma-restricted parameterization Effective hypothesis decomposition				
	SS	Degr. of Freedom	MS	F	p
Intercept	4023.800	1	4023.800	297.6444	0.000000
Academic rank	101.439	2	50.719	3.7518	0.027875
Error	1040.949	77	13.519		

Cell No.	Tukey HSD test; variable BE (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Approximate Probabilities for Post Hoc Tests Error: Between MS = 13.519, df = 77.000			
	Academic rank	{1} 7.4839	{2} 8.5000	{3} 5.6897
1	1		0.602052	0.148860
2	2	0.602052		0.027636
3	3	0.148860	0.027636	

Good vs poor sleepers – rank

Depend.: TYPE OF SLEEPER	Kruskal-Wallis ANOVA by Ranks; TYPE OF SLEEPER (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 80) =7.140833 p =.0281			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	31	1262.500	40.72581
2	2	20	990.000	49.50000
3	3	29	987.500	34.05172

Dependent: TYPE OF SLEEPER	Median Test, Overall Median = 2.00000; TYPE OF SLEEPER (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 0.000000 df = 2 p = 1.000			
	1	2	3	Total
<= Median: observed	31.00000	20.00000	29.00000	80.00000

expected	31.00000	20.00000	29.00000	
obs.-exp.	0.00000	0.00000	0.00000	
> Median: observed	0.00000	0.00000	0.00000	0.00000
expected	0.00000	0.00000	0.00000	
obs.-exp.	0.00000	0.00000	0.00000	
Total: observed	31.00000	20.00000	29.00000	80.00000

SLEEP DISTURBANCE FREQUENCY

“I cannot get to sleep within 30 min” – rank

Depend.: "I cannot get to sleep within 30 minutes	Kruskal-Wallis ANOVA by Ranks; "I cannot get to sleep within 30 minutes (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =5.354600 p =.0688			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1517.500	45.98485
2	2	20	969.000	48.45000
3	3	31	1083.500	34.95161

Dependent: "I cannot get to sleep within 30 minutes	Median Test, Overall Median = 2.00000; "I cannot get to sleep within 30 minutes (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 5.053578 df = 2 p = .0799			
	1	2	3	Total
<= Median: observed	20.00000	12.00000	26.00000	58.00000
expected	22.78571	13.80952	21.40476	
obs.-exp.	-2.78571	-1.80952	4.59524	
> Median: observed	13.00000	8.00000	5.00000	26.00000
expected	10.21429	6.19048	9.59524	
obs.-exp.	2.78571	1.80952	-4.59524	
Total: observed	33.00000	20.00000	31.00000	84.00000

“I wake up in the middle of night or early morning” – rank

Depend.: "I wake up in the middle of the night or early morning"	Kruskal-Wallis ANOVA by Ranks; "I wake up in the middle of the night or early morning" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.2557564 p =.8800			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1433.500	43.43939
2	2	20	807.500	40.37500
3	3	31	1329.000	42.87097

Dependent: "I wake up in the middle of the night or early morning"	Median Test, Overall Median = 4.00000; "I wake up in the middle of the night or early morning" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 0.000000 df = 2 p = 1.000			
	1	2	3	Total
<= Median: observed	33.00000	20.00000	31.00000	84.00000
expected	33.00000	20.00000	31.00000	
obs.-exp.	0.00000	0.00000	0.00000	
> Median: observed	0.00000	0.00000	0.00000	0.00000
expected	0.00000	0.00000	0.00000	
obs.-exp.	0.00000	0.00000	0.00000	
Total: observed	33.00000	20.00000	31.00000	84.00000

“I have to use bathroom” – rank

Depend.: "I have to get up to use the bathroom"	Kruskal-Wallis ANOVA by Ranks; "I have to get up to use the bathroom" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =1.539481 p =.4631			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1401.000	42.45455
2	2	20	753.000	37.65000
3	3	31	1416.000	45.67742

Dependent: "I have to get up to use the bathroom"	Median Test, Overall Median = 3.50000; "I have to get up to use the bathroom" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 2.636755 df = 2 p = .2676			
	1	2	3	Total
<= Median: observed	16.00000	13.00000	13.00000	42.00000
expected	16.50000	10.00000	15.50000	
obs.-exp.	-0.50000	3.00000	-2.50000	
> Median: observed	17.00000	7.00000	18.00000	42.00000
expected	16.50000	10.00000	15.50000	
obs.-exp.	0.50000	-3.00000	2.50000	
Total: observed	33.00000	20.00000	31.00000	84.00000

“I cannot breathe properly” – rank

Depend.: "I cannot breathe properly when I sleep"	Kruskal-Wallis ANOVA by Ranks; "I cannot breathe properly when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =3.157057 p =.2063			
	Code	Valid N	Sum of Ranks	Mean Rank

1	1	33	1461.000	44.27273
2	2	20	760.000	38.00000
3	3	31	1349.000	43.51613

Dependent: "I cannot breathe properly when I sleep"	Median Test, Overall Median = 1.00000; "I cannot breathe properly when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 3.234461 df = 2 p = .1984			
	1	2	3	Total
<= Median: observed	28.00000	20.00000	27.00000	75.00000
expected	29.46429	17.85714	27.67857	
obs.-exp.	-1.46429	2.14286	-0.67857	
> Median: observed	5.00000	0.00000	4.00000	9.00000
expected	3.53571	2.14286	3.32143	
obs.-exp.	1.46429	-2.14286	0.67857	
Total: observed	33.00000	20.00000	31.00000	84.00000

