

Describing the influences working night shift has on the health and wellbeing of nurses in private healthcare settings

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Thesis presented in partial fulfilment of the requirements

for the degree of

Master of Nursing Science

in the Faculty of Medicine and Health Sciences at

Stellenbosch University



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March 2018

DECLARATION

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March 2018

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ABSTRACT

Literature has shown that working night shift influences the health of night shift workers. These influences include sleep deprivation, disrupted sleeping patterns, chronic fatigue, weight gain, digestive problems, mental health problems and the development of chronic diseases such as hypertension. To date, few studies were found that report on the influence night shift has on the health of nurses in the South African context.

The aim of the study was to investigate what influences working night shift has on the health of nurses in private health settings. The objectives of the study were to:

- Identify and describe the sleeping patterns of night shift nurses;
- Describe the energy levels of night shift nurses;
- Describe current health and wellbeing of night shift nurses;
- Identify and describe the amounts of stimulants used by night shift nurses; and
- Describe the presence of anxiety and depression among night shift nurses.

A quantitative approach with a descriptive design was applied. The population consisted of N=509 nurses working night shift in the private health sector in the City of Cape Town. A calculated thirty percent (n=153) sample was drawn at each hospital identified for the project through systematic random sampling. The questionnaire that was used in this study is the validated Standard Shift work Index. The main study had been preceded by a pilot test. Ethical approval was obtained from the Health Research Ethics Committee (HREC) at Stellenbosch University. Institutional permission was obtained from the heads of the various participating hospitals to conduct the study. Other ethical principles that were considered are anonymity, confidentiality, beneficence, justice and voluntary participation.

The researcher collected all the data herself. An experienced statistician assisted with the data analysis, using the Statistical Package of Social Sciences (SPSS).

The findings of the study confirmed that the participants in the study experience high levels of fatigue, sleep disturbances, cardiac symptoms, digestive symptoms, stimulant use, depression and anxiety.

A number of participants reported to have developed diseases such as chronic back pain, headaches, hypertension, sinusitis and tonsillitis after commencing with night duty.

Key terms: night shift work, health influences, night shift nurses, digestive symptoms, cardiac symptoms, stimulants, medication, sleep disturbances.

OPSOMMING

Literatuur toon dat nagskofwerk die gesondheid van nagskofwerkers beïnvloed. Dié invloede sluit slaap-deprivasie, ontwrigte slaappatrone, chroniese moegheid, gewigstoename, spysverteringsprobleme, ontwikkeling van chroniese siekte en ook invloede op geestesgesondheid in. Tot datum is daar min studies gevind wat oor die invloede wat nagskofwerk op die gesondheid van verpleegsters in die Suid-Afrikaanse konteks het, verslag gee.

Die doel van die studie was om die invloede wat nagskofwerk op die gesondheid van verpleegsters wat werksaam is in die privaat sektor, te ondersoek. Die doelwitte van die studie was om:

- Slaappatrone van nagskof verpleegsters te identifiseer en te beskryf;
- Energievlakke van nagskof verpleegsters te beskryf;
- Hul huidige gesondheid en welstand te beskryf;
- Die gebruik van stimulant onder nagskof verpleegsters te identifiseer en te beskryf; en
- Die teenwoordigheid van angs en depressie in nagskof verpleegsters te beskryf.

'n Kwantitatiewe benadering met 'n beskrywende ontwerp was aangewend. Die populasie het uit N=509 verpleegsters wat nagskof in die privaat gesondheidssektor van die Stad van Kaapstad werk, bestaan. 'n Berekende dertig persent (n = 153) steekproef was by elke hospitaal deur sistematiese ewekansige steekproefneming getrek. Die vraelys wat in hierdie studie gebruik was, is die gevalideerde Standard Shift work indeks. 'n Loodstoets het die hoofstudie voorafgegaan. Etiese goedkeuring is vanaf die Gesondheidsnavorsings-etiekomitee te Universiteit Stellenbosch verkry. Institusionele toestemming is vanaf die hoofde van die verskillende deelnemende hospitale verkry om die studie uit te voer. Ander etiese beginsels soos anonimiteit, konfidensialiteit, liefdadigheid, geregtigheid en vrywillige deelname was in ag geneem.

