

A formative assessment of South African nurses' lifestyle behaviours and health status

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DECLARATION

I, **Lindokuhle Pellegrin Phiri**, hereby declare that the work on which this thesis is based is my original work (except where acknowledgements indicate otherwise), and that neither the whole work nor any part of it has been, is being, or is submitted for another degree in this or any other university.

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Date: 4 May 2015

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LIST OF ABBREVIATIONS

ANCOVA	: Analysis of covariance
ANOVA	: Analyses of variance
BMI	: Body Mass Index
CBD	: Central business district
CVD	: Cardiovascular diseases
CMD	: Cardio-metabolic diseases
EWP	: Employee wellness programme
FGD	: Focus group discussions
GPAQ	: Global Physical Activity Questionnaire
IHD	: Ischaemic heart disease
HCW	: Health care workers
HIV	: Human immune deficiency virus
HIV	: Human immune deficiency virus
KII	: Key informant interviews
KZN	: KwaZulu-Natal
MDR-TB	: Multiple-drug-resistant TB
MVPA	: Moderate and vigorous intensity physical activity
MS	: Metabolic syndrome
NCD	: Non-communicable diseases
PA	: Physical activity
SA	: South Africa
SB	: Sedentary behaviour

SD	: Standard deviations
TB	: Tuberculosis
TV	: Television
UK	: United Kingdom
USA	: United States of America
VCT	: Voluntary counselling and testing
WC	: Waist circumference
WHO	: World health organization
WHPP	: Worksite health promotion programmes
XDR-TB	: Extremely drug-resistant TB

DEFINITION OF TERMS

Professional nurse	: Has been awarded a University degree. Practices comprehensive nursing. Assumes responsibility and accountability for independent decision making [1].
Staff nurse	: Has been awarded a National Diploma. Their practice is focused on quality service delivery within a broad spectrum of health services and in a variety of settings [1].
Auxiliary nurse	: Has been awarded a National Senior Certificate, equivalent to completing high school. Auxiliary nurses practice basic nursing care and they work under the supervision of a nurse with a National Diploma or Degree in nursing [1].

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ABSTRACT

Background

Previous research has identified health care workers (HCWs) and shift workers as having an increased risk for non-communicable diseases (NCDs). Nurses in particular have a high prevalence of obesity, poor eating habits and insufficient physical activity and are at an increased risk for NCDs. Nurses are required to work non-traditional hours, outside the parameters of traditional day shift. Furthermore, shift work is associated with obesity and lower levels of physical activity. Even though nurses' occupations require them to be active in doing ward rounds and other duties, it is possible for these professionals to be physically active, yet highly sedentary. Sedentary behaviours such as occupational sitting, leisure-time sitting and television (TV) viewing may be associated with overweight and obesity independent of physical activity.

Aim

The primary aim of this *mini-dissertation* was to determine the health concerns, health priorities and barriers to living a healthy lifestyle among nurses and hospital management staff from public hospitals in the Western Cape Metropole, South Africa. The *mini-dissertation* included two different research methods. Study 1: The main purpose of this qualitative descriptive study was to describe health concerns, health priorities and determinants of healthy lifestyle behaviours among nurses. The objectively measured and self-reported physical activity and sedentary behaviour in day and night shift nurses were compared in Study 2. Combined, the results of these studies may be used to inform the development of worksite-related interventions for South African nurses.

Methods

Participants for the first study were purposively sampled from public hospitals based in Cape Town, South Africa. The participants included 103 nurses, of whom 57 worked night shift and 36 worked day-shift. Twelve focus group discussion (FGD's) were conducted with nursing staff to obtain insight into their health concerns, lifestyle behaviours and the nature of and access to worksite health promotion programmes (WHPPs). Nine hospital management personnel participated in key informant interviews (KII) to gain their perspective on health promotion in the worksite. The FGDs and interviews were conducted by a trained facilitator using guided questions. These included questions such as: 'What are your main personal health concerns?' and 'How does your work affect your lifestyle behaviours and health?' Thematic analysis was used

to analyse the qualitative data with the assistance of (Atlas.ti Qualitative Data Analysis Software (Scientific Software Development GmbH, Berlin, Germany)).

In a sub-study, 64 nurses (day shift n=30 and night shift n=34) working at two of the five public hospitals volunteered to complete a socio-demographic questionnaire and wear the ActiGraph GT3x accelerometer for 7 consecutive days to measure physical activity levels. Valid data was defined as ≥ 600 minutes wear time per day, minimum of 4 days (2 shift days and 2 non-shift days). In addition, self-reported physical activity was assessed using the Global Physical Activity Questionnaire (GPAQ). Statistical analyses included a T-test to determine differences in PA and SB between day and night shift nurses. If data were normally distributed, ANOVA (analyses of variance) was performed to determine the significant differences in continuous outcome variables between day and night shift nurses. If data were not normally distributed, such as the GPAQ data, a non-parametric comparison Mann Whitney U test was applied.

Results

Study 1: Night shift nurses frequently identified weight gain and living with NCDs such as hypertension as their main health concerns. The hospital environment was perceived to have a negative influence on the nurses' lifestyle behaviours, including food service that offered predominantly unhealthy foods. The most commonly delivered WHPPs included independent counselling and advisory services, an online employee wellness programme. The Western Cape Department of Health also offered wellness days in which clinical outcomes, such as blood glucose were measured. Most nurses identified a preference for WHPPs that provided access to fitness facilities or support groups. Both nurses and management personnel frequently mentioned lack of time to prepare healthy meals and/or participate in physical activity due to being overtired from the long working hours. Furthermore, both management and nurses reported a stressful working environment. The fact that the nurses were most concerned with the problems of overweight, obesity and living with NCDs such as diabetes and hypertension indicate that there is a need and desire for WHPP's aimed at addressing these concerns.

Study 2: Based on the objectively-measured results from accelerometry, all the nurses in the sub-study met the physical activity recommendations of 150 minutes or more of moderate to vigorous intensity physical activity per week. The day shift nurses reported more leisure-time moderate and vigorous intensity physical activity than the night shift nurses ($p=0.028$). Objectively-measured physical activity also showed that night shift nurses accumulated significantly more moderate intensity physical activity than the day shift nurses (16.6 ± 5.6 hrs/week versus $12.1 \pm$

4.5 hrs/week, respectively, $p=0.001$). In addition, night shift nurses accumulated more steps per day than day shift nurses (10324 ± 3414 versus 8022 ± 3245 , $p=0.013$). Self-reported sedentary behaviour was similar for the two shifts, 3.0 ± 1.8 hours versus 4.0 ± 2.6 hours a day, for day and night shift, respectively. Objectively-measured sedentary behaviour (SB) was significantly lower (as a % of wake time) in night shift compared to day shift workers, 66% and 69%, respectively, $p= 0.047$. These differences between groups remained significant, even after adjusting for differences in body size and age. Furthermore, results from the Bland–Altman plots indicate that the nurses significantly underreported their sedentary time.

Summary

The nurses in this study were concerned about NCDs and being overweight. They expressed an interest and willingness to participate in future hospital-based intervention programmes. The most frequently identified preference for WHPPs was access to fitness facilities or support groups. Despite the fact that all the nurses met the current public health recommendations for physical activity, objectively-measured SB was substantial, with both day and night shift nurses spending an average of 13 hours a day in SB. Findings from this study highlight the need for WHPPs that minimize sedentary behaviour and create a more supportive environment for physical activity.

CHAPTER 1:

LITERATURE REVIEW

1. INTRODUCTION

Nurses are at the forefront of providing direct health care and health education to patients [2-4]. They are highly trusted in the nurse–patient relationship, and are often the health professionals with whom patients have the first clinical contact during their visit to a health facility [5]. Nurses are also in an optimal position to serve as role models to the public [2-4]. Despite this, having the knowledge of what is required for healthy living is not always translated into their own self-care and behaviours [4].

Both international [2, 3, 6] and South African-based research [7-9] have reported that nurses are overweight, obese and insufficiently physically active (PA) and have unhealthy diets. Physical inactivity, obesity and unhealthy eating are known health risk factors for non-communicable diseases (NCDs), such as cardiovascular diseases (CHDs), Type 2 diabetes mellitus obesity, and certain forms of cancer [10-12]. As a result, a high proportion of nurses are at an increased risk of NCDs [2, 4, 6, 7, 13].

The World Health Organization (WHO) reported that 63% of the deaths that occurred globally in 2008 were attributed to NCDs [11]. NCDs such as Type 2 diabetes, hypertension, ischemic heart disease (IHD) and stroke are identified as the leading causes of the majority of deaths worldwide [11]. Approximately 5.3 million deaths occurring in 2008 could have been prevented if individuals engaged in physical activity [14]. The American College of Sports Medicine and the American Heart Association recommends that adults accumulate 150 minutes moderate intensity activity, or 75 minutes of vigorous intensity activity per week, in order to improve health [15]. This can be translated to an average of ≥ 7000 steps a day [16]. A cadence of 100 steps per minute is advocated for at least 3000 steps a day, which represents approximately 30 minutes [16].

Most working adults could spend up to 15 hours seated per day, including driving time to work, eating and watching TV/leisure time [17]. Work days are associated with more sitting and less walking and standing in comparison to non-work days [18]. However, this might be a different case for nurses as their job requires them to be on their feet and care for patients [9]. The workplace is an opportune setting for health promotion and disease prevention, as working adults spend a large proportion of their day at work and can therefore be easily reached [19]. The World Health Organization's (WHO) 'Healthy Workplace Framework and Model' highlights that the

workplace is an environment in which workers and managers can collaborate to utilize a continual improvement process to protect and promote the health and well-being of all workers [20]. Furthermore, worksite health promotion interventions have a great potential for sustainability because there is an existing social support and thus relies less on individual initiative and motivation for activity [21].

There is strong evidence supporting the potential economic benefits of WHPP's [22-24]. Absenteeism and poor work performance are the consequences of ill health [22-24], thereby decreasing productivity and reduced profits [25]. Evidence from a meta-analysis of workplace physical activity interventions indicates that workplace physical activity interventions can improve health outcomes such as reduced risk of diabetes and stress [26]. This meta-analysis included studies that primarily focused on increased physical activity in the workplace [26]. The most common types of companies included in this analysis were education or health services (n=37), government (n=32) and manufacturing (n=17) [26]. Interventions delivered at the worksite yielded greater effect size ($r = 0.17$) compared to interventions delivered elsewhere ($r = 0.05$) ($p < 0.10$) [26]. Furthermore, interventions that included employees in the intervention design had significant fitness outcomes and anthropometry outcomes compared to interventions implemented by an external contractor [26].

Hospitals are potential worksites for intervention because hospital employees are likely to be socio-demographically diverse yet share common physical, social and policy work environments [27]. Also, hospitals, regardless of size tend to have general workforce similarities with respect to types of departments, professional and support staff job types and unionization of workforce segments [27]. Implementing an intervention in a hospital setting is not without challenges [27]. One of the most common challenges in hospital WHPP is the organizational complexity of hospitals, which includes the use of contractors for some services such as the cafeteria and several different unions [27]. Nonetheless, hospital based worksite health promotion intervention programmes including physical activity and dietary health education, have been proven to be beneficial to health care workers (HCWs) and nurses in particular, by improving dietary habits, aerobic fitness and reducing fat mass [28-32]. These interventions may benefit from formative research, in order to identify nurses' perceptions of health, personal health status and barriers toward leading healthy lifestyle [27].

Formative research is typically conducted at the start of a program with the intent to improve feasibility, effectiveness and likelihood of sustainability [26]. This process uses qualitative and quantitative methods to provide data on participants' and stakeholders' opinions about, reactions to and participation in intervention activities and allows investigators to modify initial assumptions and planned objectives, strategies and messages [26]. The formative phase helps identify challenges that could hinder programme intervention within the organization [26]. Blake et al, recommends that in order to inform interventions development, future research should consider the barriers and facilitators of healthy lifestyle choices in pre-registered nurses [2].

2. AIM AND SCOPE OF LITERATURE REVIEW

The aim of this literature review is to provide a brief overview of current knowledge on nurses' modifiable lifestyle behaviours and their main health concerns. In cases where there was limited data specifically focusing on nurses, studies that focused on all health care workers, for example, such as doctors and physiotherapists, were included. We also examined the role of worksite environment on health and lifestyle behaviours, and the potential benefits of worksite health promotion, focusing specifically on nurses and shift workers.

3. SEARCH STRATEGY AND QUALIFY CRITERIA

Research articles were identified by means of a computerized search in the bibliographic databases including PubMed and EBSCOHOST. Various combinations of the following key terms were used when searching the databases; 'non-communicable diseases AND nurses'; 'sleep AND risk of non-communicable diseases'; 'nurses lifestyle behaviours'; 'health promotion AND non-communicable disease prevention'; 'physical activity AND worksite'; 'physical activity AND employee health'; and 'health concerns of shift workers'.

4. SUMMARY OF LITERATURE

4.1 Health status of Nurses

Self-reported survey data from a cross sectional study examining the prevalence of overweight and obesity in a cohort of working nurses and midwives in Australia, New Zealand (NZ) and the United Kingdom (UK) concluded that 62% nurses were overweight with a Body Mass Index (BMI) more than 25kg/m² [6]. The prevalence of obesity in this sample of nurses and midwives exceeded those of the general populations by 3.74%, 1.73% and 2.24% for Australia, NZ and UK, respectively [6]. These data are supported by a different study that was conducted in six hospitals in central Massachusetts USA and found that 37% hospital-based nurses were

overweight and 28% obese [3]. Moreover, the self-reported health, diet and physical activity behaviours amongst the nurses were low [3].

Therefore it appears that nurses have poorer lifestyle behaviours than anticipated. Blake et al investigated the health behaviours of 540 pre-registered nurses and their attitudes towards being role models to their patients [2] (Table 1). Despite being educated in health promotion practice, the health behaviours of nurses in this study were not ideal [2]. Overall, 24% of their pre-registered nurses were overweight or obese [2]. Nearly 50% of pre-registered nurses (240 out of 540) in their study reported that they did not meet the recommended levels of physical activity required for the benefit of health (30 minutes of moderate intense physical activity on five or more days of the week) [2].

A recent pilot study among health care workers in two large hospitals in Boston, USA, comprising of objective and subjective measures of physical activity reported that approximately 48 out of the 50 health care workers accumulated an average of 165 minutes of moderate-intensity physical activity at work [33]. This study was conducted over a period of seven days during work and non-work hours [33]. Most minutes of moderate (82%) and vigorous (97%) activity were obtained during non-working hours [33]. However, only 27 patient care workers achieved the weekly recommended guidelines of moderate and vigorous physical activity (MVPA) minutes during both working and non-working hours [33]. Additionally, only six patient care workers achieved the weekly guidelines of 150 and 75 minutes on the basis of MVPA minutes obtained in bouts of 10 minutes or more [33]. The health care workers reported an average of 206 minutes of moderate-intensity physical activity at work per week which was higher than the objectively measure of 30 minutes [33]. This study together with other similar South African studies [8, 9] suggest the need for WHPP's for the nurses and health care workers.

The limited research findings available for South African nurses and health care workers [7-9] echo the poor health status of nurses published in high-income countries. The majority of the HCWs (doctors, nurses, physiotherapists, radiographers, occupational therapists and dentists) from a tertiary public hospital in Pretoria, South Africa were either overweight or obese [7]. This study also compared the prevalence of obesity and obesity-related health conditions between HCWs and non- HCWs of the same health institution [7]. A comparison of BMI, health status, health problems, risk behaviours and perceptions about body weight was conducted between medical (n=100) and non-medical staff (n=100) [7]. Approximately 74% of HCWs were

overweight (25.0-29.9 kg/m²), obese (obese = 30.0 – 39.9 kg/m²), and severely obese (\geq 40kg/m²) [7]. More female HCWs, 77%, were overweight and obese when compared to their male colleagues, 61% [7]. There was no significant difference in BMI distribution between medical and non- medical staff [7].

The most commonly reported diseases in South African HCWs are NCDs such as hypertension and diabetes [7]. Among those who suffered from diabetes, 57% were medical staff and 43% were non-medical staff [7]. These medical conditions were more prevalent among those who were overweight and obese as compared to those who were of normal weight [7]. Furthermore, 40% of the HCWs mentioned having tried losing weight before with lifestyle behaviour changes like dieting and exercising [7]. However the results of weight loss attempts were not reported [7]. A summary of the prevalence of NCD risk factors in nurses and HCWs is shown in Table 1.

Because nurses are often walking, lifting and transferring patients and need to move quickly to aid patients during an emergency situation, one may expect them to have good cardiorespiratory fitness [9]. Skaal et al reports on low fitness levels among South African HCWs in their study comprising of 200 HCWs from a tertiary hospital in Pretoria [8]. The aim of their cross-sectional study was to identify barriers to exercise [8]. Fitness was assessed using 6-minute step test [8]. The majority of the staff, 82%, were in the low fitness category, whereas, 16% demonstrated a moderate level of fitness, and only 3% met the criteria for a high level of fitness[8]. Similar findings were observed in Kwa-Zulu Natal (KZN), South Africa, where the fitness profiles of 107 hospital nurses were assessed [9]. The KZN nurses presented with poor health and fitness profiles and a high prevalence of back pain, associated with higher levels of body fat [9]. Consequently, the authors concluded that the nurses' poor cardiorespiratory fitness levels may impact negatively on their ability to care for their patients [9]. South African researchers have recommended a structured fitness programme for nurses, as the occupational activity that nurses do in the course of their duties in the wards and around the hospital is not sufficient for aerobic benefit [9].

4.2 DETERMINANTS OF NURSES' HEALTH

4.2.1 Personal determinants

Self-reported data from a research study conducted in a teaching hospital in England showed that less than half of the student nurses (45.98%) between the ages of 19 and 53 years, met the recommended physical activity guidelines [13]. The most commonly reported barriers to

engaging in physical activity were not having time (70.6%), followed by the cost of participation (57.4 %), and feeling tired (48.5%) [13].

Similar barriers to living a healthy lifestyle were echoed by nurses from a community based, urban teaching hospital [4]. Nurses in this study spent an average of 42.4 ± 80.3 minutes per week in vigorous intensity physical activity and 113 ± 118.2 minutes per week in physical activity of a moderate intensity [4]. Also, these nurses felt that they were not getting enough exercise despite working long hours and having a physically demanding occupation [4]. A total of 41 nurses reported that they were often too busy to take meal breaks while working. Others ($n = 6$) also reported cost issues, for example, the fact that fresh fruits and salads were more expensive and less available than fast foods [4]. This may help to explain why the 73% of pre-registered nurses in the study by Blake et al study did not meet the recommended five portions of fruit and vegetables per day [2]. [One of the barriers to participating in WHPP among health care workers is no time \[28\]. Worksite health promotion providers should consider integrating physical activity and healthy food choices into the workplace routine as this might help reduce barriers such time constrains \[34\].](#)

4.2.2 Occupational demands

The health sector provides a continuous service for 24 hours a day, seven days per week [35]. Therefore, healthcare providers are required to work non-traditional hours, outside the parameters of traditional day shift [35, 36], to cater for the needs of the sick and infirmed [35, 37]. Shift work has been shown to have a negative impact on physical and emotional health, job performance, sleep, social and family life as well as increased job-related stress [35-41]. Shift work limits opportunities for physical activity and participation in sports due to lack of time and fatigue [41], which are the most common reasons given by nurses for not exercising regularly [8, 13, 31].

Even though night-shift workers understand the importance of habitual physical activity, they experience a challenge in the implementation and maintenance of an active lifestyle [41]. Leisure-time physical activities, including team sport, group activities or organised events, are often inflexible and do not meet the needs of shift workers [41]. Participation in organised competition is hindered by shift work, since it is more likely that a rotating shift worker will also be required to work on weekends [41]. For those shift workers who might have time to participate in some activities, increased fatigue and the loss of synchronisation of their ‘body

clock' during a shift work schedule might be significant enough to decrease their motivation or intention to be physically active [41].

Shift work has been shown to have a negative impact on physical and emotional health, job performance, sleep, social and family life as well as increased job-related stress [35, 37, 39-42]. Working night shift contributes to negative health behaviours such as insufficient physical activity [41] and unhealthy eating habits [42, 43]. A cross-sectional study, comprising of n= 2494 nurses from Australia, New Zealand and United Kingdom (UK) concluded that nurses working night shift were 1.15 times more likely to be overweight and 1.14 times more likely to be obese than nurses working day shift [44]. Furthermore, the busy-at-work nurse has been reported to have a higher BMI [45]. The busy at work nurses was described as an individual who undertook more than 30 minutes of workplace physical activity a day which comprised of 'running around' the work place [45]. Approximately 23.9% (63/263) night shift nurses from Groote Schuur Hospital Tertiary hospital in Western Cape (South Africa) indicated that they ate more out of frustration and 49% (130/263) revealed that they had gained weight while on the night shift. '*eating to stay awake.*'[36].