"I cough or snore loudly" – rank

Depend.: "I cough or snore loudly when I sleep"	Kruskal-Wallis ANOVA by Ranks; "I cough or snore loudly when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =2.739816 p =.2541			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1258.000	38.12121
2	2	20	856.000	42.80000
3	3	31	1456.000	46.96774

Dependent: "I cough or snore loudly when I sleep"	Median Test, Overall Median = 1.00000; "I cough or snore loudly when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 2.197220 df = 2 p = .3333			
	1	2	3	Total
<= Median: observed	23.00000	12.00000	16.00000	51.00000
expected	20.03571	12.14286	18.82143	
obs.-exp.	2.96429	-0.14286	-2.82143	
> Median: observed	10.00000	8.00000	15.00000	33.00000
expected	12.96429	7.85714	12.17857	
obs.-exp.	-2.96429	0.14286	2.82143	
Total: observed	33.00000	20.00000	31.00000	84.00000

"I feel too cold" – rank

Depend.: "I feel too cold when I sleep"	Kruskal-Wallis ANOVA by Ranks; "I feel too cold when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =2.393247 p =.3022			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1538.500	46.62121
2	2	20	830.000	41.50000
3	3	31	1201.500	38.75806

Dependent: "I feel too cold when I sleep"	Median Test, Overall Median = 1.00000; "I feel too cold when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 1.505836 df = 2 p = .4710			
	1	2	3	Total
<= Median: observed	19.00000	14.00000	22.00000	55.00000
expected	21.60714	13.09524	20.29762	
obs.-exp.	-2.60714	0.90476	1.70238	
> Median: observed	14.00000	6.00000	9.00000	29.00000
expected	11.39286	6.90476	10.70238	
obs.-exp.	2.60714	-0.90476	-1.70238	
Total: observed	33.00000	20.00000	31.00000	84.00000

"I feel too hot" – rank

Depend.: "I feel too hot when I sleep"	Kruskal-Wallis ANOVA by Ranks; "I feel too hot when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =.2451922 p =.8846			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1448.500	43.89394
2	2	20	816.500	40.82500
3	3	31	1305.000	42.09677

Dependent: "I feel too hot when I sleep"	Median Test, Overall Median = 1.50000; "I feel too hot when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 1.104985 df = 2 p = .5755			
	1	2	3	Total
<= Median: observed	15.00000	12.00000	15.00000	42.00000
expected	16.50000	10.00000	15.50000	
obs.-exp.	-1.50000	2.00000	-0.50000	
> Median: observed	18.00000	8.00000	16.00000	42.00000
expected	16.50000	10.00000	15.50000	
obs.-exp.	1.50000	-2.00000	0.50000	

Total: observed	33.00000	20.00000	31.00000	84.00000

"I have bad dreams" – rank

Depend.: "I have bad dreams when I sleep"	Kruskal-Wallis ANOVA by Ranks; "I have bad dreams when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =2.067724 p =.3556			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1543.500	46.77273
2	2	20	816.000	40.80000
3	3	31	1210.500	39.04839

Dependent: "I have bad dreams when I sleep"	Median Test, Overall Median = 1.50000; "I have bad dreams when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = .5630499 df = 2 p = .7546			
	1	2	3	Total
<= Median: observed	15.00000	10.00000	17.00000	42.00000
expected	16.50000	10.00000	15.50000	
obs.-exp.	-1.50000	0.00000	1.50000	
> Median: observed	18.00000	10.00000	14.00000	42.00000
expected	16.50000	10.00000	15.50000	
obs.-exp.	1.50000	0.00000	-1.50000	
Total: observed	33.00000	20.00000	31.00000	84.00000

"I have pain" – rank

Depend.: "I have pain when I sleep"	Kruskal-Wallis ANOVA by Ranks; "I have pain when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 84) =3.507501 p =.1731			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	33	1277.000	38.69697
2	2	20	816.500	40.82500
3	3	31	1476.500	47.62903

Dependent: "I have pain when I sleep"	Median Test, Overall Median = 1.00000; "I have pain when I sleep" (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = 3.568591 df = 2 p = .1679			
	1	2	3	Total
<= Median: observed	26.00000	15.00000	18.00000	59.00000
expected	23.17857	14.04762	21.77381	
obs.-exp.	2.82143	0.95238	-3.77381	

> Median: observed	7.00000	5.00000	13.00000	25.00000
expected	9.82143	5.95238	9.22619	
obs.-exp.	-2.82143	-0.95238	3.77381	
Total: observed	33.00000	20.00000	31.00000	84.00000

“Other reasons” – rank

Depend.: Frequency of other reported disturbances	Kruskal-Wallis ANOVA by Ranks; Frequency of other reported disturbances (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Kruskal-Wallis test: H (2, N= 73) =.5362773 p =.7648			
	Code	Valid N	Sum of Ranks	Mean Rank
1	1	29	1106.500	38.15517
2	2	17	656.500	38.61765
3	3	27	938.000	34.74074

Dependent: Frequency of other reported disturbances	Median Test, Overall Median = 4.00000; Frequency of other reported disturbances (CODED DATA in WORKBOOK 1 - DESCRIPTIVE STATISTICS - TRIALS 101) Independent (grouping) variable: Academic rank Chi-Square = .7088803 df = 2 p = .7016			
	1	2	3	Total
<= Median: observed	25.00000	13.00000	22.00000	60.00000
expected	23.83562	13.97260	22.19178	
obs.-exp.	1.16438	-0.97260	-0.19178	
> Median: observed	4.00000	4.00000	5.00000	13.00000
expected	5.16438	3.02740	4.80822	
obs.-exp.	-1.16438	0.97260	0.19178	
Total: observed	29.00000	17.00000	27.00000	73.00000