Die navorser het al die data self versamel. 'n Ervare statistikus het die data deur middel van statistiese sagteware, d.i. die Statistical Package of Social Sciences (SPSS) ontleed.

Die bevindinge van die studie het bevestig dat die deelnemers in die studie hoë vlakke van moegheid, slaapversteuringe, hartsimptome, spysverteringsimptome, die gebruik van stimulant, depressie en angs ervaar het.

'n Aantal deelnemers het die ontwikkeling van siektes soos kroniese rugpyn, hoofpyne, hipertensie, sinusitis en tonsillitis na die aanvangs van nagdienswerk, gerapporteer.

Sleutelwoorde: nagskofwerk, gesondheids-invloede, medikasie, nagskofverpleegsters, spysverteringsimptome, hartsimptome, stimulant, slaapversteurings.

ACKNOWLEDGEMENTS

I would like to express my sincere recognition and gratitude to the following role-players:

- Our Heavenly Father, for I can do all things through Christ who strengthens me.
- My parents and family, for teaching me and modelling resilience.
- My mother Katie Beukes, for praying for me and helping where she could.
- My Father John Beukes, for always being proud of me.
- My husband Robert Bruce, for making my tasks around the house lighter.
- My children, York and Mckenzie, who were willing to share me with the books and thus had to take a backseat sometimes; my daughter who indirectly inspired this study.
- My brother Cobin-John, my sister Rochelle, my cousins Bianca and Jerome for always being there for me.
- Mrs M. Van Der Heever, my supervisor for her guidance.
- Ms T. Crowley, for her valuable input.
- Brenda van Rensburg and Hugo Chandler, for language editing
- Ms T. Esterhuizen, for data analysis
- Ms S. Delport, for technical editing
- Mediclinic Louis Leipoldt, for allowing me time off from work whenever I needed it.
- The staff at Mediclinic Louis Leipoldt, for all the love, support and encouragement.
- Ms Anna Mostert, who is a role model and inspiration to me in many ways.
- My colleagues, Samantha Du Plessis and Edna Terblanche, for the role they played in supporting me.
- All the nursing staff at various hospitals for participating in the study.
- And last but not least thank you to my colleagues and everyone else who believed that I could complete this journey successfully.

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ABBREVIATIONS

SSI Standard Shiftwork Manual

REM Rapid Eye Movement

CHAPTER 1: SCIENTIFIC FOUNDATION OF THE STUDY

1.1 INTRODUCTION

Working night shift is a worldwide phenomenon and most nurses work night shift at some point in their careers as clinical nurses (Drake & Wright, s.a.:784). According to the literature, night shift work influences the health of nurses negatively (Gaultney & Collins-McNeil, 2009:132; Takahashi, 2012:6). Nurses who work night shift tend to develop diseases such as diabetes, mental illness, muscular-skeletal illnesses and cancers. The negative influences on health tend to occur within a short period of working night shift. These influences also tend to worsen as nurses continue to work night shift (Costa, 1996:9).

There are various reasons why nurses choose to work extended periods of night shift, for example, being able to meet family responsibilities during the day, the slower pace and lighter workload at night, and additional earnings in the form of a night shift allowance (Akerstedt, 1998:117).

Since patients need continuous care, healthcare settings need to deliver a twenty-four-hour service. Therefore, night shift work is a reality for healthcare workers and a major feature of work life in nursing (Akerstedt, 1998:117).

Working during the natural rest period of the human body, causes physiological stress as the body is forced to do the opposite of what it is designed to do (Gaultney & Collins-McNeil, 2009:132; Takahashi, 2012:6). Generally, the amount of quality sleep that a night shift worker obtains is insufficient, since night shift workers sleep when they are supposed to work and work when the body is supposed to sleep. The low amount of quality sleep, together with circadian misalignment, negatively influences physical health, emotional, mental abilities and general wellbeing, as well as productivity and performance (Gaultney & Collins-McNeil, 2009:132; Johnson, 2010:147). This could be the reason why absenteeism is significantly higher in the night shift worker than in the daytime worker (Coburn & Sirois, 2000:28; Drake & Wright, s.a.:784; Gaultney & Collins-McNeil, 2009:132; Takahashi, 2012:6).