A prospective cohort, the Nurses' Health Study I (NHSI) (1988-2008) including 69,269 women aged 42–67 years and 107,915 women aged 25–42 in NHS II (1989–2007) without diabetes, cardiovascular disease, and cancer at baseline reported that extended period of rotating night shift work is associated with a modestly increased risk of type 2 diabetes in women [46]. This study also found that rotating night shift work was associated with an elevated risk of obesity and excessive weight gain during the follow-up period [46, 47]. The findings are supported by Pietrojusti et al [48], who reported that the cumulative incidence of metabolic syndrome (MS) was 9% among night-shift health care workers, and 2% among daytime health care workers [48]. Emphasizing that the risk of developing metabolic syndrome is strongly associated with night-shift work in nurses [48].

5.1 PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR IN THE WORKPLACE

5.1.1 Physical activity in the workplace

Scientific research has reported that employees with occupations requiring walking and lifting have a 35% lower risk of all-cause mortality than those with occupations involving mostly sitting [49]. It can be argued that these findings suggest that blue collar workers are at a reduced risk of

all-cause mortality when compared to white collar workers. Blue-collar workers' occupations requires them to engage in manual labour on the other hand, white-collar workers' occupation is sedentary [50]. Nurses are continuously walking, lifting and transferring patients and need to move quickly to aid patients during an emergency situation [9]. For this reason, they could be considered as blue-collar workers or similar.

Chau et al concluded that white collar workers are significantly more likely to be sufficiently active during leisure-time than employees who's occupations require standing and walking (RR=0.88, 0.80, 0.86 respectively) [51]. Conversely, a systematic review on occupational correlates of adults' participation in leisure time physical activity (LTPA) reported that those employed in physically active occupations demonstrated higher levels of LTPA when compared to those individuals employed in non-active occupations [50]. The explanation for this conclusion is that individuals who are active in their jobs may feel more capable to engage in LTPA whereas individuals who are not active in their occupations may feel less capable as a result of fatigue [50].

Workplace physical activity represents a potentially important opportunity to manage obesity [52]. According to the World Health Organization 2010 global status report on NCDs, obesity is one of the risk factors for insulin resistance and Type2 diabetes [11]. A meta-analysis of workplace physical activity interventions states has shown that such health promotion programmes can improve health outcomes such as reduced risk of diabetes [26]. Furthermore, research shows that workers with occupations involving mostly sitting are at an increased risk of being overweight or obese when compared to workers with jobs involving mostly standing [51]

5.1.2 Sedentary behaviour in the workplace

The term 'sedentary behaviour' (SB) is defined as any behaviour involving little (1–1.5 Metabolic Equivalent (METs) [49]. METs is a unit for measuring physical activity energy expenditure), or no energy expenditure above that required for sitting or a reclining posture [49]. This includes sitting during transport, at work, in leisure time and at home [49]. Spending too much time in sedentary behaviour has been identified as an independent risk factor for morbidity [53]. Indeed, sedentary behaviours such as occupational sitting, leisure-time sitting, and television (TV) viewing have been associated with overweight and obesity, independent of physical activity [54, 55]. Thus, it is possible for individuals to be physically active, yet highly sedentary [56].

Television watching is the most common type of sedentary behaviour. A prospective cohort study (1992-1998) including women from 11 states in the Nurses' Health Study found that time spent watching TV was positively associated with the risk of obesity and Type 2 diabetes [53]. Even after adjusting for age, smoking, exercise and dietary factors, a two hours per day increment in TV watching was associated with 23% increase in obesity and 14% increase in diabetes [53]. In contrast, standing or walking around at home for the same amount of time that could be spent sitting (two hours a day) was associated with a 9% reduction in obesity and 12% reduction in diabetes [53].

Work hours are usually associated with more 'sedentary' time and less light intensity activity compared to leisure days [52]. The mean occupational sitting time in employees is more than three hours a day, with some even reporting more than six hours of sitting time at work [51, 57]. Furthermore, other research studies have reported that more than 10 hours a day of total sitting time had a 65% and 115% greater risk of all-cause and cardio-metabolic diseases (CMD)-related mortality [49]. This is even after adjustment for sex, education, BMI, physical activity, smoking, self-rated general health and CMD status [49]. For this reason, reducing employees sitting time has become an important workplace health priority due to the emerging evidence linking sedentary behaviour with adverse health outcomes [21].

A study examining sedentary time, prolonged sedentary bouts and physical activity was conducted in Australian employees from different workplace settings, within work and non-work contexts [58]. This study included a convenience sample of 193 employees working in offices (n= 131), call centres (n= 36) and customer service (n= 26) [58]. The ActiGraph GT1M accelerometers were used to derive percentages of time spent sedentary (<100 counts per minute), in prolonged sedentary bouts (≥ 20 minutes or ≥ 30 minutes), light-intensity activity (100–1951 counts per minutes) and MVPA (≥ 1952 counts per minutes) [58]. Accelerometer data were collected in one minute epochs [58]. In addition, in order to accurately quantify work hours on work days, the participants were required to record days on which they worked and the respective work start and finish times in a daily diary [58]. Results from this study concluded that "work" was more sedentary and had less light-intensity activity, than "non-work" [58]. Working hours were mostly spent sedentary (77.0%, 95%t CI: 76.3, 77.6) [58]. Working time spent in prolonged sedentary bouts, light intensity physical activity and MVPA differed significantly across all the three workplace settings ($p < 0.001$) [58]. However, call-centre workers spent more

of their time at work in prolonged sedentary bouts and less in light intensity physical activity and MVPA in comparison to customer service and office workers [58].

5.1.3 Summary of PA and SB in workplace

In summary, nurses' are often on the move during the day as their occupational demands require them to be active during ward rounds and nursing patients [59]. For this reason, we can argue that nurses are different to white-collar workers, but similar to blue collar workers. Objectively measured sedentary time in regional male transport workers in Australia was significantly higher on non-work days (64% of wear time) than work days (52%) ($p<0.05$) [60]. Furthermore, sedentary time was significantly lower when employees were working (44%) than when not working (60%; $p<0.05$) [60]. Also, time spent in light-intensity physical activity was significantly higher during work days (52.7%), than non-work time (35%) ($p<0.05$) [60].

Unfortunately there is limited published literature on sedentary behaviour among nurses. It is known that nurses and doctors occupations require them to be active in doing ward rounds and other duties [59]. Therefore they move throughout the day, which results in an increased levels of physical activity [59]. The prevalence of physical activity and sedentary behaviour in the workplace is presented in Table 2.

6.1 ROLE OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR IN HEALTH

Physical inactivity has been estimated to responsible for 6–10% of all NCD-related deaths globally [14] Furthermore, insufficient physical inactivity has economic consequences such as increased healthcare expenditure and loss of productivity [14]. Healthier workers are more likely to remain employed than those who are sick or physically unfit [61]. A South African study examining the association between participation in physical activities and hospital admission among members of a private health insurer [62] concluded that hospitalization costs were lower in members who were participating in physical activity, compared with the inactive group [62]. The same pattern was demonstrated for hospital admissions rates [62].

Despite the strong evidence that physical activity contributes to the prevention of NCDs [10, 12, 15, 31, 63, 64], only 36% of SA men and 24% of women report sufficient physical activity levels for health benefit daily [65]. The American College of Sports Medicine and the American Heart Association state that, for substantial health benefits, adults should accumulate 150 minutes per

week of at least moderate intensity activity, or 75 minutes per week of vigorous intensity activity [15]. MVPA has a key preventive role in NCDs such as cardiovascular disease and Type 2 diabetes [17]. According to Tudor-Locke et al, accumulating 7000 steps/day every day of the week is consistent with obtaining 150 min of weekly MVPA [66]. Therefore, it is recommended that we advocate the message of sitting less and moving more by encouraging individuals to break up extended sitting time with ambulatory activity [16, 67].

Both physical activity and sedentary behaviour can be measured using objective and subjective methods [68]. It can be argued that it is important to apply both methods when measuring physical activity as it would help strengthen the research study. Table 2 gives a summary of the level of sedentary behaviour and physical activity including how these were quantified. The commonly used methods were self-report surveys such as the International Physical Activity Questionnaire (IPAQ) and ActiGraph GT3X. There seem to be limited research studies reporting on the direct measurement of physical activity in nurses or health care workers using the accelerometer. To our knowledge, the study by Umuroko et al is the only study that has used the ActiGraph GT3X accelerometer to objectively measure the physical activity levels of hospital patient care workers in addition to the self-report physical activity survey [33]. The currently published studies on nurses' physical activity level status are based on self-report measures. Both objective measures using the ActiGraph GT3X and self-report surveys such as the IPAQ have their strength and weaknesses, which will be discussed in detail in the next section.

7.1 METHODS FOR MEASURING PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR

7.1.1 Self-report questionnaires

Examples of self-report questionnaires that have been validated in both lower-middle-income countries (LMICs) and High-income countries (HICs) include the International Physical Activity Questionnaire (IPAQ) [65, 69] and the Global Physical Activity Questionnaire (GPAQ) [70]. The World Health Organization–Centre for Disease Control international working group developed the long and short version of the IPAQ questionnaire [69]. The GPAQ was developed by WHO for physical activity surveillance in countries [71]. This instrument is derived from the long and short forms of the IPAQ which has been validated and widely used to assess physical activity patterns [71].

The Global Physical Activity Questionnaire is an example of a physical activity survey which has been used to describe and compare levels and patterns of physical activity among adults across 22 African countries [70]. Participants were requested to report on moderate and vigorous intensity PA during their occupation, travel and leisure time [70]. Physical activity levels varied greatly across African countries and population subgroups [70]. Across all the 22 African countries, 79.1% achieved the WHO physical activity recommendations [70]. Furthermore, work activity (vigorous and moderate combined) was the largest contributor of the overall physical activity (48.6%), followed by transport (46.3%), with leisure-time activity contributing the least (5.1%) [70].

Data from a study conducted by Herrmann et al, evaluating the validity and reliability for GPAQ showed low-to-moderate validity and generally acceptable reliability evidence for the GPAQ [71]. This study comprised of two separate samples of adults (18–65 years) [71]. In the first study, 69 adults completed the GPAQ and all of them wore pedometer and 53 participants wore an accelerometer for seven days at baseline [71]. In the second study, 16 adults completed the GPAQ 10 days apart. The GPAQ moderate and vigorous minutes were correlated with the accelerometer moderate ($r = 0.28$) and vigorous ($r = 0.48$) physical activity [71].

Physical activity and average daily sitting time can be measured using the GPAQ [71]. The GPAQ comprises of 19 questions which collects information on physical activity at work, travel to and from places, leisure activities as well as average daily sitting time [71]. Leisure and work related physical activities are categorized into either moderate or vigorous intensity, whereas transport is only categorized into moderate intensity [71]. Self-reported physical activity is quantified as METs per minutes, per week; with 1 MET being equivalent to the energy expenditure during one hour of rest. [71]. Metabolic Equivalent is applied to physical activity variables derived from the GPAQ [71]. One MET is defined as the energy cost of sitting quietly, and is equivalent to a caloric consumption of 1 kcal/kg/hour [71]. A MET value of 4 is assigned to moderate intensity physical activity [71] and 8 for vigorous intensity PA [71]. Thus, METs minutes per week is calculated for the different intensity levels in each domain.

Strengths related to the use of self-report questionnaires such as the IPAQ and GPAQ include cost-effectiveness, ease of administration and low participant burden [68]. In contrast, a key limitation includes the potential problem of subjective recall, which objective monitoring devices can eliminate. The GPAQ has showed acceptable evidence of short and long term test–retest

reliability by activity category and modest validity evidence [71]. A study investigating the validity and reliability of the GPAQ concluded that the coefficients for short-term 10-day reliability ($r = 0.83\text{--}0.96$) were acceptable while long-term three-month reliability was lower ($r = 0.53\text{--}0.83$) [71].

A positive correlation between self-reported workplace sitting and accelerometer-derived workplace sedentary time has been reported among individuals between the ages of 18 and 65 years, employed full-time and not wheelchair bound [72]. The self-reported measures were compared with the accelerometer-derived sedentary time (hours per day, < 100 counts per minute) and breaks per sedentary hour (number of times, ≥ 100 counts per minute) during work hours [72]. A positive correlation was found between self-reported workplace sitting time and accelerometer-derived sitting time in the total group (Pearson correlation (r_p) = 0.39, 95% CI = 0.22–0.53; Spearman rank-order correlation (r_s) = 0.29, 95% CI = 0.11–0.44) [72]. The correlation of self-reported breaks per sitting hour with accelerometer-derived breaks per sedentary hour was also statistically significant ($r_s = 0.26$, 95% CI = 0.11–0.44) [72].

7.1.2 Objective measure of physical activity

The ActiGraph GT3X accelerometer is a portable light weight device (27 g; 3.8 cm×3.7 cm×1.8 cm) that objectively measures both physical activity and sedentary behaviour, steps taken and energy expenditure. [73] This device is a tri-axial accelerometer, meaning that it measures accelerations in three planes of motion total activity counts, [73]. The ActiGraph GT3X also measures physical activity in different intensities within the set epoch length [74, 75]. For example, time spent in light intensity physical activity (LPA), moderate intensity physical activity (MPA), and vigorous intensity physical activity (VPA) intensity [73, 76]. Additionally this device uses acceleration values to estimate angles and from that estimate different body positions such as sitting, standing or lying down [73].

There are various accelerometer cut points used by different researchers. For light-intensity cut point as an example, Troiano RP et al applied the widest range and highest threshold (100-2019 counts/min) [74] in comparison to the smallest range and lowest threshold (100-759 counts/min) reported by Matthews CE et al [77]. The Freedson cut-points measures “lifestyle” activities and divides physical activity into four sub-categories, namely light-intensity (100-1951 counts/min), moderate-intensity (1952-5724 counts/min), vigorous-intensity (5725-9498 counts/min) and very vigorous-intensity (≥ 9499 counts/min) [78]. On the other hand, the Matthews cut points define

the different intensity domains, with sedentary behaviour defined as activity counts $\leq 100 \text{count.min}^{-1}$, light intensity $\leq 759 \text{count.min}^{-1}$, moderate intensity $\leq 5999 \text{count.min}^{-1}$) and vigorous intensity $\geq 6000 \text{count.min}^{-1}$) [77]. The Freedson moderate and vigorous intensity cut-points are higher than the Matthews moderate and vigorous intensity cut-points. This could result in more moderate and vigorous intensity physical activity when using the Matthews cut-points in comparison to using the Freedson cut-points.

Advantages of using the accelerometer include the ability to capture low movement counts which constitute light-intensity PA or 'incidental' activity (>1.5 to <3 METs), as well as time spent involved in sedentary behaviours (≤ 1.5 METs). Even though the accelerometer is seen as criterion measure of PA, they cannot be used to distinguish whether a person is carrying weight while walking [79]. Another limitation when using accelerometers relates to the wide range of proposed cut-points [74, 77, 78] and the different thresholds employed to characterise physical activity intensities.

As shown in Table 2, several studies have used the ActiGraph device to measure both physical activity and sedentary behaviour in the workplace [60, 80, 81]. Results from a study examining the associations between objectively measured physical activity, sedentary behaviour, and presenteeism concluded that employees who spent more time sedentary and less time in light-intensity activity were more likely to report higher levels of presenteeism [80]. Sedentary behaviour was the predominant activity during work time (65.6 %), lunchtime on a workday (60.1 %), and non-work time (53.0 %) [80]. Additionally, of the total wear time, 37.5 % was spent in light activity, and 5.1 % in MVPA [80].

The sedentary behaviour findings described in the previous paragraph are echoed in a different study by Clemes et al [81]. This study objectively measured sedentary behaviour and physical activity during working and non-working hours in full-time office workers using the ActiGraph GT1M accelerometer discovered that up to 71 percent of working hours were spent sedentary [81]. The office workers accumulated significantly higher levels of sedentary behaviour (68% versus 60%) and lower levels of light-intensity activity (28% versus 36%) on workdays in comparison with non-workdays [81]. However, there were no significant differences between workdays and non-workdays in terms of the proportion of time spent in moderate and vigorous physical activity [81].

The ActiGraph GT3X accelerometer has been reported to be a reliable measure of time spent sedentary, light intensity activity and in moderate-to vigorous-intensity activity during different time periods including work days and non-workdays [80]. On the other hand, there are some studies that use the ActivPal device to measure time spent in sedentary behaviour, but not in MVPA [82]. The ActivPal is a small single unit device uses accelerometer-derived information to estimate time spent in different body positions such as lying or sitting down which is in a horizontal position or ; standing which is in a vertical position [82]. In addition, the ActivPal is a more precise and sensitive method to measure sitting time than the ActiGraph [82]. Thus, studies designed to assess sedentary behaviour should consider using the ActivPal [82]. The ActiGraph GT3X accelerometer is a better option of measurement method where physical activity is the main outcome because this device provides a reliable measure of time spent sedentary, light and MVPA during work hours and non-work hours [80].

Research studies presented in Table 2 [2, 4, 44] used self-report measures to measure physical activity in nurses. These studies conclude that nurses are not meeting the physical activity recommendations of equal or greater than 30 minutes of moderate and vigorous physical activity a week. The ActiGraph GT3X is seen as a criterion measure of physical activity as it measures physical activity in different intensities within the set epoch length [74, 75]. For example, time spent in light intensity physical activity (LPA), moderate intensity physical activity (MPA), and vigorous intensity physical activity (VPA) intensity [73, 76]. In addition, the ActiGraph GT3X as a measure of sedentary time and physical activity levels is a criterion measure to reduce bias.

However, it is important to note that adherence to physical activity recommendations based on accelerometer measured physical activity is significantly lower than self-reported physical activity [74]. A research study investigating the effects of measurement method on relationships with risk biomarkers using both objective (accelerometer) and subjective (IPAQ) methods concluded that the agreement between the accelerometer derived and IPAQ reported measures of PA and SB were poor [75]. The mean IPAQ reported sitting time was significantly lower than the accelerometer derived SB ($p < 0.0001$) [75]. Also, the IPAQ reported estimates of MVPA were 2.6 fold higher compared to the accelerometer derived MVPA ($p < 0.0001$) [75]. Results from this study suggests that using IPAQ to estimate PA and SB as opposed to using accelerometer may result in failure to detect real relations with metabolic and vascular disease risk factors [75].

8.1 SUMMARY

In summary, the studies presented in this paper show that a large proportion of nursing population is at an increased risk of NCDs. Similarly, research studies on nurses' physical activity status show that a vast majority of the nurses do not meet the public health physical activity recommendations of ≥ 150 minutes of MVPA per week. Findings from a study investigating the association between self-rated health, psychological conditions, lifestyle factors and health resources among hospital nurses in Lithuania reported that only 36% nurses perceived their health to be 'good' or 'very good' [83]. Therefore, suggesting poor health quality among these nurses.

Nurses' profession requires them to work shifts as they have to render continuous services 24 hours a day. Shift work is associated with reduced opportunities to engage in physical activities and participation in sports due to lack of time and fatigue. Fatigue and lack of time are common major barriers that have been reported by nurses for being physically inactive. Furthermore, nurses working night shift are more likely to be overweight and obese than nurse's working day shift. Additionally, the risk of developing metabolic syndrome is strongly associated with night shift work in nurses. The prospective cohort nurses' health study reported that extended period of rotating night shift work is associated with a modestly increased risk of Type 2 diabetes in women [46]. The increased risk of metabolic syndrome among the nursing population could result in ill-health. It widely documented that ill-health in the workplace is associated with absenteeism and poor work performance [22-24, 84], which consequently results in decreased productivity and loss in profits [25, 85]. The need to embark on the process of implementing health and wellness centres in hospitals has been recommended by South African researchers after the alarming results on nurses and HCWs poor health status [7-9].

A formative assessment, which is also known as the needs assessment is the first step in planning a WHPP [27]. Additionally, a formative assessment is conducted with the intent to improve feasibility, effectiveness and likelihood of sustainability of the WHPP [27]. Furthermore, a formative assessment does not only assist identify various challenges that could hinder the success and sustainability of the intervention, but also engages leadership and employee support and assistance in developing an intervention plan that is both theoretically and practically grounded [27].