From personal experience, the researcher has observed that nurses working night shift for longer periods are frequently off sick, often due to chronic disease or depression. The researcher therefore wished to explore the possible influences that working night shift has on the health of nurses.

1.2 BACKGROUND AND RATIONALE

1.2.1 Relevance of researching the influences that night shift has on the health and wellbeing of nurses in South Africa

In South Africa, a large percentage of the population is working night shift and the numbers are expected to continue rising (Adler, 1991:38). Nevertheless, only six South African research sources regarding the health influences of working night duty were sourced. These sources were all in the form of theses. Except for one recent study, the rest were all older than ten years. Only two of these studies were conducted in the nursing field and only a small section of these studies focused on the health of nurses working night shift (Swartz, 2006:49; Madide, 2003:10). One study focused on breast cancer development in night shift working females. (Moukangoe, 2013:49). This study included shift workers in general and was not focused on night shift only. Other studies were conducted on mine workers, the tyre and rubber industry and truck drivers (Potgieter, 1996:1; Maldonado, 2003:1). Therefore, the research in South Africa regarding health influences working night duty has on nurses, is lacking. Researching the health and wellbeing of nurses working night shift, will provide the evidence and insight to manage the health of nurses effectively, and consequently impact on the quality of patient care.

1.2.2 Shifts

The Basic Conditions of Employment Act No. 75 of 1997 states that an employer may not require or permit an employee to work more than twelve hours on any day. The frequency of night shift work, work over weekends and public holidays should be limited. Employers should consider the difficulties employees may have to adapt to night work. It is therefore required that the night shift worker should be provided with periods of rest (Republic of South Africa, 1997:11).

In South Africa (SA) nursing shifts are scheduled over a four-week period whereas nursing shifts in the United Kingdom (UK) are scheduled over a seventeen-week period. Section 10(2) of The Basic Conditions of Employment Act No. 75 of 1997 specifies that maximum hours of work over a four-week period should not exceed 45 hours per week i.e. 180 hours per month (Republic of South Africa, 1997:11). In the UK a formula is applied to calculate the employee's work hours for each twenty-four hours, during a reference period of less than seventeen weeks, for example, due to resignation or illness. The formula is: $A \div (B-C)$ where A is the number of hours during the reference period, B is the number of days and C is the total number of hours during the reference period, including rest periods divided by twenty-four. An

employee's maximum hours of work over a seven-day period should not exceed forty-eight hours (United Kingdom, 1998:4).

Nurses in the UK either work six, eight or twelve-hour shifts, depending on the country/state for example Wales, Ireland, or Scotland, and this is also hospital-dependent (Brucker, Burke, Curtois, Qu & Venden Berghe, 2009:6).

From personal experience, the researcher gathered that nurses in South Africa generally work twelve-hour night shifts, which amount to 168 hours per month. These shifts are worked from seven p.m. to seven a.m. Shift rosters are scheduled mainly to suit the service, but do take individual preferences into account where possible. Night shifts are rostered in three different ways: two to three twelve-hour shifts followed by one to two nights off, which amounts to 168 hours per month; seven twelve-hour shifts followed by seven nights off; or a midweek schedule whereby the nurse works twelve-hour shifts from Monday to Thursday (Madide, 2003:10).

More information regarding shifts can be found in Chapter 2 under Section 2.3 - Policies regarding night shift.

1.2.3 Circadian misalignment

The mechanisms linking shift work to health problems are not explicitly clear, but changed circadian rhythm, sleep problems, stress, lifestyle and behavioural changes may be potential mediators (Kim, Son, Park, Choi, Yoon, Lee, Cho & Cho, 2013:1204; Croskery & Cosby, 2009:261). Circadian rhythm can be explained as the internal body clock or the master clock of the body. It is the body's endogenous clock, signalling the body when to release or withdraw certain hormones (Lange, Dimitrov & Born, 2010:48). People are biologically inclined to experience different levels of sleepiness and alertness throughout the day – these levels of sleepiness and alertness are regulated by circadian rhythms (Coburn & Sirois, 2000:28; Cherry, 2013:n.p.; Lange et al., 2010:48; Schwartz, 2010:18).