9.1 AIM OF THE MINI-DISSERTATION

The overall aim of this *mini-dissertation* was to examine the nurse's lifestyle behaviours, health status and physical activity levels. This formative research will provide a basis on which to develop a worksite health promotion intervention in South African health care workers. Therefore, the aims of this mini-dissertation will be addressed in two separate studies with the following objectives:

Study 1: A qualitative descriptive study

- i). To explore the nurses' health priorities, current lifestyle behaviours and barriers to living a healthy lifestyle.

Study 2: A quantitative pilot study

- i) To compare physical activity and sedentary behaviour in day and night shift nurses.
- ii) To compare self-reported clinical measures and health status between day and night shift nurses.

To the best of our knowledge, this is one of the first descriptive and qualitative research studies on nurses' lifestyle behaviours, health priorities and barriers to living a healthy lifestyle conducted in South Africa.

Table 1: Selected summary of publications: The prevalence of risk factors and NCD in nurses and HCWs

Study title	Aim	Study design	Study components	NCDs risk factors	NCDs	Determinants of NCDs	References
The Association Between Shift Work and Unhealthy Weight: A Cross-Sectional Analysis From the Nurses and Midwives' e-Cohort Study .	To examine the association between shift work and unhealthy weight among nurses and midwives.	Cross-sectional study	N= 2494 nurses from Australia, New Zealand and United Kingdom. Diet quality measured by ARFS Physical activity assessed by IPAQ. Smoking assessed. Alcohol consumption assessed	31.8% nurses overweight. 26.9% nurses obese. 12.3% smokers 9.4% Low physical activity.	-----	-----	Zhao I, 2011 [44].
Nurses' self-care behaviours related to weight and stress.	To examined registered nurses' dietary and exercise practices, weight status, stress levels, and preferred preventive health strategies	Cross-sectional design	N=183 nurses from a community based urban teaching hospital. Anonymous online survey on weight and height, diet patterns, level of physical activities,	N= 47 nurses overweight. N= 53 nurses obese. N= 14 smokers. N=73 nurses<100 min/wk of PA	-----	-----	Eun-Shim Nahm, 2012 [4]
Lifestyle behaviours and weight among	To describe the weight, weight-	Intervention study	N= 194 nurses from six hospitals central Massachusetts	37.2% overweight	13.6% hypertensive		Zapka JM, 2009 [3]

hospital-based nurses.	related perceptions and lifestyle behaviour profile of hospital-based nurses		Anthropometric measurements and self-administered surveys.	28.2% obese 5.9% smokers	21.5% high cholesterol.		
Health behaviours and attitudes towards being role models	To investigate health behaviours in pre-registered nurses, examine nurses' attitudes towards the role of the nurse in promoting health a	-----	540 pre-registered nurses self-reported on measures of physical activity, smoking, alcohol, diet and attitudes towards being a role model.	46.9% nurses did not meet 30min of pa/wk. 22.4% reported eating foods high in fat. 16.8% nurses smoked. 24% nurses were overweight or obese	-----	-----	Blake H, 2013 [2]
Obesity and health problems among South African healthcare workers: do healthcare workers take care of	To determine the prevalence of obesity & obesity health related problems among HCW and to	Quantitative, cross-sectional study	Tertiary hospital in Pretoria, South Africa N= 200 Black HCW (100 medical staff & 100 non-medical staff) Self-reported disease profile.	73.5% HCW overweight	Hypertension: n= 38; (medical=20; non-medical=18) Diabetes: n=21;	-----	Skaal L, 2011[7]

themselves?.	compare these parameters between medical and nonmedical staff.				(Medical= 12; non-medical=9) Heart diseases: n=5; (medical=3; non-medical=2)		
Overweight and obesity in nurses, advanced practice nurses and nurse educators.	To quantify the incidence of overweight & obesity in nurses and associated health risks.	Descriptive study.	760 nurses from 6 states. Self-administered survey.	30% overweight. 18.7% obese. 5.2% morbidly obese.	-----	Comfortable and not interested in weight reduction. Lack the discipline to change diet/exercise habits	Miller SK, 2008[86]

Table 2: Selected summary of publications: Level of physical activity and sedentary behaviour in workers.

Aim of study	Participants	Self-report measure	Objective Measure	Cut points	Valid wear days and time acceptable	Main findings	Reference
To examined the validity of a new interviewer-administered questionnaire measure of workplace sitting time and breaks in sitting time using accelerometer-derived sedentary time and breaks per sedentary hour as the relevant criterion measures.	N=121 Age= 18 and 65 years	-International Physical Activity Questionnaire (IPAQ)	Accelerometer	SB: <100 Counts per minute Matthews	4 days; working hours	Average levels of sitting and sedentary time were (6.82 h/day). Self-reported sitting time was 0.45 hours/day. There were positive correlations between self-reported workplace sitting and accelerometer-derived workplace sedentary time in the total group.	Clark BK, 2011 [72]
To determine a number of moderate and vigorous physical activity at work in comparison to weekly	N= 48 hospital patient care workers	Survey	-----	SB: 0-100 counts per minute	7 consecutive days (work and non-working hours)	48 patient care workers averaged 165 minutes of moderate-intensity PA at work. The health care workers	Umuroko PE, 2013 [33]

total minutes						<p>reported an average of 206 minutes of moderate-intensity physical activity at work.</p> <p>82% of moderate and 97% of vigorous PA were obtained during non-working ours.</p> <p>27 patient care workers achieved the weekly amount recommended by guidelines during both working and non-working hours.</p> <p>6 patient care workers achieved the weekly MVPA of 150 and 75 minutes (≥ 10min bouts).</p>	
To examine sedentary time, prolonged sedentary bouts and physical activity in Australian employees	N= 193 employees n=131; working in offices n=36; call centres n=26 ; customer	-----	ActiGraph GT1M	SB<100 counts per minute Freedson cutpont	≥ 10 hours	Working hours were mostly spent sedentary (77.0%, 95%CI: 76.3, 77.6) “Work” was more	Thorp AA, 2012 [58]

From different workplace settings, within work and non-work contexts.	service					sedentary and had less light-intensity activity, than “non-work”. The proportion of working time spent sedentary, in prolonged sedentary bouts, light-intensity activity and MVPA differed significantly across the three workplace settings (all p<0.001)	
To examine associations between objectively measured physical activity, sedentary behaviour, and presenteeism.	N= 108 office employees Women = 70% Mean age 40.7 ±11.2 years	-----	ActiGraph GT3X+	SB: ≤150 counts per minute Kozey-Keadle S,	7 Days of wear. 10 hours a day	57% time was spent in sedentary behaviour and 38% in light activity. Employees who spent more time sedentary and less time in light-intensity activity were also more likely to report higher levels of Presenteeism.	Brown HE, 2013 [80]
To objectively measure PA patterns	N = 23 male truck drivers		ActiGraph GT3x	SB: < 150 counts per	3 working days. 10 hours day	The drivers spent a significantly higher	Wong JYL, 2014

and sedentary time, and explore perceptions of workplace PA opportunities in regional male transport workers.	Age:52.4±9.69years			minute. Kozey-Keadle S,		proportion of time in sedentary activities on their off-workdays than on workdays (52.4%; 7.8±1.54 hours/day; $t(15)=-3.692$, $p<0.05$). The drivers spent significantly higher proportion of time in light intensity activities on workdays (43.9%; 6.6±1.30 hours/day) than off-workdays (32.9%; 4.6±1.60 hours/day). Time spent in moderate+ intensity activities was similar on workdays (3.7%; 0.6±0.38 hours/day) and off-workdays (3.6%; 0.5±0.46 hours/day).	[60]
To examine	N= 170 employees	-----	ActiGraph	SB: <100 counts	7 consecutive	Employees accumulated	Clemes

objectively determined sedentary behaviour and PA during and outside working hours in full-time office workers.	(30% male) Age: 18 and 65 years		GT1M	per minute Atkin	working days. > 10 hours/day	significantly higher levels of sedentary behaviour (68% vs 60%) and lower levels of light-intensity activity (28% vs 36%) on workdays in comparison with non-workdays. 71% of working hours were spent sedentary.	SA, 2014 [81]
To determine time spent on the working day in sleep, work, sedentary behaviour, and light-, moderate-, and vigorous-intensity behaviour by occupation intensity.	N= 30,758 Employees.	American Time Use Survey	-----	Sedentary (1.0 to 1.5 METs), -Light (1.6 to 2.9 METs), moderate (3.0 to <6.0 METs), Vigorous intensities (≥ 6.0 METs).	-----	Time spent in sedentary behaviors outside of work were higher, and light-intensity time was lower, with higher levels of intensity-defined occupation. Those employed in sedentary occupations were sedentary for approximately 11 hours per day.	Tudor-Locke C, 2011[87]
To determine the	N=110 nurses	-----	Submaximal	-----	-----	Aerobic capacity of most	Naidoo R,

health and fitness profiles of nurses working in a public hospital.	≥22 years		Aerobic Cycle Test			of the nurses was below average or poor. The mean predicted maximal oxygen consumption (VO ₂ max) of the sample was 33ml/kg/min.	2007 [9]
To determine the level of physical activity of healthcare workers	N= 200 hospital staff workers (N=100 medical staff, N= 100 non-medical staff) 18 to 63 years,		6-minute step test	Low fitness level = could not finish the test. Moderate fitness level = those who finished the test, but whose V02max was less than the average value based on gender and age. -High fitness level = those who		Majority of the staff, 81.5% (n=200), fell into the low fitness category. 15.5% demonstrated a moderate level of fitness. 3% met the criteria for a high level of fitness.	Skaal L, 2011 [8]

				finished the test and whose V02max was higher than the average value based on gender and age.			
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CHAPTER 2:

NURSES' LIFESTYLE BEHAVIOURS, HEALTH PRIORITIES AND BARRIERS TO LIVING A HEALTHY LIFESTYLE: A QUALITATIVE DESCRIPTIVE STUDY

This chapter has been accepted for publication by the BMC Nursing Journal.

2.1 INTRODUCTION

The workplace is defined as an environment in which workers and managers collaborate to promote the health and wellbeing of all workers [20]. Also, the worksite is internationally recognized as an appropriate setting for health promotion and disease prevention [88] as this is where working individuals could spend up to 60% of their waking hours [89]. Employees including nurses are at increased risk of non-communicable diseases (NCDs) like diabetes, hypertension and coronary heart diseases (CHD) [7]. The main risks of NCDs are physical inactivity, unhealthy eating, smoking and alcohol abuse [11].

NCD risk factors such as physical inactivity and comorbidities like obesity have been widely reported among nurses in countries like Australia, United Kingdom, New Zealand and South Africa [2, 6, 7, 13, 86]. Similarly, nearly one-fifth of the South African healthcare workers, including doctors, dentists, nurses, radiographers, physiotherapists and occupational therapists, reported having NCDs such as hypertension and diabetes [7]. In addition, more than 70%, are overweight or obese [7]. Also, overweight participants experienced a higher prevalence of diseases and health problems than those with a normal body mass index (BMI) [7].

Additionally, Naidoo et al, reported poor physical activity levels among nurses in KwaZulu-Natal, South Africa [9]. These findings are supported by other studies [2, 13] which found that nurses do not meet the recommended levels of physical activity required for the benefit of health (30 minutes, 5 days a week). Other behavioural risk factors that have been identified among nurses include smoking and alcohol abuse [47, 90-92].

In response to these problems, several research findings have emphasized the need for worksite wellness programmes to improve nurses' health and lifestyle behaviours, including physical activity [31, 32]. A three-month physical activity intervention in nurses showed significant differences in Body Mass Index (BMI) from pre to post intervention [31]. Similarly, a 10 weeks physical activity intervention study in hospital-based registered nurses showed significant effects on fat mass, fat index and fat percentage ($p < 0.03$) [32]. The intervention participants' fat mass decreased from 28.4 to 27.8 and the fat mass percentage decreased from 39.1% to 38.4% [32]. These findings are supported by a workplace physical activity interventions meta-analysis by Conn et al [26] who concludes that some workplace physical activity interventions can improve health and important worksite outcomes.

Because patient care cannot be confined to usual working hours (09h00 – 17h00), approximately a quarter of all nurses work non-traditional hours or shifts [42, 93]. Shift work can have a negative impact on the employee and could lead to increased drug use, job-related stress, poor job performance, insomnia, and disrupted social and family life [37-40, 42]. The high prevalence of health-related conditions and risk factors such as obesity, overweight, physical inactivity, and poor eating habits has been reported amongst shift and rotational night shift workers [43, 44, 94-96].

Therefore, the main aim of this research study was to explore the health priorities, current lifestyle behaviours and barriers to living a healthy lifestyle among nurses working in public hospitals in the Western Cape Metropole, South Africa. These findings will then be used to provide recommendations for a worksite wellness intervention programme for nurses aimed at reducing NCDs risk factors such as obesity, physical inactivity and poor eating habits.

2.2 METHODS

2.2.1 Design

This study used qualitative research methods [97] for data collection which included focus group discussions (FGDs) and key informant interviews (KIIs). The aim of the focus groups was to explore and obtain in-depth information about the nurses' lifestyle behaviours, health concerns and priorities and barriers to living a healthy lifestyle. These included lifestyle behaviours such as habitual levels of physical activity, smoking and dietary habits. In addition, the preferred types of WHPPs and factors that might influence their participation in the WHPPs were also investigated. Seven key informant interviews were conducted with management personnel in order to gain their perspective on health promotion in the worksite.

2.2.2 Setting

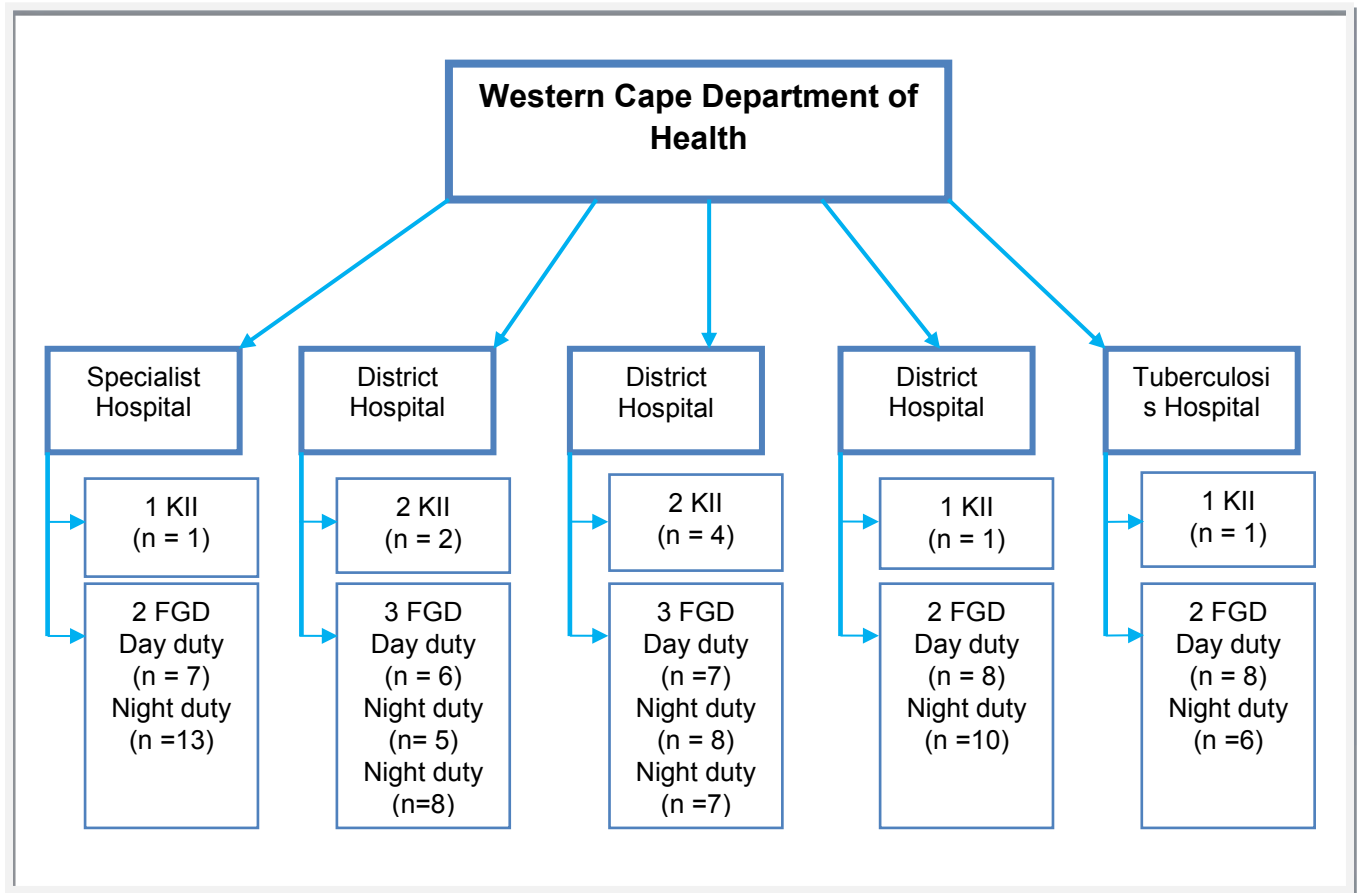
As shown in Figure 1, all hospitals in the Western Cape Metropole were eligible to participate in the study. There are a total of 22 public hospitals in this region, including three tertiary hospitals, two specialist hospitals, nine district hospitals, four psychiatric hospitals, one regional hospital and one tuberculosis hospital. Half of the hospitals were purposively sampled to participate in the research study. Of the eleven hospitals invited to participate in the research study, five agreed, and these included three district hospitals, one specialist hospital, and one tuberculosis hospital.

2.2.3 Participants

The Human Resources Manager and/or Nursing Manager at each hospital was invited and informed of the study via an e-mail, followed by a telephone call. This was followed by a meeting between the nursing manager and the researchers to make arrangements for the focus groups and interviews. Purposive sampling was used to select the nurses for the focus groups, which included nurses from various occupational ranks (professional nurse, staff nurse and nurse management) and hospital wards. According to the South African Nursing Council [1], a professional nurse needs to hold a University degree whereas a staff nurse holds a National Diploma in nursing. A professional nurse is competent to practice comprehensive nursing, assumes responsibility and accountability for independent decision making [1]. On the other hand a staff nurses is a generalist nurse who's practice is focused on quality service delivery within a broad spectrum of health services and in a variety of settings [1].

A total of ninety-three (n = 93) nurses, representing both night shift (n = 57) and day shift (n = 36), participated in the study. Five focus groups were conducted with the day staff, while seven focus groups were conducted with the night staff from the five participating hospitals. The group discussions comprised of a minimum of five nurses and a maximum of thirteen nurses per group. None of the hospital managers were invited to attend any of the focus group discussions in order to ensure that the nurses were free to express their opinions. This was to try to eliminate the potential negative impact of any power dynamics between the nurses and management, which could occur due to the hierarchical structures in the South African health care setting [98]. A poor interpersonal relationship between supervisors/management and nurses has been reported in a South African setting [98].

Figure 1: Facility category classification by the Western Cape Province Department of Health (KIIs and FGDs).



The key informant interviewees were also purposively selected, and included individuals working in a managerial role. Key informants are defined as those individuals who are knowledgeable in a specific field and/or hold special skills [99, 100]. These types of informants voluntarily share their knowledge and skills, observations and insights to which the researcher would otherwise not have access [99, 100]. Interviews were conducted on a one-on-one basis with seven hospital managers and the seventh key informant interview was conducted with three managers. This was due to time constraints reported by these managers. The researchers acknowledge that there might be some disadvantages in having more than one manager present at the last interview, like managers not feeling free to voice their opinions.

2.2.4 Data collection

The focus groups and interviews were conducted by a trained facilitator using guided questions. These included questions such as: ‘What are your main personal health concerns?’, ‘What are the main health concerns in your workplace?’ and ‘How does your work affect your lifestyle behaviours and health?’ (Table 3). All the FGDs and KIIs were conducted within the health facility during working hours and were audio recorded with the participants’ consent. They were approximately 60 minutes in duration.

Table 3: Focus Groups Discussion and key informant interviews guide questions.

Number	Question
1	What are your main health concerns?
2	How does your work affect your lifestyle behaviours and health?
3	What do you think the main health concerns are in your workplace?
4	How do you think your health could affect work performance?
5	Has your workplace ever implemented a wellness or worksite health promotion programme?
6	What type of programme was delivered?
7	Which factors would influence your participation in a worksite health promotion programme?
8	Which types of programmes would you like to have implemented at your workplace?
9	What is the ‘health’ and lifestyle behaviour culture among employees?
10	Which factors influence your health behaviour both at work and away from work?

2.2.5 Qualitative data analyses

All focus groups and interviews were transcribed by an independent transcriber. Transcripts were analysed using thematic analysis [97], with the assistance of Atlas.ti Qualitative Data Analysis Software (Scientific Software Development GmbH, Berlin, Germany). The researcher conducting the analyses (LP) familiarised herself with the transcribed data by reading through the transcripts numerous times with the aim of identifying main themes and sub-themes, which are based on meaningful categories of data and “repeated patterns of meaning” [97].

The guide questions also informed the identification of themes in the analysis process, as these questions referred to the main issues that needed to be covered in the focus groups and interviews. Other authors (CED and TKA) were involved in the development of the guide questions. The themes and sub-themes then formed the basis of the coding framework, which was refined through consultation with the other authors (CED and TKA). This coding framework

was then systematically applied to the transcripts, and portions of the text were assigned to various sub-themes. Quotes for each sub-theme were then collated and summarised, and pertinent quotes have been included in this manuscript in order to best illustrate these sub-themes. The sub-themes and themes were used to develop a conceptual framework, which also aims to summarise the data.

2.2.6 Ethical consideration

The University of Cape Town Research Ethics Committee of the Faculty of Health Science (REC REF: 212/2012) approved this study. In addition, the Western Cape Department of Health provided approval for the research study to be conducted in their hospitals (Ref No: 2012; RP121). All participants gave written consent prior to participating in the focus groups and interviews.

2.3 RESULTS

We have prepared a conceptual model based on the results of this study (Figure 2). The model represents a summary of the themes and sub-themes from both the focus group discussions and key informant interviews. Furthermore, this model illustrates the relationship between the various main themes and sub-themes and how these themes influence the nurses' lifestyle behaviours and health priorities.

2.3.1 Perceptions of health

Most of the management personnel (n =6) perceived a healthy lifestyle as a good state of health. A good state of health was described as the absence of disease, being physically, spiritually and emotionally fit to cope with the challenges of the daily life. Night shift nurses reported that being healthy included eating a balanced diet, such as eating breakfast in the morning.

“Proper meals with the right nutrition’s like you start with your breakfast which is an important meal of the day”. (FGD) (Eerste Rivier Hospital; Night shift)

2.3.2 Personal health concerns

Weight gain and living with NCDs such as hypertension and diabetes were frequently reported by night shift nurses as their main personal health concerns. Nurses from both day and night shifts also acknowledged that overweight and obesity were a common health threat. Furthermore, being overweight was perceived to have a negative impact on work performance. Nurses

mentioned that some of their overweight colleagues found it difficult to cope with their job demands.

“Many of the nurses are overweight, too slow in the wards because they are carrying that weight ‘..’. I was looking at some of us and thought oh my, if there’s going to be an emergency will you be able to run”. (KII). (Victoria Hospital)

“Well, if they have to pick up patients and they can hardly move themselves around ‘...’, it’s not that easy. So people who are overweight, I think, cannot do physical work like leaner people”. (KII) (Victoria Hospital)

2.3.3 Occupational environments’ influence on health challenges

Being exposed to tuberculosis (TB), including multi-drug resistance TB (MDR-TB) and extensively drug-resistant TB (XDR-TB) and the fear of contracting this infectious disease emerged as the main occupational health-related challenges for both day and night shift nurses. However, this was a greater concern for night shift nurses compared to day shift nurses.

“When they come in casualty (accident and emergency unit) you don’t know, and you treat the patient and they are coughing and everything, but now if they come from the clinic and there is a slight hint, we give them a mask. Otherwise you don’t know what it could be and next thing you hear, oh!, someone has got TB and you like you very exposed to that”. (FGD) (Victoria Hospital; Day shift).

Musculoskeletal pain such as backache was identified as another occupational health concern by both day and night duty nurses. Lifting heavy patients and standing for long hours were reported as the main cause of backache among nurses.

“In ICU ‘...’, backaches because we lift a lot of heavy patients and most of our patients are sometimes unconscious or they are heavy sedated. The physio comes she asks if we can help to lift the patient ‘...’, the x-ray lady also comes and asks if we can help lift the patient. The doctor comes and wants to listen to the chest, and also ask if you can help to lift the patient. We do pressure care like four hourly or six hourly, we need to lift the patient and turn the patient and then we need to turn the patient to the other side twice”. (FGD) (Victoria Hospital, Day shift)

2.3.4 Influence of occupational environment on health and non-health lifestyle behaviours

Nurses frequently mentioned lack of time to prepare healthy meals due to long working hours and being overtired from work as major challenges to leading a healthy lifestyle. Buying fast foods was regarded as the most convenient option, and in most cases fast foods were unhealthy. Some of the day and night shift nurses reported that occupational stress was one of the reasons they ate throughout the day. Interestingly, the fear of contracting TB was another reason mentioned for eating throughout the day as the nurses believed that it is easier to contract the TB on an empty stomach as your immune system is not strong enough to handle the infections.

“Eating all the time, I especially eat when I’m stressed, I eat when I’m happy then ‘...’, like I’m working in C ward, especially during the day then you don’t even have time to have, for tea, or lunch time, then you just grab anything you know. Eating in a rush, that stresses me”. (FGD) (Mowbray Hospital, Night shift)

Both management and day shift nurses agreed that the hospital cafeterias sold predominantly unhealthy foods such as deep-fried chicken, hot chips (french fries) and pies (pastries). Some of the reasons for choosing less healthy foods were related to cost, as healthier foods like fruits and salads were more expensive in the cafeteria. A small number of the management and day and night shift nurses were of the opinion that the lifestyle culture in the worksite was neither healthy nor unhealthy. This is because some nurses preferred eating fruits, while others preferred eating deep-fried hot chips (french fries). There was little input about the cafeteria services from the night shift nurses as it was reported that the cafeteria was closed at night.

“You know there is not one healthy thing at that tuck shop other than the little bowl of fruit, and that is why the girls will buy the chips and the coke and whatever. That tuck shop should be scrapped or healthy”. (FGD) (Victoria Hospital; Day shift).

Some of these nurses felt that their colleagues negatively influenced their health behaviours by making them feel guilty for choosing not to eat cake on certain days. Others felt that their colleagues were a good influence as they encouraged them to have a healthy diet and also gave advice on the healthy food choices.

Around our department there is always cake and stuff like that and if you say no, they say what is wrong with you, so you just like obliged to say okay I will also

have another piece, so they are encouraging me not to be healthy”. (FGD)
(Victoria Hospital; Day shift).

Perceived lack of support from the Department of Health (government), burnout, needle stick injuries and insufficient and poor quality resources such as aprons and gloves, were identified as occupational environmental safety challenges by day and night shift nurses. Torn gloves can expose nurses to diseases that can be contracted through bodily fluids, like Hepatitis B. It was also reported that needle stick injuries were more prevalent among night shift nurses and often occurred in the early hours of the morning when the nurses were exhausted. In contrast, burnout was frequently reported by the day shift nurses and not night shift nurses.

“And funny enough my observation has been that most of the needle injuries that have been in theatre are when people are exhausted at that time of the morning, two, three am”. (FGD) (Mowbray; Day shift)

Besides personal and occupation-related health and safety challenges, there was an emergence of other non-health occupational related challenges experienced by the nurses. These included lack of recognition for hard work from management which was frequently reported by night shift nurses. Another non-health occupational related challenge frequently reported by the day shift nurses and management was the hiring of agency nurses. Agency nurses were described as nurses that are temporarily hired by the Department of Health to assist with the shortage of nurses. However, this temporary solution appears to add to the nurses’ occupational-related stress, as they reported that they had limited time to educate the agency nurses about the patients’ required treatment and hospital procedures.

“I’m not unhappy, but I can tell you if I’ve got eight patients to look after and there is an agency nurse that knows nothing. She knows her observations but she doesn’t know anything and I have to see to that also, at the end of the day you are not feeling happy about it”. (FGD) (Victoria Hospital, Day shift).

Budget constraints within the public health system reported by nursing managers and nurses seemed to be the major contributing factor to the increased shortages of nurses. This led to increased workloads due to inadequate patient to nurse ratios. The shortage of nursing staff frequently reported by day shift nurses was perceived to be associated with the stressful working environment.

“Because of money, they don’t have enough money to hire people, but they have money to give to agencies that’s a problem, or maybe if you are permanent you must have benefits, hence you use extra money. But, there are vacant posts”.

(FGD) (Brooklyn Chest Hospital, Night shift)

Two of the seven management personnel interviewed shared their concerns relating to alcohol abuse by nurses. Factors contributing to this abuse included financial stress and the “slow vehicle of the state”, which referred to slow government systems that hinder the filling of the vacant nursing posts, hence perpetuating the shortage of nurses.

“They said, this is the ratio that is being used in South Africa as a developing country and we need to function like that ‘...’, and you know that I came in to work in somebody’s place, so what has been set up here over the last 4 years, I have to continue until the new hospital. They are now planning for something better, but the vehicles of the state are very slow, you know the machinery is very, very slow and so, with work load and not enough staff you will find, personal problems of staff like alcoholism”. (KII) (Mitchels Plain Hospital)

Lastly, nurses reported that their work demands negatively affected their family responsibilities. This was more frequently reported by night shift nurses who mentioned that they had limited time to spend with their families due to their long working hours (12 hours) and high work demands. In addition, night shift nurses also reported feeling moody and irritable most of the time, and this sometimes created family conflict.

“When you get home you are frustrated because you feel sick and now you must go back to that place tonight, so you take it out on the kids, the husband and everybody else”. (FGD) (Victoria Hospital, Night shift)

2.3.5 Coping strategies

Another concern raised by the day shift nurses was absenteeism in the workplace, which resulted in having insufficient nurses on duty. The nurses and management identified absenteeism as a coping strategy, because the nurses felt that being absent from work gave them an opportunity to rest. A stressful working environment and being unhappy at work were reasons mentioned by nurses for staying away from work. Although the nurses are allocated days off to rest, they

reported that sometimes they had to work overtime to earn an extra income. The nurses regarded their salaries to be inadequate for their daily living needs and necessities.

“Because they are working so much overtime they become tired. They are working overtime to compensate for whatever is missing from their salaries, as a result they are over tired and they stay away from work, those kinds of things. So it’s a whole lot of things”. (KII) (Victoria Hospital)

Absenteeism was the most commonly identified coping strategy reported by both the nurses and management. Other coping strategies identified by the nurses included eating unhealthy foods and drinking high calorie beverages. The nurses believed that these beverages helped to reduce fatigue and enabled them to cope with their work demands. Also, a few management personnel mentioned alcohol abuse and smoking as possible coping strategies. Another coping strategy mentioned by the nurses was unnecessary shopping. A consequence of purchasing unnecessary goods was having to work overtime, as they needed to earn extra money to clear debt.

“I only drink coffee or coke at night. I will eat like you say one meal and then you don’t eat for the rest of the night and then maybe and you drink coke, and then 5 o’clock the morning you like at that point in the morning you feel like aah ‘...’, I can drink coffee now and you have that cup of coffee at five because that is the time you feel like a zombie, especially if you are working in theatre“. (FGD) (Mowbray Hospital; Day shift)

2.3.6 Existing worksite health promotion programmes

An online employee wellness programme (EWP) offered by the Department of Health was the most commonly identified existing worksite health promotion programme by the nurses. This is a programme designed to assist nurses experiencing personal and work-related stress as well as financial challenges.

Wellness days were the most frequently delivered worksite health promotion programmes in the worksite. The wellness days were offered by the Government Employee Medical Scheme (GEMS), a medical insurance provided by the South African government for public servants. These were delivered once or twice a year and programmes offered during these days included voluntary counselling and testing (VCT) for human immune deficiency virus (HIV), and cholesterol, blood pressure and blood glucose tested/measured. Day shift nurses and management

commented on the wellness days more often as these events usually took place during the day and were rarely offered at night.

“And even early in the year, so twice a year we try and have wellness days with staff and then we look at blood glucose, we look at high blood pressure, we also have voluntary HIV testing ‘...’, just general and we will get a dietician to come in and speak about a healthy lifestyle, eating and things like that”. (KII) (Mowbray Hospital).

Furthermore, day shift nurses felt that the current health and wellness programmes focused mainly on the identification of health risk factors such as obesity. The nurses reported that the wellness clinical measures did not positively impact their lives because there was a lack of programmes implementation to address the poor health behaviours. The nurses believed that a worksite health promotion programme should include individualized feedback in order to achieve long term positive impact on the individual’s health risk behaviours or /conditions. Both day shift nurses and nursing management perceived the delivered worksite health promotion programmes as being worthwhile.

“Yes, there is something like that, but I mean that is only once off and most of the staff just go for the freebies like .But, once those people are gone, then it’s back to square one as there is not continuity with it”. (FGD) (Mitchel Plain Hospital; Day shift)

Negative factors which could influence the participation in the desired worksite health promotion programmes were identified. These included lack of facilities such as showers, especially after participating in physical activities, lack of interest by the nurses, staff shortages and fatigue. Limited time was frequently reported as the main reason for not participating in the existing worksite health promotion programmes. Furthermore, due to the need to have sufficient nurses in the wards to care for the patients at all times, it would be impossible for all nurses to participate in the worksite programmes simultaneously. The nurses felt that the shortage of nurses in the wards poses a risk of subsequent legal action if something were to go wrong with a patient while they were absent from the ward.

“You can’t just take your nurses out of the work place. Your operational requirements would require that within the wards, so to take them out of their

wards during working hours is usually not a good idea because some people we have a few nurses as it is. So it would be difficult to implement that, it would have to be done in their time". (KII) (Brooklyn Chest Hospital)

2.3.7 Desired worksite health promotion programmes

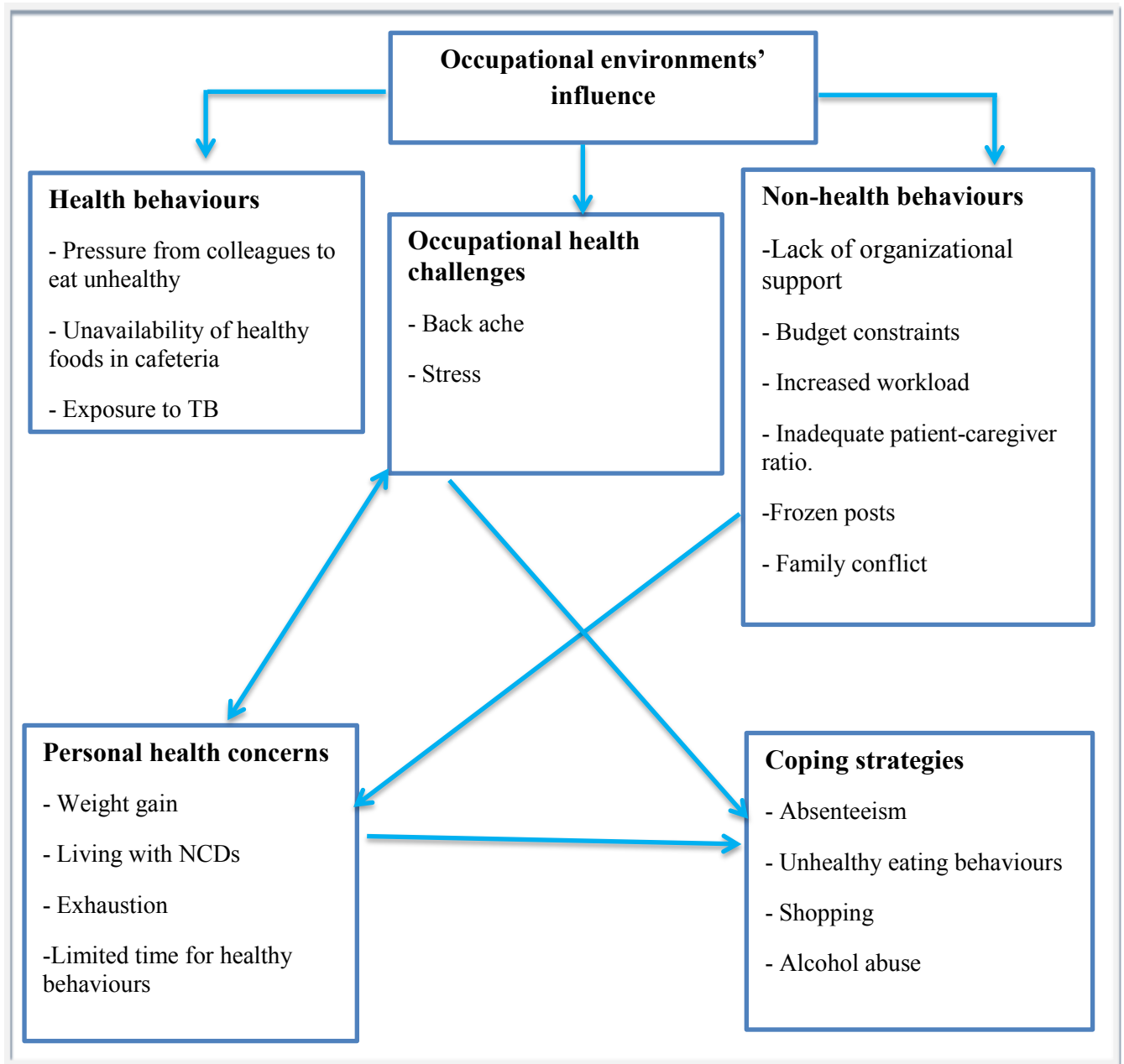
Day shift nurses suggested support groups where they could discuss their occupational and personal challenges. These nurses also suggested physical activities such as aerobic classes and a gym in the health care facility. The gym to which they have access at an affordable price is difficult to access due to transport challenges as it is situated at the head office in the central business district (CDB).

"It will be very nice if they could organise maybe like a small gym, where you can walk in the hospital for free". (KII) (Eerste Rivier Hospital).

There was shared interest between the day and night duty shift for self-care activities, including massage sessions. Nursing management requested other worksite health promotion programmes such as team building, information about healthy meals and addressing cultural diversity.

"But, even if it is like a little sports room and you have five little chairs with five little those foot spa's where everyone can just go sit there and put their feet in the spa". (FGD) (Victoria Hospital; Day shift).

Figure 2: Conceptual model summary of the results and how the different factors influence the nurses' lifestyle behaviours



3.1 DISCUSSION

A common and important theme arising from all the nurses' focus group discussions was concerns about being overweight and living with NCDs such as hypertension and Type 2 diabetes. Another common and important theme arising from all the nurses' focus group discussions was musculoskeletal injuries such as backache and exposure to tuberculosis (TB), these were their main occupational health-related concerns. Both management personnel and nurses frequently reported experiencing a stressful working environment. The lack of institutional support was one of the key themes that emerged and was identified by the nurses in this study as a major barrier on their ability to prioritize their health and make healthy choices. This lack of institutional support impacted on the nurses' ability to cope with the stresses of their occupation and resorting to coping mechanisms such as absenteeism.

The fact that the nurses were most concerned with the problems of overweight, obesity and living with NCDs such as diabetes and hypertension indicate the enormous challenges faced by this vulnerable population. These findings are supported by a study in South African HCWs which reported that one out of three HCWs were diagnosed with NCDs such as hypertension and diabetes [7]. Nurses are expected to be role models to their patients and in their communities and to lead by example [3, 7, 13]. However, they are challenged in this role due to poor personal health and associated risk factors, for example, being overweight [2, 3, 6, 7, 13, 86] and not meeting public health physical activity recommendations[2, 13].

The unavailability of healthy foods and high cost of healthy foods in the hospitals' cafeterias were associated with unhealthy eating habits by the nurses in this study and may be a possible factor contributing to the problem of overweight and obesity. It can be argued that modifying external factors such as increasing the availability and lowering the cost of healthy foods in the cafeteria might promote the consumption of fruits and vegetables among the nurses [101]. This has been shown to be effective in a military setting [102]. [The nurses in this study also reported the consumption of high calorie beverages for energy purposes. Therefore, future interventions should include strategies aimed at reducing the consumption of high calorie beverages.](#)

The fear of being infected with TB was the key occupational health-related issue affecting nurses in this study. This was not surprising considering, the high prevalence of TB infection amongst HCWs in the Eastern and Western Cape provinces of South Africa [103]. Fear of being exposed to and contracting TB, MDR-TB, and XDR-TB are amongst the most commonly reported

occupational stressors and health concerns by nurses in South Africa [104, 105]. Furthermore, South African HCWs are reported to have five to six fold increased rate of hospital admission with MDR-TB admission when compared to non-medical staff [106]. The vulnerability to TB exposure by HCWs has been found in a number of other studies [103, 106, 107].

Other occupational-related concerns raised by the nurses in this study including musculoskeletal pain backache, budget constraints, burnout and increased work load due to staff shortages has been reported in other research studies [42, 104, 108-111]. A study investigating the association between nurses' occupational-related injuries and illnesses long work hours among nurses in the Philippines reported that over 78 percent of the nurse's experienced back pain [112].