The nervous system of the body is not designed for working at night and sleeping during the day. Night shift work compels workers to invert the body's normal activity-rest cycle, forcing it to adjust its normal function to the night activity period (Price, 2011:38).

Chronic fatigue syndrome, a very debilitating condition characterised by fatigue, malaise, non-refreshing sleep and cognitive problems, has been noted as a symptom of disrupted or misaligned circadian rhythm (Schwartz, 2010:18; Tyron, Jason, Frankenberry & Torres-Harding, 2004:849).

A recent study regarding circadian misalignment have shown that there is a definite correlation between night shift work and ischaemic heart disease, changes in systolic and diastolic blood pressure, supraventricular and ventricular cardiac arrhythmias, diabetes, inflammation and platelet activity (Kim, Jong-Shin & Kim, 2012:369).

1.2.4 Rapid Eye Movement sleep

Rapid Eye Movement (REM) sleep refers to a phase of total relaxation and deep sleep. The night shift worker often experiences sleep loss during the REM phase (Carskadon & Dement, 2007:21). Imperfect sleeping conditions during the day such as excessive light and noise influence the quality of sleep experienced by night shift workers, ultimately resulting in a loss of deep sleep (Admi, Tzischinsky, Epstein, Herer & Lavie, 2008:250-257; Coburn & Sirois, 2000:28; Smith, Robinson & Segal, 2013:n.p.; Carskadon & Dement, 2007:12; Fox, 1999:44; Horne, 2000:777).

1.2.5 Quality sleep

In addition to the negative factors mentioned above, the sleep of a night shift worker is often postponed, to attend to domestic demands. Society tends to underestimate the importance of sleep and sacrifices sleep to work or play (Gaultney & Collins-McNeil, 2009:132; Smith et al., 2013:n.p.). The way night shift workers manage their sleep influences how their bodies respond to night shift work (Drake & Wright, s.a.:784).

Quality sleep contains all the important phases of sleep, including most importantly, deep sleep (REM) which is much needed for recuperation and is free from interruptions (Depoortere, Francon, Granger & Terzano, 1993:786; Fox, 1999:44). Without quality sleep one cannot maintain optimal productivity, health, sharpness, emotional balance, physical activity and optimal body weight (Gaultney & Collins-McNeil, 2009:148).

1.2.6 Sleep deprivation

The night shift worker is chronically subjected to insufficient sleep and is therefore chronically deprived of sleep (Gaultney & Collins-McNeil, 2009:148). Chronic sleep deprivation is evident in professionals doing shift work in healthcare facilities (Admi et al., 2008:250).

Gaultney and Collins-McNeil (2009:148) found that on average, the night shift worker sleeps 1.1 hours less per day than day workers. This loss of sleep can amount to four to seven hours of sleep debt per week.

A lack of sleep or sleep deprivation was found to be associated with serious health problems, for example, depression, obesity, diabetes and cardiovascular disease (Gaultney & Collins-McNeil, 2009:134; Johnson, 2010:149).

1.2.7 Sleep problems

Sleep problems can be ascribed to a lack of sleep, chronic sleep restriction, circadian rhythm disruption or deficiencies in melatonin production (Cherry, 2013:n.p.; Schwartz & Roth, 2006:2357). Numerous night shift workers suffer from sleep disorders or sleeping problems such as patterns of involuntary sleep and insomnia (Cherry, 2013:n.p.; Gaultney & Collins-McNeil, 2009:134; Schwartz & Roth, 2006:2357; Suzuki, Ohida, Kaneita, Yokohama & Uchiyama, 2005:445).

1.2.8 Melatonin

Melatonin, a hormone secreted by the pineal gland, is responsible for regulating the sleep-wake cycle and promoting sleep (Schwartz & Roth, 2006:2357). In a healthy circadian rhythm, melatonin is excreted in a dark environment (Graves, 2001:n.p.; Horne, 2011:3).