Increased workloads reported by the day shift nurses in this study have also been reported by nurses in other research studies [110, 113]. Working day shift was reported to be more physically demanding by female nurses in Australia as it entailed bathing and lifting of patients [113]. These nurses also reported that there was more administration work during the day shift in comparison to night shift [113].

As our research study has shown, nurses working night shift found their shift had negative influence on some aspects of their lives such as limited family time and the ability to resolve family conflicts. Nurses in this study reported having insufficient time to manage their personal and home responsibilities. Some nurses mentioned that their spouses disliked their occupation based on their opinion that the nurses brought work stress and frustrations back home. Similar findings were reported by night shift workers in Iran [114].

Shortages in nursing staff, unreliable and lack of equipment and also inadequate remuneration were some of the occupational-related challenges mentioned by the nurses in this study. These challenges are echoed by other South African nurses in the Limpopo [98] and KwaZulu-Natal provinces [104]. Furthermore, George et al [115] also reported that low salaries and human resource shortages are some of the factors leading to the immigration of nurses from sub Saharan-Africa, thus adding to the existing shortage of nurses.

Nurses in this study perceived their salaries to be inadequate, thus often worked overtime on their days off so as to add to their existing salary. Previous research has reported that nurses' working overtime is a trend that is commonly seen in countries where nurses earn low salaries [116].

Working overtime could possibly be one of the contributing factors to the reported absenteeism, as the need for more time to rest was one of the reasons mentioned by the nurses for staying away from work. Absenteeism was raised as a problem by the nurses in this study. The shortage of nurses leads to an increased workload, and absenteeism could be interpreted as a coping strategy among nurses, helping to maintain manageable levels of physical and psychological states [117].

Findings from this study emphasise the need for a worksite health promotion programme aimed at reducing NCD health-related conditions or risk factors such as obesity, physical inactivity and poor dietary eating habits and also reducing the fear of TB infection among the nurses. Over and above these challenges, it appeared that there was a general lack of nurses' involvement in the planning of the existing WHPPs which seemed to be one of the contributing factors to the poor levels of participation. A participatory approach in which employees are involved in both the planning of the WHPPs and active engagement in the decision-making process is deemed necessary for the success of any health promotion program [118]. Even though the existing worksite health promotion programmes addressed the nurses' health concerns, they did not seem to address their barriers to living a healthy lifestyle. Suggested worksite health promotion programmes by the nurses in this study included fitness facilities and massage sessions. In contrast, the delivered WHPPs comprised mainly of clinical measures and online employee assistance programmes.

There was clearly mismatch between the type of WHPPs that the employees preferred and those offered, highlighting the importance of consultation and inclusion of employees in the decision-making process. Previously published research suggests that lack of consultation and exclusion of employees in the planning and decision-making process could possibly result in lack of interest from the nurses to participate in the delivered programmes [118]. However, the active involvement of the nurses in the planning and implementation of these programmes can be viewed as a critical starting point as it may result in positive outcomes and sustainability of the programmes [118].

4.1 STRENGTHS OF THE STUDY

The strengths of this study include the naturalistic environment within which the study was conducted. The qualitative research method provided an opportunity for capturing a range of opinions among the nurses and management personnel during the focus groups and key

informants. The interviews enabled the researcher's access to the nursing managements' knowledge, unique perspectives, observations and insights to the nurses' lifestyle behaviours and worksite health promotion programmes. Another strength includes the representation of the various wards and shifts in the different types of hospitals in the Cape Town Metropole. This included day and night shift workers from various wards in the different hospitals. We can argue that gathering information from the different wards, shifts and hospitals assists in the greater understanding of the extent of the challenges experienced by the nurses in the Western Cape Metropole.

To the best of our knowledge, this one of the first descriptive qualitative research studies investigating nurses' lifestyle behaviours, health priorities and barriers to living a healthy lifestyle in South Africa. Other studies have only identified the health risk factors and made recommendations for an intervention programme [7, 9].

5.1 LIMITATIONS OF THE STUDY

It was often a challenge for the night shift nurses to attend the FGDs as they reported that they were fewer nurses working at night. The research study was only conducted in the Western Cape public hospitals and not private hospitals. Also, Primary Health Care facilities were not included in the data collection, largely due to most of them having only day-time hours. Conducting the group interviews might have resulted in disadvantages such as managers not being free to voice out their opinions in the presence of fellow colleagues.

6.1 CONCLUSION

The prevalence of NCDs and health-related conditions and risk factors such as obesity, physical inactivity, poor dietary habits, and substance abuse has been reported among the nursing workforce. Occupational challenges including TB, musculoskeletal injuries, budget constraints, burnout and increased workload due to staff shortages have been reported among this population. The findings presented in this study call for the urgent action of implementing WHPPs such as physical activity interventions to help reduce the prevalence of NCDs, obesity and physical inactivity among nurses.

Maintaining the health of the nurses has been recognised as being important also for maintaining the health of the patients [119]. Therefore, employers in a healthcare setting should understand and address, where possible, the main causes of physical and psychological ill-health occurring

within their organisations [120]. There is good evidence demonstrating the efficacy of WHPPs to reducing NCDs health risks and potentially decreasing the cost of health care expenditure [22, 23, 112]. Furthermore, WHPPs have been reported to result in increased in work productivity and increase employee loyalty [25, 85].

Nurses in this study perceived that their occupation required them to engage in large amounts of walking during their working hours. The night shift nurses perceived that they worked harder than those working the day shift as they were short staffed during the night, yet had to care for the same number of patients. Therefore, we concluded that it is important to measure the nurse's physical activity levels prior embarking on a worksite intervention programme focused on physical activity. Also, investigate and compare the difference in physical activity levels and sedentary behaviour between the day and night shift nurses. Measuring and comparing habitual levels of physical activity between the two shifts will provide information to tailor and target to appropriate worksite intervention programmes for the two shifts. Physical activity levels can be measured using both objective and subjective methods. In this study we used both the objective (Actigraph GT3x accelerometer) and subjective (GPAQ) measures.

CHAPTER 3:

A COMPARISON OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR IN DAY AND NIGHT SHIFT NURSES: A PILOT STUDY

3.1 INTRODUCTION

Living with non-communicable diseases (NCDs) such as hypertension and diabetes were frequently reported by the nurses in [Chapter 2](#) of this mini-dissertation as their main personal health concerns. Previous research has identified health care workers [HCWs], and shift workers as having an increased risk for NCDs [2, 3, 6, 7, 13, 44, 94]. In South Africa, NCDs account for 37% of all deaths, with cardiovascular diseases (CVDs) and diabetes together accounting for 19% of all South Africa's deaths [121]. Physical inactivity has been associated with 6–10% of all NCD-related deaths globally [14], and 30% of ischaemic heart disease and 20% of diabetes in South Africa (SA) [122]. Despite the strong evidence that physical activity contributes to the prevention of NCDs [10, 12, 64] only 36% of SA men and 24% of women report sufficient physical activity levels for health benefit daily [65].

Most of the nurses that participated in the first chapter of this mini-dissertation identified working shifts, lack of time and 'being exhausted' as barriers to participating in regular leisure time physical activity (PA). This is in line with previous research where nurses identified 'lack of time', and fatigue as the main barriers for engaging in PA [4, 13]. Furthermore, night shift nurses from our qualitative study ([Chapter 2](#)) also reported that they need to rest in order to prepare for their next shift, which makes participating in leisure time physical activity challenging. Indeed, previous research has shown that shift work is associated with decreased opportunities for physical activity [41].

In addition to physical activity, sedentary behaviour (SB) has also been identified as an independent risk factor for all-cause mortality [49, 51]. Sedentary behaviour includes any behaviour involving little or no energy expenditure, such as occupational sitting, leisure-time sitting and television (TV) viewing [54, 55]. Moreover, these sedentary behaviours have been associated with overweight and obesity [54, 55, 123]. The mean occupational sitting time in employees is reported to be more than 3 hours a day, with some employees reporting more than 6 hours of sitting time at work [51, 57]. However, there are limited research studies reporting on sedentary behaviours among nurses.

Both physical activity and sedentary behaviour can be measured using objective and subjective (self-report) methods [68]. The Global Physical Activity Questionnaire (GPAQ) is an example of a PA survey which has been used to quantify and compare physical activity globally [70]. Participants report on moderate and vigorous intensity PA during their occupation, travel and

leisure time [70]. In addition, the GPAQ includes a question on total time spent sitting during a usual day [124]. Herrmann et al evaluated the validity and reliability of the GPAQ showed a low-to-moderate validity and generally acceptable reliability evidence for the GPAQ [71]. Self-reported moderate and vigorous minutes correlated with the accelerometer moderate ($r = 0.28$) and vigorous ($r = 0.48$) physical activity [71].

Accelerometers and pedometers provide objective measures of physical activity [73, 125]. The Actigraph GT3x is an example of an accelerometer that measures physical activity in different intensities [74, 75]. For example, time spent in light intensity physical activity (LPA), moderate intensity physical activity (MPA), and vigorous intensity physical activity (VPA) intensity [73, 125]. Additionally this device uses acceleration values to estimate angles and from that estimate different body positions such as sitting, standing or lying down [73].

Based on our current knowledge, there is limited research comparing physical activity and sedentary behaviour between day and night shift nurses using both subjective and objective measures. Therefore, the aim of this pilot study was to compare physical activity and sedentary behaviour in day and night shift nurses. We hypothesised that the nurses working night shift would have significantly lower levels of physical activity and spend more time sitting than those who work day shift. A secondary aim of this study was to compare self-reported clinical measures and health status between day and night shift nurses.

3.2 METHODS

3.2.1. Setting

The participants were recruited from two of the hospitals that were part of the research conducted for [Chapter 2](#). Similar to chapter one, the nursing manager at each hospital was invited and informed of the study via an email, followed by a telephone call. This was followed by a meeting between the nursing manager and the researchers. Arrangements were then made to meet with the nurses to provide an overview of the research and invite them to participate in the study. It is important to note that this research study was a part a larger study being conducted evaluating nurses' physical activity, sedentary behaviour and health status.

3.2.2 Participants

All the nurses working at these hospitals were invited to participate in the research study. Any nurse, irrespective of occupational rank, was eligible to participate in this study. This meant that the nurses could either be a professional nurse, staff nurse, auxiliary nurse and/or assistant nurse. Healthcare workers who were not nurses, for example; occupational therapists or doctors, were excluded from this study. A small number of nurses (n= 11) who participated in the focus group discussions (FGD) and key informant interviews (KII) from chapter one, also participated in this study.

3.2.3 Data Collection

The researchers visited each hospital three times. The first visit included a meeting with the nursing manager informing them of the research study and inviting the hospital to be one of the research sites. The aim of the second visit was to provide an overview and explain the purpose of the research study to nurses interested in the research study. Those nurses who agreed to participate were asked to complete a socio-demographic questionnaire and wear the Actigraph GT3x accelerometer for seven consecutive days. The third visit to the hospital was to collect the accelerometers from either the nurses or nursing manager (Figure 3).

4.1 SOCIO-DEMOGRAPHIC QUESTIONNAIRE (Appendix 2)

The participants were asked to complete a comprehensive socio-demographic survey which included questions on age, gender, marital status, shift-work history and highest level of education. Lifestyle behaviours that were included in the survey were smoking status and current physical activity habits. The nurses also had to report on the influence that working shifts has on their behaviours.

Self-reported clinical information included weight, height, waist circumference, and dress size. Many of the nurses were unable to recall their body mass, and as a result, clothing size was also used to estimate waist circumference (WC) based on previous research showing that clothing size was strongly associated with waist circumference [126, 127]. In addition, the nurses were asked if a medical doctor has ever diagnosed them of medical conditions such as hypertension, diabetes and high blood cholesterol.

5.1 GLOBAL PHYSICAL ACTIVITY QUESTIONNAIRE (Appendix 3)

Physical activity and average daily sitting time were measured using the Global Physical Activity Questionnaire (GPAQ) [124]. The GPAQ comprises of 19 questions related to occupational physical activity, active travel, leisure activities as well as sitting time [124]. Leisure time and work-related physical activities were categorized into either moderate or vigorous intensity, whereas only moderate intensity transport-related physical activity was quantified [124]. Self-reported physical activity was reported in hours and minutes per week and was only recorded if the activity was in bouts of at least ten minutes. A MET value of 4 was assigned to moderate intensity PA and 8 for vigorous intensity PA [124]. One MET is defined as 3.5 mL oxygen/kg body weight per minute [128] and is equivalent to the energy expenditure during one hour rest [129].

Total physical activity was computed as the sum of all minutes per week and/or hours per week for physical activities performed in work, active travel and leisure activities [124]. Total moderate and vigorous intensity physical activity minutes (MVPA) were calculated by adding moderate and vigorous intensity PA from both occupational and leisure physical activity. Daily physical activity minutes were derived from dividing the weekly reported physical activity minutes by seven. The nurses were also asked to report on the amount of time they spend sitting on a usual day.

6.1 OBJECTIVE MEASURES OF PHYSICAL ACTIVITY AND SEDENTARY BEHAVIOUR

The ActiGraph GT3X accelerometer is a portable light-weight device that measures both physical activity and sedentary behaviour objectively [125]. This device measures total activity counts, steps taken and energy expenditure [73, 125]. In addition, the Actigraph GT3x has an inclinometer that measures movement in three different planes, the vertical, horizontal, and lateral axes [73]. Therefore the inclinometer is able to differentiate between activities performed while sitting, standing or lying down [73]. The data collection mode for the ActiGraph GT3x was set in 3 axis and 1 minute epoch mode. The Matthews cut points were used to define the different intensity domains; light intensity ($\leq 759 \text{ count}\cdot\text{min}^{-1}$), moderate intensity ($\leq 5999 \text{ count}\cdot\text{min}^{-1}$) and vigorous intensity ($\geq 6000 \text{ count}\cdot\text{min}^{-1}$) [77]. Sedentary behaviour was defined as activity counts $\leq 100 \text{ count}\cdot\text{min}^{-1}$ [77]. The accelerometer derived data was analysed and reported according to one minute bouts. This was based on published data which suggests

that short bursts of physical activity accumulated in bouts less than 10 minutes can result in reduction of CVD risk factors [53, 130].

Each nurse was provided with an accelerometer after completing the questionnaires, and requested to wear it for at least seven consecutive days. Participants were instructed to wear the accelerometer during all waking hours and to only remove it when bathing, showering, or during water-based activities [73, 125]. Valid data was defined as ≥ 600 minutes wear time per day and a minimum of 4 days of wear time [131], of which at least two days had to be shift days.

7.1 ETHICAL CONSIDERATION

After reading the information sheet, the participants were required to sign an informed consent prior to data collection. Each participant was provided with a code to ensure their confidentiality. None of the data collected were sent to the hospital management or the provincial Department of Health. The hospitals did not receive any results from the data collected. Ethical approval for this research study was received from the University of Cape Town Research Ethics Committee of the Faculty of Health Science (REC REF: 212/2012). Furthermore, the Western Cape Department of Health granted their approval for the research study (Ref No: 2012; RP121).

8.1 STASTICAL ANALYSIS

All statistical analyses were performed on STATISTICA 10 software. Descriptive statistics for continuous variables such as age, BMI and PA time were calculated and reported as means and standard deviations (SD). Results for categorical data such as marital status were calculated from frequency tables and were presented as percentages. The normality of continuous data was tested by applying Shapiro Wilk's W Test. If data were normally distributed, ANOVA (analyses of variance) was performed to determine the significant differences in continuous outcome variables between day and night shift nurses. If data were not normally distributed, such as the GPAQ data, a non-parametric comparison Mann Whitney U test was applied. The Pearson Chi square test was performed to determine if there were any significant differences in categorical variables between the day and night shift nurses.

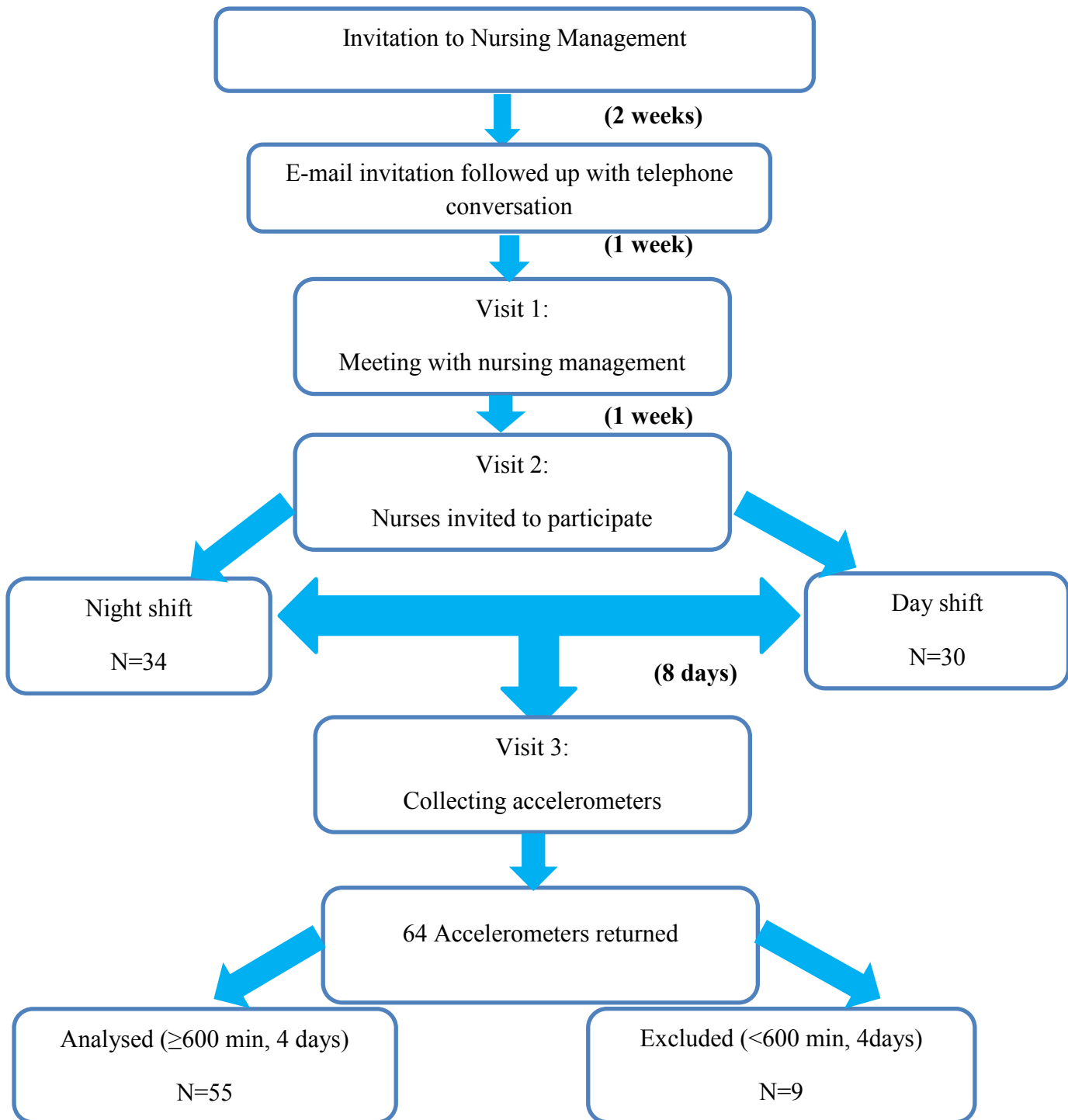
Analysis of covariance (ANCOVA) was applied to determine possible factors that contribute to the PA in day and night shift nurses, after co-varying for age and dress size. In addition, Spearman's rank-order correlation coefficients (r) test was applied to explore association the

between directly measured PA and self-reported PA. Statistical significance was attained with a p value <0.05 . In addition, Spearman's correlation test explored associations between objectively measured physical activity and self-reported physical activity. Lastly, the Bland-Altman method was used to calculate the limits of agreement between the accelerometer measured physical activity and the self-reported physical activity for both the day and night shift nurses.

Sample size calculation.

The main outcome of this pilot study was to compare physical activity in day and night shift nurses. The power calculation was calculated based on the primary outcome, which was moderate-to-vigorous intensity physical activity, and based on data from Wushe NS et al [132]. The mean and standard deviation of MVPA from a South African study reporting on the objectively measured physical activity difference between adolescence girls (61.13 ± 52.2 minutes/day) and boys (35.0 ± 32.9 minutes/day) was used to conduct the sample size effect needed for this study [132]. The required sample size of 43 nurses per shift, based on a significant level $\alpha=0.05$ and 80% power is needed to detect a difference of 42.75% minutes in daily MVPA between the two shifts. It is important to note that the data obtained from (Study 2) Chapter 3 is part of a larger study, which will be sufficiently powered once all the data has been collected.

Figure 3: Recruitment process of the study participants



9.1 RESULTS

9.1.1 Participant's characteristics

A convenience sample of 64 nurses; 5 males and 59 females, met the inclusion criteria and volunteered to participate (Table 4). Four out of the 5 males worked day shift. The mean age, 56 ± 11 years, was similar for night and day shift nurses. The majority of the nurses were married. Of the nurses who worked night shift, 15 were on permanent night shift, whilst the remaining ($n=17$) either worked either a single block of night shifts a year or occasional blocks of night duties a year.

All the nurses reported on their clothing size, but only 3 nurses knew their waist circumference. Consequently, dress size was used as a proxy to estimate waist circumference. The overall mean clothing size was 38 ± 4.2 , and there were no significant differences between the two shifts. Less than half the nurses ($n=30$) knew their height and weight. Of those who reported on height and weight, their BMI ranged from 28kg/m^2 to 38kg/m^2 , with no significant difference between the two shifts.

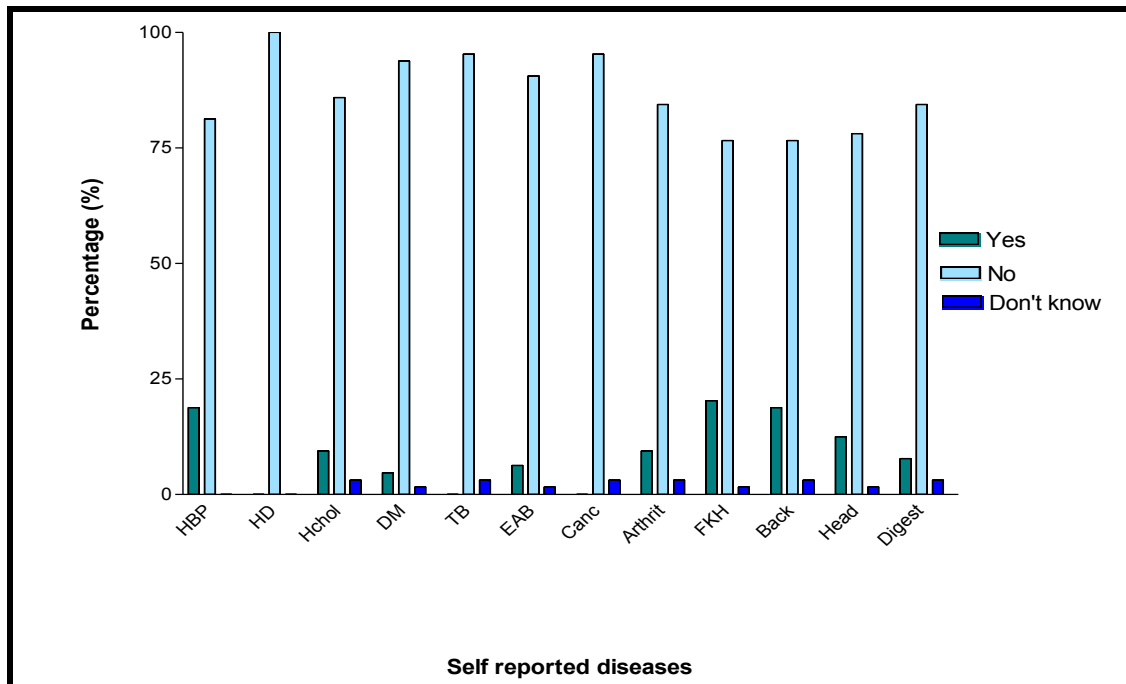
Table 4: Participants characteristics of night and day shift nurses (n, %)

Variables	Total (n=64)	Day shift (n=30)	Night shift (n=34)
Age (years)	56 (43±11.1)	25 (41±12.1)	31 (45±9.8)
Female	59 (92.19)	26 (40.43)	33 (51.56)
Marital status			
Never married	6 (9.38)	4 (6.25)	2 (3.13)
Married	26 (40.63)	10 (16.63)	16 (25.00)
Single	18 (28.13)	9 (14.06)	9 (14.06)
Divorced	8 (12.50)	4 (6.25)	4 (6.25)
Widow/Widower	4 (6.25)	2 (6.67)	2 (5.58)
Living with partner	2 (3.13)	1 (3.33)	1 (2.94)
Education level			
High school	22 (35.48)	8 (12.90)	14 (22.58)
College	28 (45.16)	12 (19.35)	16 (25.81)
University of Technology	5 (8.06)	3 (4.48)	2 (3.23)
University Degree	7 (11.29)	6 (9.68)	1 (1.61)

Legend:*Age: (mean±sd)**Pearson chi-square test was applied for comparing categorical variables and to derive p value.**T-test independent by group was applied to compare continuous data and derive p value.**Mean±SD represents continues data and (%) represents categorical data.***9.1.2 Diagnosed disease**

Twenty three percent of the nurses reported that they were previously diagnosed with either diabetes, hypertension or backache (Figure 4). The most frequently reported diagnosed medical conditions were hypertension and lower limb orthopaedic conditions. The prevalence of lower back pain was similar for the two shifts. There were no other differences in the prevalence of self-reported diseases between the two shifts.

Figure 4: Nurse’s self-reported diagnosed diseases (%)



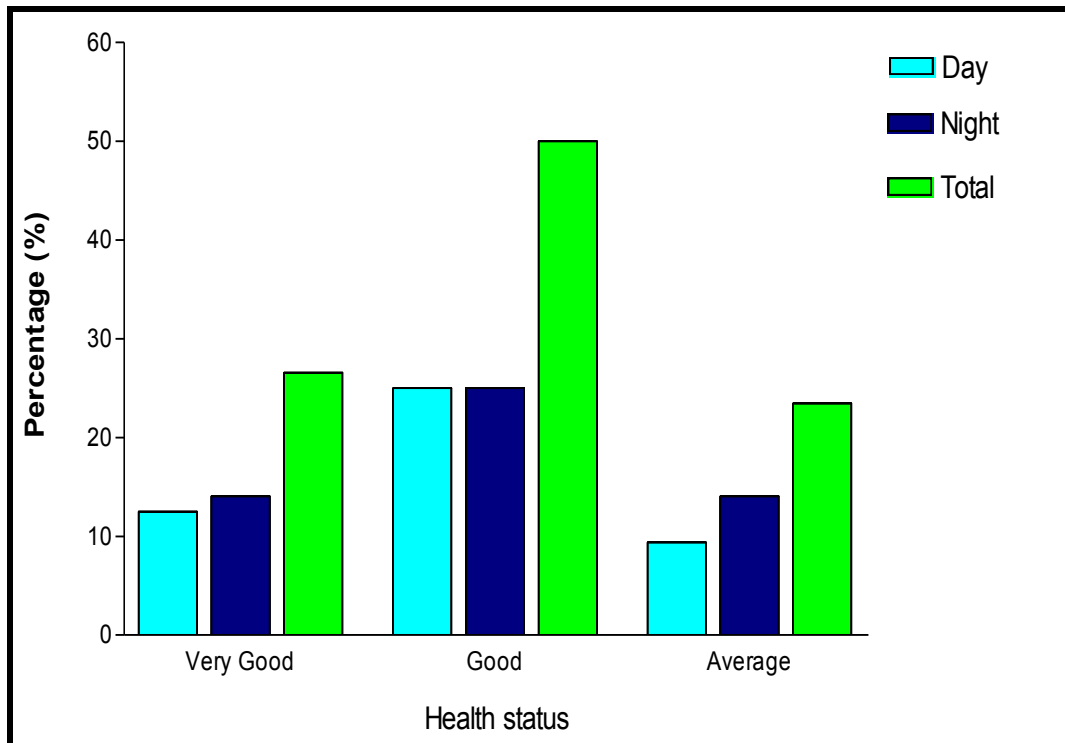
Legend:

HB: High blood pressure; HD: Heart diseases; Hchol: High cholesterol; DM - Diabetes Mellitus; TB: Tuberculosis; EAB: Emphysema/Asthma/Bronchitis; Canc: Cancer; Arthrit: Arthritis; FKHI: Foot/knee/hip; Head: Headache; Digest: Digestive problems

9.1.3 Self-reported health status

Figure 5 illustrates the self-reported health status of the nurses. Most nurses perceived their general health as good and none on the nurses reported that their health status as excellent or poor. There were no significant differences ($p = 0.813$) in the self-reported health status between day and night shift nurses.

Figure 5: Self-reported Health Status



9.1.4 Self-reported physical activity: GPAQ

Self-reported PA for both night shift and day shift nurses, categorized into the different intensities (total moderate, total vigorous and total moderate-vigorous) and domains (work, transport and leisure) is presented in Table 5. Day shift nurses accumulated most of their physical activity from active travel, whereas night shift nurses accumulated most of their physical at work. However, there was no significant differences in self-reported, moderate-to-vigorous physical activity between the two shifts in the transport and occupational domain.

Approximately, 65% nurses reported more than 150 minutes of moderate and vigorous physical activity a week. The total reported weekly moderate and vigorous physical activity was 6.6(2-14.3) [median (inter-quartile range)] hours per week. Both night and day shift nurses had similar reported occupational moderate and vigorous intensity physical activity (Table 5). However, the day shift nurses reported significantly higher levels of leisure-time MVPA than the night shift nurses, 9.1 (3-22.3) hours per week versus 3.5 (1.6-9) hours per week [median (inter-quartile range)], $p= 0.028$.

After controlling for age and clothing size, ANCOVA results in Table 6 show that working night shift was a statistically significant predictor of leisure-time MVPA, $p=0.018$. Overall the model explains 13% ($r^2=0.13$) of variance between the day and night shift nurses in self-reported leisure-time MVPA. There were no significant differences in self-reported moderate intensity PA and moderate and vigorous intensity physical activity among nurses who were diagnosed with NCDs after controlling for shift.

Reported sedentary behaviour was similar for the two shifts, 3 ± 1.8 hours per day versus 4 ± 2.6 hours a day, for day and night shift, respectively. The ANCOVA test concluded that there was no significant difference in sedentary behaviour after controlling for shift in nurses who reported NCDs compared to nurses who did not.

Table 5: Self-reported physical activity (GPAQ): night and day shift nurses (Median \pm IQR)

Variables	Total	Day shift	Night shift	P value
Work vig	0 (0-180)	0 (0-80)	0 (0-480)	0.640
Work mod	120 (0-1480)	50 (0-1080)	360 (0-1800)	0.418
Leisure vig	0 (0-50)	0 (0-120)	0 (0-0)	0.021
Leisure mod	40 (0-180)	90 (0-180)	0 (0-90)	0.112
Transport	150 (45-450)	217 (55-910)	120 (40-400)	0.237
Total vig	20 (0-420)	120 (0-240)	0 (0-480)	0.275
Total mod	630 (190-2160)	800 (290-1890)	570(180-2370)	0.679
Occ MVPA	270 (0-1860)	240 (0-1800)	480 (0-1920)	0.671
Leis MVPA	400 (120-860)	550 (180-1340)	210 (100-240)	0.028
Tot MVPA	1080 (210-2865)	1080 (500-2205)	915(14.29)	0.277

Legend:

*QR: Inter-quartile range (upper and lower quartile); Vig: vigorous intensity physical activity; Mod: moderate intensity physical activity; MVPA: moderate and vigorous intensity physical activity Tot: total; Occ: Occupational
Mann Whitney U test applied to determine statistical difference*

Table 6: Difference in physical activity and sedentary behaviour after covarying for age and dress size

Variable	Total sample	Day shift (n)	Day shift adj. mean	Night shift (n)	Night shift adj. mean	F	Unadj p	Adjst p
Steps/day	47	25	7712.10	22	(22)10168.07	11.444	0.013	0.003
Mod PA (accel)	47	25	696.78	22	(22) 993.04	13.852	0.001	0.004
Leis vig (GPAQ)	55	24	96.25	31	(31) 13.87	6.654	0.021	0.019
Leis MVPA (GPAQ)	55	24	96.25	31	(31) 454.06	5.879	0.028	0.052
Tot MVAP (accel)	47	25	698.46	22	(22) 993.68	13.608	0.001	0.004
Sed % (accel)	47	25	70.74	22	(22) 66.08	6.162	0.047	0.109

Legend:

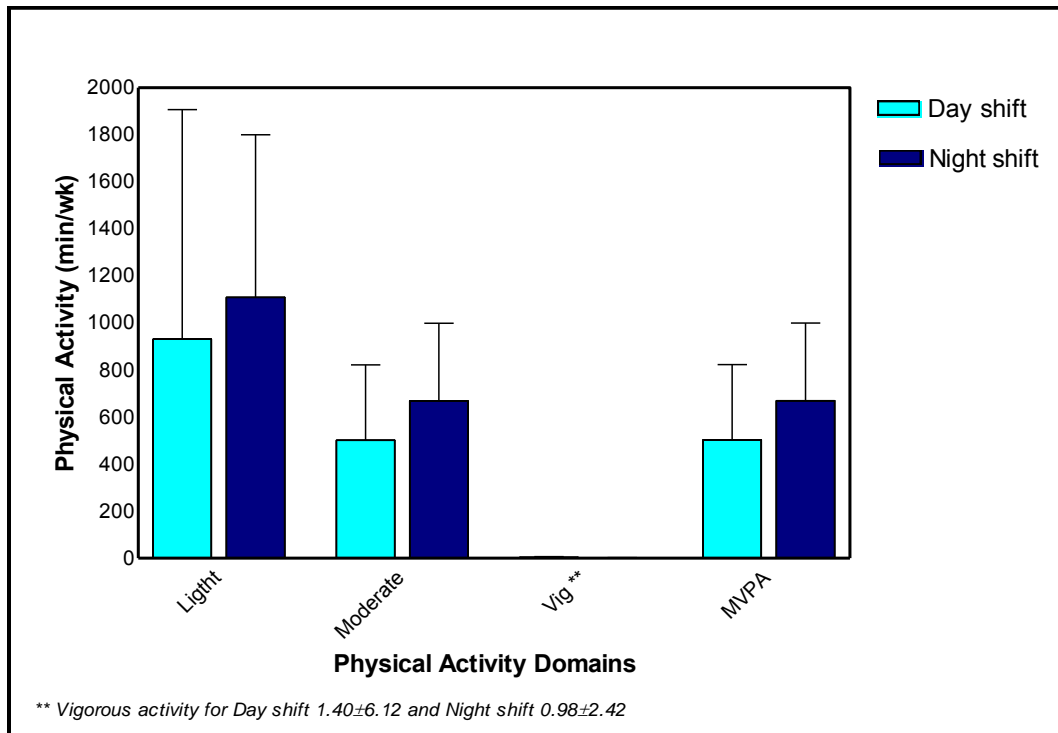
Mod PA (accel): Objectively measured moderate intensity physical activity; Leis vig (GPAQ): Self-reported leisure vigorous intensity physical activity; Leis MVPA (GPAQ): Self-reported leisure moderate and vigorous intensity physical activity; Tot MVPA (accel): Objectively measured moderate and vigorous intensity physical activity; Sed % (accel): Objectively measured percentage sedentary time; Unadj P: Unadjusted P; Adjst P : Adjusted P; R²: R-squared; Adj r²: Adjusted R-square

9.1.5 Objective measure of physical activity: Accelerometer

Only 55 nurses met the inclusion criteria for objective data analysis (≥ 600 minutes wear time per day and a minimum of 4 days of wear of which at least 2 days had to be shift days were included in the analyses). Nine nurses were excluded from the data analyses because they had less than four days of at least 600 minutes wear time. Similar studies only included a minimum of ≥ 600 minutes wear time per day in their data analyses, this is equivalent to 10 hours and is considered a valid day [74, 133]. Day shift nurses spent less time in light PA, 27 ± 4 hours per week in comparison to night shift nurses who spent 30.1 ± 6.9 hours per week. However these differences were not significant. Night shift nurses spent a mean of 0.9 ± 2 minutes per week in vigorous intensity PA and day shift nurses spent a mean 1 ± 6 minutes per week.

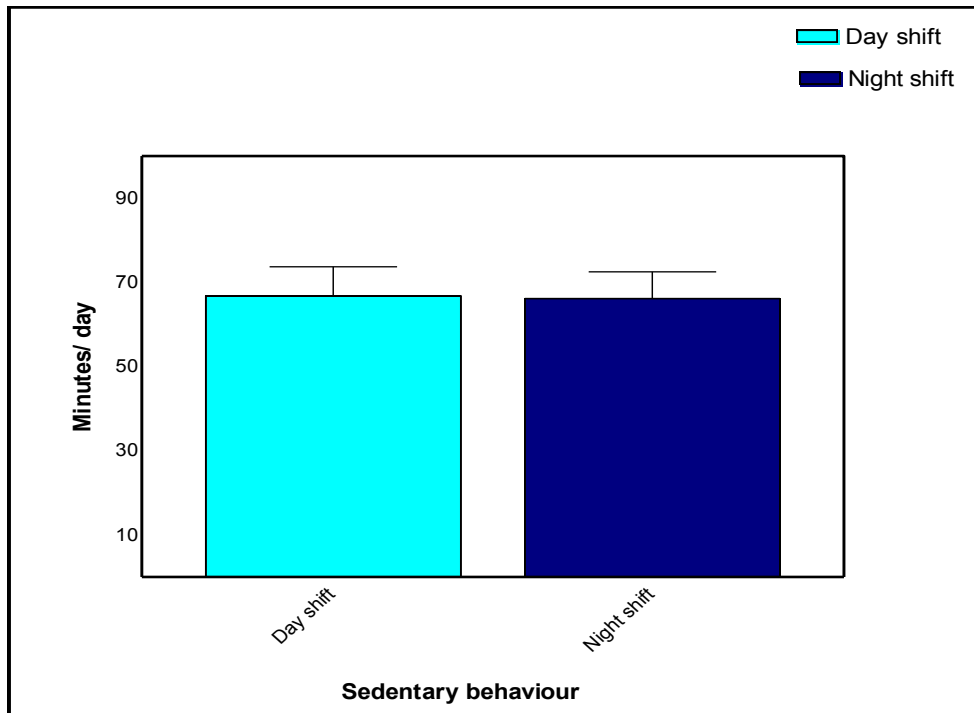
Nurses working night shift did more in moderate intensity PA per week than those working day shift (Figure 6). Night shift nurses accumulated 16.6 ± 5.6 hours of moderate intensity PA per week, compared to the day shift nurses who accumulated 12.1 ± 4.5 hours of moderate PA per week. Night shift nurses spent a mean of 0.9 ± 2 minutes per week in vigorous intensity PA and day shift nurses spent a mean 1 ± 6 minutes per week. All the nurses engaged in more than 150 minutes of moderate and vigorous intensity physical activity per week, when analysing the data in 1 minute bouts. In addition, there was a significant difference in objectively measured moderate and vigorous intensity physical activity between the day and night shift nurses ($p=0.001$). A significant difference was observed between the two shifts even after adjusting for age and dress size ($p=0.004$), Table 6.

Figure 6: Accelerometer derived physical activity for day and night shift nurses



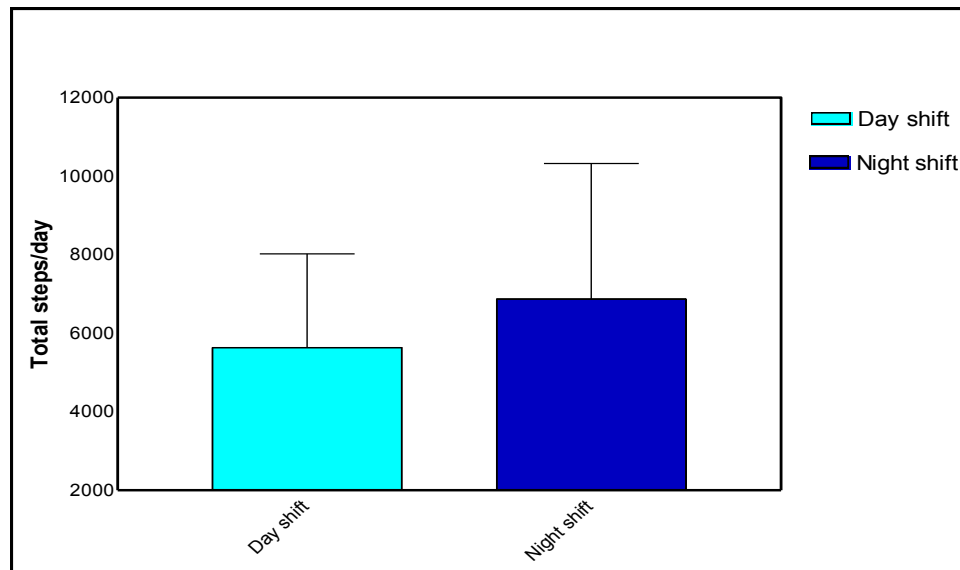
Nurses spent most of total wear time sitting and the day shift nurses had higher sitting times than those working night shift, 69% and 66%, respectively $p= 0.047$ (Figure 7). The ANCOVA showed that there was no significant difference in sedentary behaviour after adjusting for shift in nurses that reported NCDs compared to nurses without NCDs.

Figure 7: Total Percentage (%) of sedentary behaviour



Night shift nurses accumulated significantly more steps per day (10324 ± 3414) than day shift nurses (8022 ± 3245 , $p=0.013$) (Figure 8). Therefore, working night shift is associated with taking more steps a day, engaging in moderate intensity PA and spending less time sitting, even after adjusting for age and clothing size (Table 6). In addition, after controlling for shift, the ANCOVA test suggested a significant difference in moderate intensity PA ($p=0.003$) and moderate and vigorous PA ($p=0.002$) between individuals reporting NCDs compared to individuals without NCDs.

Figure 8: Accelerometer derived estimated indices of total steps (Mean± Standard Deviation).



9.1.6 Self-reported versus objectively measured physical activity

According to the Spearman's Rank correlation results, there was a significant relationship between objectively measured and self-reported sedentary time; $p=0.049$ (Table 7). There was no significant relationship for the other variables including moderate and vigorous intensity physical activity.

Table 7: Spearman’s Rank correlation coefficient between direct measures and self-reported

Variables	r	P- value
Obj sitting time vs. subj sitting time (min/wk)	0.281	0.049
Obj moderate intensity vs. subj moderate intensity (min/wk)	-0.145	0.239
Obj vigorous intensity vs. subj vigorous intensity (min/wk)	0.036	0.793
Obj MVPA vs. subj MVPA (min/wk)	-0.114	0.408

weekly minutes of physical activity

Legend:

Obj: Objective; Subj: Subjective; MVPA: Moderate-and- vigorous physical activity; Min/wk: Minutes per week

The difference in objectively measured moderate and vigorous intensity physical activity and self-report moderate and vigorous intensity physical activity is illustrated in the Bland Altman plot (Figure 9). This figure shows narrower limits of agreement for the objectively measured method and self-report moderate and vigorous intensity physical activity as the values are closer to zero for majority of the nurses. Figure 10 is the Bland-Altman plot for the difference between objectively measured self-reported and sedentary time. The nurses underreported their daily sedentary time based on the objectively measured sedentary time being higher than that the self-reported data. The more dispersed data, with larger standard deviations, suggest greater differences between the methods of measurements.

Figure 9: MVPA vs. GPAQ

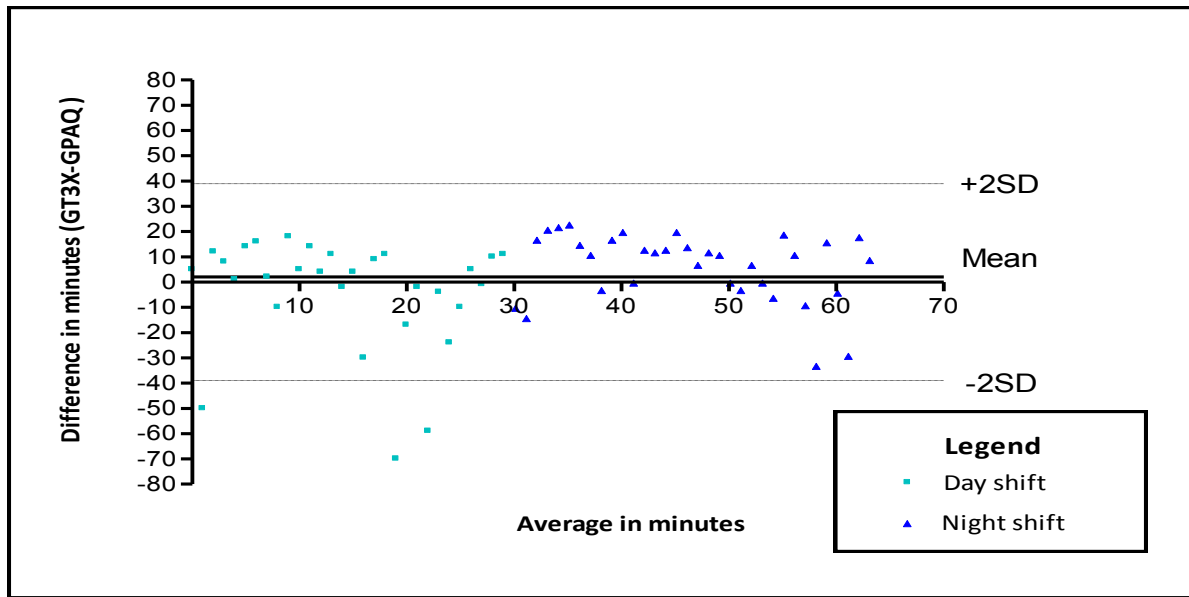
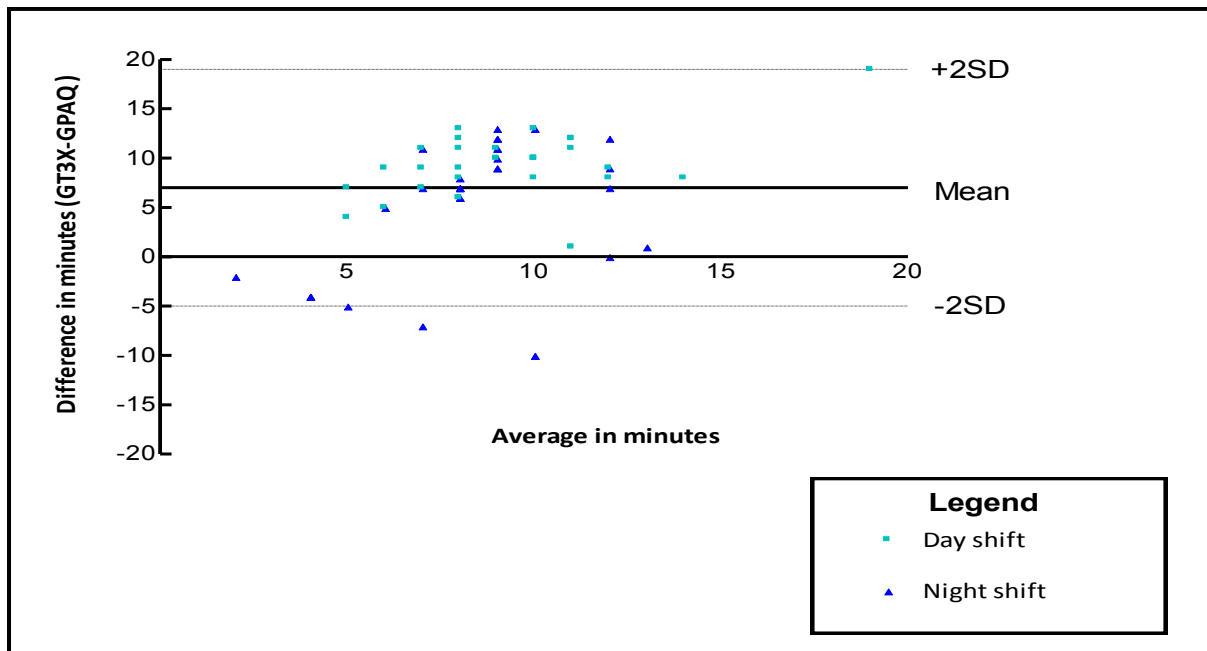


Figure 10: Sitting /Sedentary vs. GPAQ



10. DISCUSSION

The aim of this pilot study was to compare physical activity and sedentary behaviour between day and night shift nurses. We hypothesised that night shift nurses would have lower levels of physical activity and spend more time sitting than day shift nurses. Contrary to our hypothesis, night shift nurses were significantly more physically active than day shift nurses based on the objectively measured data. In addition, night shift nurses spent less time in sedentary behaviour than compared to day shift nurses.

Day shift nurses in this study reported more time in leisure-time moderate and vigorous intensity physical activity than the night shift nurses. This finding is supported by Atkinson et al [41], who concluded that night-shift workers experience more challenges in maintaining physical fitness compared to other groups of workers [41]. Leisure-time physical activities, including team sports, are often inflexible and do not meet the needs of shift workers [41]. Therefore, time constraints as a result of abnormal working hours might be a negative influencing factor for not participating in physical [41]. Furthermore, the day shift nurses in our study reported spending more time in active transport compared to day shift nurses. One of the factors that might contribute to the differences in transport between the two shifts is the perception of crime and feelings of safety in nurses working night shift. Individuals are likely to walk when they perceive more safety from crime during the day [134].

This study is the first to objectively measure physical activity and sedentary time in day and night shift nurses in South Africa. Our results are inconsistent with other studies in similar populations which have reported low levels of physical activity among nurses working night shift [135]. Takahashi et al [135], reported that nurses working a 16-hours night shift (n=20) had significantly lower levels of physical activity compared to nurses working a 8-hours evening/night shifts (n=20). Physical activity recorded during the shifts was compared between the 16-h and 8-h shifts [135]. These researchers used the ACTIVTRACER AC-300, GMS, Japan to record physical activity every 30 seconds [135]. The percentage of time spent in PA was calculated before, during, after the shifts and during days off [135]. The 30 seconds values of physical activity during shifts were averaged for each 4 hour period and data recorded during napping on the 16 hour shift was excluded from the calculation of the average score [135]. Dissimilarly, our study did not calculate PA time within each 4 hour period before, during, after the shifts and during days off, but calculated total PA time for work days and non-work days.

According to the accelerometer results all the nurses in our study met the physical activity guideline of 150 minutes or more of moderate and vigorous intensity physical activity per week. Similar to our study, Umuroko et al conducted a pilot study using both subjective and objective methods to determine minutes spent in moderate and vigorous physical activity at work and during non-working hours among 50 hospital patient care workers [33]. The researchers successfully collected accelerometer data on 48 of the 50 patient care workers [33]. Their results were different to ours, as their objectively measured physical activity results reported that only six out of 48 patient care workers from different shifts (day, evening and night shift) met the physical activity guidelines of 150 minutes of moderate and vigorous intensity physical activity per week [33].

The biggest contributor factor for the difference in results between our study and that of Umuroko and colleagues [33] is that they analysed their objectively measured moderate and vigorous intensity physical activity in 10 minutes bouts. It can be argued that the reason we have more nurses meeting the 150 minutes moderate and vigorous intensity physical activity weekly public health guidelines for good health is because our accelerometer data was analysed in one minute bouts. Even though our accelerometer data was analysed one minute bouts, our findings suggest that nurses were sufficiently physically active enough to achieve health benefits. There is recent evidence that moderate and vigorous intensity physical activity obtained in bouts of less than 10 minutes may favourably influence cardio-metabolic risk [130]. Findings from the Framingham cohort study concluded that shorter bouts of moderate and vigorous intensity physical activity are related to lower triglyceride levels, reduced risk of CVD, BMI and Framingham risk score, smaller waist circumference, and lower prevalence of obesity [130]. Therefore, we can anticipate the moderate and vigorous intensity physical activity observed in this study to contribute to health benefits.

Furthermore, our accelerometer data show that nurses who reported being diagnosed with a NCD engaged in less moderate and vigorous physical activity than those without diagnosed NCDs. These findings are supported by those of a recent cross –sectional study among 2867 South African employees who were clients of a private health care insurer [136]. Employees who did not meet the recommended physical activity guideline of 150 minutes of moderate and vigorous intensity physical activity per week had a higher of NCDs compared to those who were sufficiently physically active [136]. In addition, another study in South African worksites concluded that of the employees who were not physically active, 19% had blood cholesterol

concentrations of more than 5 mmol/l and 12% were hypertensive [137]. These findings suggest that nurses from our study who reported being diagnosed with NCD could benefit from increased levels of physical activity.

The higher MVPA in night shift nurses is confirmed by our step counts data. Nurses working night shift accumulated more steps per day in comparison to day shift nurses. These results support the findings that night shift nurses were indeed more physically active than day shift nurses. Accumulating 10,000– 10,999 steps/day is associated with 40–47 min/day of moderate and vigorous intensity physical activity [66]. Moreover, the night shift nurses in our study accumulated more steps a day than the general South African population [138]. Our findings are in line with those reporting that nurses walk great distances during their shift [4]. Night shift nurses from chapter one reported that there were fewer nurses working during the night in comparison to nurses working during the day. Therefore, these nurses perceived to be doing more work than day shift nurses because they had to cover the same work load with half the ‘man power’, and this was confirmed by the objective accelerometer data. Furthermore, our findings are in line with those by Abdalkader et al [37] where 78% of nurses working in an Intensive Care Units (ICU) at Jordan University Hospital felt that night shift nurses had heavier workloads than the day shift nurses. Also, the Jordanian nurses reported that the nurses-to-patient ratio is inadequate during night shift [37]. Employees with occupations requiring much walking and lifting have 35% lower risk of all-cause mortality than those with jobs requiring them to sit most of the day [49]. Additionally, our findings suggest that total daily steps accumulated decreases as clothing size (which is a proxy for waist circumference) increases. Similarly, HangstrÖmer et al [131] who measured the levels and patterns of physical activity and inactivity in an adult population sample using accelerometers reported that average physical activity intensity was lower with higher BMI [131].

Regardless of shift, nurses in our study were sedentary for an average of 13 hours per day based on data derived from the accelerometer. Previous research has shown that even though adults meet the recommended physical activity guidelines for health, higher levels of sedentary behaviour may still be independently associated with increased risk of chronic diseases[49]. It can be argued that the nurses might still have a significant risk factor due to high prevalence of sedentary behaviour, despite meeting PA guidelines. Evidence from the HUNT3 cohort study reported that sitting for more than 10 hours a day total was associated with a 115% greater risk of all-cause and cardio metabolic diseases (CMD) -related mortality than those who sat less than 4

hours per day[49]. This is after adjusting for sex, physical activity, smoking, BMI, and CMD status[49]. Participants from the HUNT3 cohort study reported on their average daily sitting time as a continuous measure including work hours and leisure time [49]. Nurses from our study also reported an average of just over 4 hours of sitting per day.

Furthermore, results from the Bland–Altman plots indicate that the nurses underreported their sedentary time. A possible reason for this could be that nurses perceive their job to be physically demanding as reported [Chapter 2](#). This is not surprising as research evidence from objective versus self-report studies have consistently found that individuals tend to underestimate their sitting time and overestimate time spent in physical activity [75]. One of the many reasons for this is that subjective measurements such as using self-report has the potential for respondents bias [75]. On the other hand most of the nurses were more accurate in reporting their moderate and vigorous physical activity (Table 5). Our finding is in contrast, nurses in other studies over reported minutes of moderate intensity physical activity by nearly sevenfold compared to the objectively measured moderate intensity physical activity [33].

The mean reported a clothing size in our study was 38 ± 4 for females and 36 ± 4 for males. Most of the nurses did not know of their clinical measures including waist circumference. Hence clothing size was used as an indicator of waist circumference. Waist circumference can be used as an indicator of health risk because android obesity provides an increased risk of hypertension, Type 2 diabetes, and CVDs [126, 127, 139]. Clothing size is a strong surrogate for estimating waist circumference and central adiposity [126]. Hughes LE at al [127] reports that clothing size of less than 40 corresponds to a waist circumference of less than 74 centimetres.

Half the nurses in this study rated their health as good. This is in contrast with findings from the hospital nurses in Lithuania where only 39.6% nurses rated their health as ‘good’ or ‘very good’ [83] suggesting poor health quality among these nurses. Majority of nurses from our study reported fewer NCDs diagnoses than those previously assessed in South Africa, where 57% of health care workers reported to be living with hypertension and/or diabetes [7]. A possible reason for the nurses reporting fewer NCDs diagnosis in the current study might be because the nurses do not know their clinical measures such as waist circumference and hypertension. This is surprising as one would expect health professionals to know their clinical measures as they are seen as role models for health [13]. However, this proves to be rather challenging since they themselves are overweight [3, 13]. As a result, nurses might find it challenging to promote

healthy lifestyle behaviours to their patients if do not represent an image of a healthy individual and/or practice a healthy lifestyle.

11. LIMITATIONS AND STRENGTHS

One of the limitations in this study was possible respondent bias in the GPAQ, due to social desirability, thus resulting in the under estimation of daily sitting time and over estimating daily physical activity. Objective methods were used to measure sedentary time and physical activity levels as a criterion measure to reduce bias. Even though the accelerometer is seen as criterion measure of physical activity, it cannot distinguish whether a person is carrying weight while walking [79], thus resulting in gaps of information with regards to the intensity at which the activity was carried out. Also, the objectively measured physical activity did not disaggregate physical activity measured ‘at work’ or outside of work time. Objectively measured results from similar studies concluded that health care workers tend to overestimate the amount of physical activity obtained at work in comparison to objectively measured physical activity [33]. Another limitation was the missing BMI data, nonetheless, we were able to use clothing size as a proxy for waist circumference [126, 127].

This study is among the first, in South Africa to our knowledge, comparing habitual levels of physical activity and sedentary behaviour in day and night shift nurses. The inclusion of both day (n=30) and night (n=34) shift nurses is one of the strengths of this study. Furthermore, all the nurses were measured in the same season, eliminating seasonal variation effect. Additionally, most of the nurses in our study had 4 valid days of accelerometer data, which included working and non-working days. Lastly, The GPAQ measured physical activity on different domains including at work physical activity and leisure physical activity and was also reported in 10 minutes bouts. Furthermore, self-reported and objectively measured physical activity data was collected for the same week.

12. CONCLUSION

In summary, irrespective of shift and physical activity measurement method, the nurses in this study achieved more than 150 minutes of moderate intensity physical activity per week, suggesting that the nurses in our study met the PA recommendations. One of the main findings was that night shift nurses accumulated significant moderate and vigorous intensity physical activity and steps per day than the day shift nurses. The nurses in our study spent an average of

13 hours per day in sedentary behaviour, which suggests that they are at increased risk of all-cause and CVD-related mortality. For this reason the nurses could benefit from an intervention that encourages less sitting and more walking despite them having an occupation that requires them to take short walks to attend to patients.

This study can be used to inform a worksite wellness intervention study among nurses in South Africa. The use of both subjective and objective measures of PA and SB could play a pivotal role in future interventions or advice for the Department of Health. Also, since this is a pilot study comprising of only 2 hospitals, a larger study representing more nurses with different responsibilities from different hospitals and wards is needed to determine if findings from our study can be generalised to all SA nurses. Furthermore, findings from this study support the night shift nurses perceptions from chapter 1 that their workload is increased during the night as they have to take care of the same number of patients with less nurses on duty. Therefore, suggesting that night shift nurses are more active than the day shift nurses.

CHAPTER FOUR

SUMMARY AND CONCLUSION

SUMMARY

The main objective of this *mini-dissertation* was to conduct a formative assessment among nurses working in the public sector to identify their health concerns and current lifestyle behaviours. A secondary objective was to compare physical activity and sedentary behaviour between day and night shift nurses.

Results from study 1, ‘[Nurses’ Lifestyle behaviours, health priorities and barriers to living a healthy lifestyle: A qualitative descriptive study](#)’, show that the nurses were concerned about being overweight and living with NCDs such as hypertension and Type 2 diabetes. Indeed, a previous study on South African HCWs reported that one out of three had diagnosed NCDs such as hypertension and diabetes [7]. The nurses in our study frequently mentioned lack of time to prepare healthy meals due to long working hours and being overtired from work as major challenges to leading a healthy lifestyle. Previously published research has also found that nurses feel overworked, tired and perceive that they have limited time to take part in physical activities [8, 13, 31].

In our study, the intervention preferences and personal health concerns were different between the day and night shift nurses. Night shift nurses frequently reported weight gain and living with NCDs as their main personal health concerns. Day shift nurses suggested intervention programmes such as aerobic classes and a gym in the health care facility. These worksite health promotion programmes have the potential to counter the increasing burden of overweight and obesity as well as physical inactivity [31, 32]. Also, it’s been reported that participation in PA during work time could result in high participation rates [140].

Therefore, Hospital Management and employers should consider a campaign of implementing WHPP which is tailored to the nurse’s preferences and work demands. Worksite health promotion programmes that are currently offered include independent counselling services, an online employee wellness programme and wellness days in which clinical measures, such as blood glucose were measured. Night shift nurses reported that they did not have access to programmes like the wellness days because such programmes only occurred during the day and not at night. The programme planners would need to ensure that the nurses understand and perceive the added benefit of the intervention and this could increase participation and buy-in to the WHPP [141]. It is also important to note that the involvement of employees by the organization in programme intervention planning could increase employee recruitment rate for

the intervention [140]. Therefore, possibly contribute to the success of the WHPP. Other factors that could contribute to the success of a worksite intervention programme is the creation of supportive work environment [141].

Creating supportive work environments such as offering healthy food choices in the cafeteria and giving the employees time off for physical activity could help improve employees health [142]. Both nursing management and day shift nurses in this study agreed that the hospital cafeterias predominantly sold unhealthy foods. Therefore, modifying external factors such as increasing the availability of healthy foods in the cafeteria could be a simple intervention programme to help reduce the unhealthy eating culture in the worksite. Also, such interventions may achieve long lasting health improvements at low cost [142]. A 18-month intervention study, including an individualized computer-tailored health messages resulted in increased fruit and vegetable consumption ($p<0.05$) as well as improvements in strengthening and flexibility exercise ($p<0.01$) [143]. Furthermore, this study used the qualitative information from the study population to design programs and messages based on women's expressed needs and choices for behavioral change. Similarly, in our research we first embarked on a qualitative investigation, which is similar to a needs assessment. The main purpose for this was to gain an in-depth understanding the nurses' health priorities and barriers to living a healthy lifestyle. The next step is to implement a worksite health promotion programme based on the findings from the needs assessment.

The [nurses in Study 1](#) expressed an interest in a gym facility in the hospital as their preferred worksite intervention programme. Despite the interest in a physical activity-based programme, the nurses perceived their current levels of activity as high. In addition, the night shift nurses perceived their workloads as more physically active than the day shift nurses. Similarly, the day shift perceived their work demands as greater than that of the night shift staff.

[Therefore, results from the Study 1 prompted us to conduct a pilot study comparing physical activity and sedentary behaviour in day and night shift nurses \(Study 2\)](#). This study used both objective (ActiGraph GT3X accelerometer) and subjective (Global Physical Activity Questionnaire) methods to measure the nurses' physical activity and sedentary behaviour. Data from this study showed that all the nurses were meeting PA recommendations, but that the night shift nurses were significantly more active than those working day shift. This finding supports our results from study 1 where the night shift nurses perceived that they were working harder

than day shift nurses. Additionally, night shift nurses reported that they were short staffed yet had to care for the same number of patients as the day shift nurses. Nonetheless, the nurses still spent most of total wear time sitting, with day shift nurses having higher sitting times than those working night shift. There is scientific evidence that more than 10 h/day total sitting time is associated with 65% and 115% greater risk of all-cause and cardio-metabolic diseases (CMD)-related mortality [49]. In addition, sedentary behaviours such as occupational sitting been associated with overweight and obesity, independent of physical activity [54, 55].

RECOMMENDATIONS FOR HOSPITAL EMPLOYERS

Findings from this research suggests that implementing a worksite health promotion programme in the hospitals would play an important role in health promotion among nurses. Furthermore, worksite health promotion programmes have been reported to result in increased in work productivity and increase employee loyalty [25, 85].

The first step that the employer can take is to conduct a needs assessment. The needs assessment will comprise of programme activities such as formative assessment, health, quality of life, behaviour, and environment assessment, capacity assessment and also establishing programme outcomes [141]. The main aim of this step is to identify the overall objective of the worksite health promotion programme intervention. This will include the identification of problem behaviours and desired programme outcomes as well as the environmental conditions associated with the identified problems [141]. Thereafter, designing the guidelines and intervention programme [141] . This will include consultation with the nurses, creation of programme scope, reviewing available materials and developing needed programme materials [141].

STRENGTHS AND LIMITATIONS

To our knowledge this study is among the first to investigate nurses' perceptions of health and the determinants of healthy lifestyle behaviours in both day and night shift nurses in South Africa. The strengths include the use of both qualitative and quantitative research methods. The qualitative research method provided an opportunity for capturing a range of in-depth opinions among the nurses and management personnel. Furthermore, self-reported and objectively measured physical activity data was collected the same week for analysis from both the day and night shift nurses.

However, this research is not without limitations, one of which is the possible respondent bias in the GPAQ, due to social desirability, thus resulting in the under estimation of daily sitting time and over estimating daily physical activity. To reduce bias, objective methods were used to measure sedentary time and physical activity levels as a criterion measure. Another limitation was the missing BMI data. The nurses did not know their height and weight measurements. Nonetheless, we were able to use clothing size as a proxy for waist circumference.

CONCLUSION

In summary, our data shows that nurses are concerned about their lifestyle and risk of non-communicable diseases. They expressed an interest in workplace health promotion programmes, one of which was to increase levels of physical activity. Objective measures of PA show that the night shift nurses are more active, but also spend more time sitting than the day shift nurses. These findings suggest that hospital managers and employers should consider implementing WHPP's. The programmes should be tailored according to the nurses' work demands and aim to reduce as many barriers to participation as possible. A summary of the main findings of the *mini-dissertation* is presented in Table 8.

Table 8: Summary of the main findings

Chapter	Findings
Chapter 2, Study 1: Qualitative descriptive study	<ul style="list-style-type: none"> - Night shift nurses frequently identified weight gain and living with NCDs such as hypertension as their main health concerns. - Being overweight was perceived to have a negative impact on work performance. - Nurses frequently mentioned lack of time to prepare healthy meals due to long working hours and being overtired from work. - Nurses identified a preference for WHPPs that provided access to fitness facilities or support groups.
Chapter 3, Study 2: Quantitative (Pilot study)	<ul style="list-style-type: none"> - According to the accelerometer results, all the nurses analysed in this study, n=55 (100%) met the public health recommendations of equal to or greater than 150 minutes of moderate and vigorous intensity PA/wk. - Only 65% nurses reported meeting equal to or more than 150 minutes of moderate and vigorous intensity PA/wk. - The night shift nurses accumulated significantly more moderate intensity PA and steps per day than day shift nurses. - Objectively-measured sedentary behaviour was significantly lower (as a % of wake time) in night shift compared to day shift workers. - Nurses who reported being diagnosed with NCDs engaged in less moderate intensity physical activity and moderate and vigorous intensity physical activity compared to nurses who did not report any NCDs.

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APPENDIX A



UCT/MRC RESEARCH UNIT FOR EXERCISE SCIENCE &
SPORTS MEDICINE Faculty of Health Sciences, University of Cape
Town
Private Bag, Rondebosch 7700, South Africa
Tel: + 27-21-650-4561 Fax: + 27-21-686-7530
Director: Professor T D Noakes
Discovery Health Professor of Exercise and Sports Science

Dear Interested participant

We would like to invite you to participate in the following research study;

A Formative Assessment of Nurse's Lifestyle Behaviours and Health Status

What is this research study about?

The UCT/MRC Exercise Science and Sports Medicine Research Unit will be conducting a formative assessment to establish the health status, lifestyle behaviours (smoking, physical activity and nutrition) and health concerns among nurses working in Cape Town hospitals.

Healthcare workers have high physical work demands including manual work tasks such as lifting patients and having to work in awkward work postures, placing them at increased risk for musculoskeletal pain. Previous research in Kwa Zulu Natal has reported that South African healthcare workers have poor overall health status and fitness profiles, which has been associated with increased prevalence of lower back pain. In addition, those nurses with higher body fat percentages were more likely to experience lower back pain.

We would like to develop an intervention programme for nurses to address their health concerns such as musculoskeletal pain and risks for cardiovascular disease. However, we would like to hear the nurse's views and opinions to inform the best options for worksite health promotion programmes and interventions that could take place in hospitals in the future.

Therefore, the main aim of this research study is to conduct a formative assessment among nurses and healthcare workers to establish their health status, lifestyle behaviours and health concerns. The results of this formative assessment will be used to develop a comprehensive intervention programme for nurses.



The University of Cape Town is committed to policies of equal opportunity and affirmative action which are essential to its mission of promoting critical inquiry and scholarship



Why have I been invited to participate?

You have been invited to participate in the research study because you are currently employed in a nursing position at the hospital.

If I choose to participate, what is involved?

You will be requested to complete 3 questionnaires, which will take approximately one hour to complete. [In addition, we will ask you to wear an activity monitor, called an accelerometer.](#)

The questionnaires are:

A: Health Risk Appraisal (HRA) Questionnaire

The HRA is comprised of demographic, health and lifestyle factors, as well as questions related to stages of change for the various lifestyle behaviours. We will ask questions related to your height, weight, cholesterol, glucose and blood pressure measurements. In addition you will answer questions related to your self-perceived health status, nutritional habits, smoking status and working environment. This questionnaire also includes questions where you be asked to rate your hospital / employer's interest and commitment to health promotion programmes.

B: Global Physical Activity Questionnaire

The aim of this questionnaire is to determine how much physical activity you are able to fit into your usual week. A sub-sample of nurses will be randomly selected to wear a pedometer for 4 consecutive days to measure the number of steps taken per day. A pedometer is a step counter and due to the busy nature of nursing, we would like to measure the number of steps nurses take at work during their shifts.

C: Horne-Ostberg Morning-Evening Personality Questionnaire (Appendix 6)

This questionnaire aims to establish whether the you are a night owl (evening) or lark (morning) person. It comprises of 20 questions related to the time that you wake up wake up, how refreshed you feel upon waking and whether you need to use an alarm clock to wake up in the morning.

[Accelerometer](#)

[The accelerometer is a small device approximately the size of a matchbox. It has a small pendulum device inside it that enables the accelerometer to measure movement, both forwards and backwards and also up and down. We are requesting that you wear the accelerometer on your left or right hip, for seven consecutive days.](#)

We will provide a belt so that you can attach the accelerometer to it, as it is very important that the accelerometer is held firmly in position. You can take it off when you are sleeping and also during water-based activities (such as bathing and showering) as the device is not water-proof.

Incentive to complete survey

All the nurses who complete the survey will be entered into a lucky draw competition. The prize draw will take place three weeks after the nurses have received the survey, and will take place at their worksite. This prize will be either a massage, manicure and pedicure, or a meal voucher at a neighbouring restaurant. The prize will be valued at R200.

Ethical considerations

Participation or non-participation is voluntary, will not affect your occupation or employ, and all information obtained will be confidential. No individual-level information will be made available to your employer / hospital executives. The results from your survey, together with an interview with the hospital management and focus group discussions, will be combined with other hospitals in the Cape Town area when writing the research report.

Inquiries:

Please feel free to contact Dr Tracy Kolbe-Alexander (021 650 5126 or tracy.kolbe-alexander@uct.ac.za) if you need any further information or points of clarity. Please feel free to ask about any aspects of the research. The results of the formative assessment will be sent to all participants upon completion of the data collection and analysis.

Use of Information:

Since these focus group discussions are being conducted for the purpose of scientific research, you are also hereby required to grant consent for the use of this information for this purpose. All information obtained will be regarded as being privileged, and subsequently confidentiality will be maintained.

Freedom of Consent:

Your participation in this test is voluntary and you have the freedom to withdraw at any stage.

This study will be conducted in accordance with the Declaration of Helsinki, Good Clinical Practice as well as the laws of the Republic of South Africa.

Should you have any queries regarding your rights and welfare as a research participant, please contact:

Prof. Marc Blockman
Chairperson
Health Science Faculty Research Ethics Committee
021 406 6492
E52-24 Grootte Schuur Hospital Old Main Building
Observatory, 7925

DECLARATION BY PARTICIPANT:

I the undersigned _____, hereby agree that I have fully read and understood this form and that I understand the nature, purpose and procedures of this research study. My agreement to participate in this study is voluntary and I am aware that I can withdraw at any stage that I feel appropriate. On the basis of the above, I hereby agree to participate in this study being conducted by the UCT/MRC Research Unit of Exercise Science and Sports Medicine.

Name of Participant: _____

Participant Signature: _____

Date: _____

Name of Researcher: _____

Researcher Signature: _____

Date: _____

Name of Witness: _____

Witness Signature: _____

Date: _____

Principal Investigator:

Dr Tracy Kolbe-Alexander

Tel: 021 650 5126

Email: tracy.kolbe-alexander@uct.ac.za

APPENDIX B

A Formative Assessment of Nurse's Lifestyle Behaviours and Health Status

Phase 2: Accelerometer Study

Demographic Information:

Name	
Participant Code	
Accelerometer Number	
Current Shift	
Hospital Name	
Ward	
Telephone number	
Email Address	
Date and time Accelerometer given	
Date Accelerometer collected	
Download date	

This week's shift: (to be completed when collecting accelerometer)

Day	Week day							Work hours
1	M	Tu	W	Th	Fri	Sa	Su	
2	M	Tu	W	Th	Fri	Sa	Su	
3	M	Tu	W	Th	Fri	Sa	Su	
4	M	Tu	W	Th	Fri	Sa	Su	
5	M	Tu	W	Th	Fri	Sa	Su	
6	M	Tu	W	Th	Fri	Sa	Su	
7	M	Tu	W	Th	Fri	Sa	Su	
8	M	Tu	W	Th	Fri	Sa	Su	

SECTION A: SOCIO-DEMOGRAPHIC INFORMATION

1. What is your date of birth?

Date/month/year / /

2. What is your gender? (Please tick next to the correct answer)

Male Female

3. What is your marital status? (Please tick next to the correct answer)

Never married Married Single
Divorced / separated Widow / widower Living with partner

4. What is your highest educational qualification? (Please tick next to the correct answer)

High School College or technical school diploma
University of Technology diploma University degree
Masters degree or equivalent PhD

5. Which shift are you working today? Tick only one box

Day shift OR Night shift

6. How would you best describe your work over the past 12 months? Tick only one box

Mostly Day shift Mostly Night shift
Rotational shifts (day alternating with nights)
Agency nurse Other, eg, locum

7. How long have you been working shifts altogether?

Years	Months

8. How are your night shifts organised?

(please tick the one which best describes your night work)

- Permanent nightshift
- A single block of night duty per year
- Occasional blocks of night duty per year
- Less than 3 nights each week
- More than 3 nights each week
- Other, *(please specify)*

9. If you do work rotational shifts, how many nights are you on duty and how many nights off duty in a 7 day period?

Nights on duty	
Nights off duty	

10. How would you describe your general health?

- Very good
- Good
- Average
- Poor
- Very Poor

11. How tall are you?

Centimeters:

12. How much do you weigh?

Kilograms:

13. What is your waist circumference?

Centimeters:

14. What size skirt or trousers do you wear?

Size:

15. Has a doctor or a healthcare professional told you that you currently have any of the following illnesses?

	Yes	No	Don't know
High Blood Pressure			
Heart disease (chest pain, angina, shortness of breath, heart attack)			
High blood cholesterol			
Diabetes			
Tuberculosis (TB)			
Emphysema / asthma / bronchitis			
Cancer			
Arthritis / rheumatism			
Foot / knee / hip problems			
Back pain / problems			
Chronic headaches or migraines			
Digestive problems such as inflammatory bowel disease			
Other, please specify			

16. Do you currently smoke tobacco products (cigarettes / cigars / pipe)?

No (non-smoker) Ex-smoker Yes, (current smoker)

17. Do you participate in physical activity during your leisure time?

Yes No

18. If yes, how much time on average, do you spend doing physical activity per week?

Days per week	
Minutes of activity on these days	

19. How does working night shifts influence your leisure time physical activity?

- I am **more** physically active during my leisure time when I work night / rotational shifts.
- I am **less** physically active during my leisure time when I work night / rotational shifts.
- There is no change in my physical activity habits

20. What would best describe how you feel about your levels of physical activity.

- I am happy with my current levels of physical activity.
- I know I should be more physically active, but do not plan to start anytime soon.
- I would like to become more physically active and plan to increase my levels of physical activity within the next 6 months.

APPENDIX C

Global Physical Activity Questionnaire

Participant Code:

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP						
<p>These questions are about the time you spend doing different types of physical activities. This includes activities you do at home, at work, travelling from place to place and during your spare time. You are requested to answer the questions even if you don't consider yourself to be an active person.</p>									
<p>Occupation-Related Physical Activity (paid or unpaid work): When answering the following questions, think back over the past 12 months and consider (think of) a usual week.</p>									
1	<p>Does your work involve <u>mostly</u> sitting or standing still, OR walking for very short periods (less than 10 minutes)?</p>	<p>MOSTLY SITTING..... 1 MOSTLY STANDING STILL 2 MOSTLY WALKING FOR VERY SHORT PERIODS 3 MOSTLY DOING MODERATE/VIGOROUS ACTIVITY 4 NONE OF THE ABOVE..... 5</p>	<p>→4 →5A</p>						
2A	<p>Does your work involve <u>vigorous</u> activities, (like heavy lifting, digging, or heavy construction) for at least 10 minutes at a time?</p>	<p>YES 1 NO..... 2</p>	<p>→3A</p>						
2B	<p>In a usual week, how many days do you do <u>vigorous</u> activities as part of your work?</p>	<p>DAYS <table border="1" data-bbox="1203 1547 1326 1688"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table></p>							
2C	<p>On a usual day on which you do <u>vigorous</u> activities, how much time do you spend doing such work?</p>	<p>HOURS 1 <table border="1" data-bbox="1203 1839 1326 1980"> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> <tr><td> </td><td> </td></tr> </table></p>							

		MINUTES 2	<table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>																								
3A	Does your work involve <u>moderate-intensity</u> activities (<u>like</u> brisk walking or carrying light loads) for at least 10 minutes at a time?	YES 1 NO 2	→4																								
3B	In a usual week , how many days do you do <u>moderate-intensity</u> activities as part of your work?	DAYS	<table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>																								
3C	On a usual day on which you do <u>moderate-intensity</u> activities, how much time do you spend doing such work?	HOURS 1 MINUTES 2	<table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table> <table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>																								
4	How long is your usual workday?	HOURS 1 MINUTES 2	<table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table> <table border="1"> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> <tr><td></td><td></td><td></td><td></td></tr> </table>																								

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP																					
<p>Travel-Related Physical Activity: Other than activities that you've already mentioned, I would like to ask you about the way you travel to and from places (to work, to shopping, to market, to church, etc.).</p>																								
5A	Do you walk or use a bicycle (pedal cycle) for at least 10 minutes at a time to get to and from places?	YES 1 NO 2	→6																					
5B	In a usual week, how many days do you walk or cycle for at least 10 minutes to get to and from places?	DAYS..... <table border="1" data-bbox="1187 689 1310 835" style="display: inline-table; vertical-align: middle;"> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </table>																						
5C	On a usual day, how much time do you spend walking or cycling for travel?	HOURS..... 1 <table border="1" data-bbox="1187 943 1310 1088" style="display: inline-table; vertical-align: middle;"> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td></tr> </table> MINUTES 2 <table border="1" data-bbox="1187 1144 1369 1290" style="display: inline-table; vertical-align: middle;"> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </table>																						
<p>Non-Work Related and Leisure Time Physical Activity: The next questions ask about activities you do in your leisure or spare time, for recreation or fitness. Do not include the physical activities you do at work or for travel already mentioned.</p>																								
6	In your leisure or spare time do you do any vigorous or moderate-intensity physical activity lasting more than 10 minutes at a time?	YES 1 NO 2	→9																					
7A	In your leisure or spare time, do you do any vigorous activities (like running or strenuous sports, weightlifting) for at least 10 minutes at a time?	YES 1 NO 2	→8A																					

7B	In a usual week , how many days do you do <u>vigorous</u> activities as part of your leisure or spare time?	DAYS..... <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div>	
7C	How much time do you spend doing this on a usual day ?	HOURS.....1 <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> MINUTES2 <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] [] </div>	
8A	In your leisure or spare time, do you do any <u>moderate-intensity</u> activities (like brisk walking, cycling or swimming) for at least 10 minutes at a time?	YES1 NO2	→9
8B	In a usual week , how many days do you do <u>moderate-intensity</u> activities as part of your leisure or spare time?	DAYS..... <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div>	
8C	How much time do you spend doing this on a usual day ?	HOURS.....1 <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] </div> MINUTES2 <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] [] </div> <div style="display: flex; justify-content: space-between; width: 100px;"> [] [] [] </div>	

Sitting / Resting Activity: Now I would like to ask you about the time spent sitting or resting, not including sleeping, **in the past 7 days**. This may include time sitting at a desk, visiting friends, reading, or sitting down to watch television **during working hours and leisure or spare time**.

9	Over the past 7 days , how much time did you spend sitting or reclining (lying) on a usual day (excluding sleeping) ?	HOURS.....1 MINUTES2	
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