Besides preparing the body to sleep, melatonin also performs critical tasks such as promoting health and adding to longevity (Dupont, 2013:n.p.; Jockers, 2011:n.p.; Smith, et al., 2013:n.p.; Srinivasan, Sing, Pandi-Perumal, Brown, Spence, & Cardinali, 2010:796). If melatonin is not present in optimal levels during the right time of day, i.e. night time, the sub-optimal levels thereof cause strain to the body cells, since, with low melatonin levels, certain important tasks such as detoxification and rejuvenation cannot take place (Cajochen, Krauchi & Wirz-Justice, 2003:432; Smith et al., 2013:n.p.).

1.2.9 Working night shift and cancer

Night shift workers do not only exhibit altered eating habits and altered melatonin levels, but also altered reproductive hormones. Altered reproductive hormones, together with decreased melatonin levels and poor eating habits, immediately put the night shift worker in a high-risk category for hormone-related diseases such as breast cancer (Admi et al., 2008:250; Davis & Mirick, 2006:539; Schernhammer, Laden & Speizer, 2001:1563).

1.2.10 Digestive problems

Night shift workers with sleep disorders also have higher rates of digestive tract problems (Addler, 1991:103; Admi et al., 2008:250; Planton, Meyer & Edlund, 2011:10; Schwartz & Roth, 2006:2357). Digestive problems in shift workers are due to poor eating habits and eating at abnormal times (Jockers, 2011:n.p.).

Eating during the night, when the digestive system should rest and recuperate, causes problems of the digestive tract. Night shift workers eat quickly, during short breaks, and tend to take in more stimulants such as coffee and nicotine, which puts the night shift worker at risk for developing cancers, obesity and weight gain (Costa, 1996:9; Schwartz & Roth, 2006:2357).

1.2.11 Obesity and weight gain

Night shift workers consume food over a longer period of the day, suggesting that they consume more food than a daytime worker. In addition to digestive problems, these workers tend to develop weight gain because of the quality of food that they consume, i.e., sugary drinks, coffee, caffeinated drinks and pre-packed quick meals. Hormones such as leptin and ghrelin regulate normal feelings of fullness and hunger. Ghrelin is responsible for stimulating appetite while leptin sends signals to the brain when one is saturated (Smith et al., 2013:n.p.). When quality of sleep is reduced, leptin levels decrease and ghrelin levels spike, which means more food will be needed more often to satisfy hunger (Smith et al., 2013:n.p.).

1.2.12 Vitamin D

Failure to obtain sufficient sunlight exposure (as in the case of night shift workers who spend most of their time indoors due to daytime fatigue) leads to Vitamin D deficiency. This deficiency leads not only to obesity and weight gain but also causes disorders of the bones, such as osteomalacia and osteoporosis (Pandit, 2011:n.p.; Planton et al., 2011:9). Vitamin D, also known as calciferol, is essential for proper growth and development, promotes calcium absorption and strengthens bony structures, thus minimising the risk of fractures and arthritis (Pandit, 2011:n.p.; Planton et al., 2011:10). In addition, Vitamin D enhances the immune system and protects the body from several infectious diseases (Pandit, 2011:n.p.; Planton et al., 2011:10).

1.2.13 Psychological effects of working night shift

Equally as important as the negative influences working night shift has on physical health, is their psychological impact. Sleep deprivation due to night shift work tend to cause various mental health problems, such as depression and mood disorders (Gaultney & Collins-McNeil, 2009:133; Johnson, 2010:148). Regular sleep disturbances could also cause both physical and mental breakdown (Smith et al., 2013:n.p.).

1.3 PROBLEM STATEMENT

A research problem is an area of concern in which there is a gap in knowledge needed for nursing practice (Burns & Grove, 2011:146). It is a statement that concludes the discussion of a problem. The problem statement provides the basis of the research which is done to gain

essential knowledge, and addresses the gap in the practice concerned (Burns & Grove, 2011:547).

As discussed in the background and rationale, working night shift influences physical and mental health in negative ways (Gaultney & Collins-McNeil, 2009:133; Johnson, 2010:148; Schwartz, 2010:18). The literature has also shown that healthcare workers often present with diseases such as diabetes, cancers, hypertension and muscular-skeletal illnesses, depression and mood disorders (Johnson, 2010:148; Schwartz, 2010:20). South African literature confirms the influences that working night shift has on the health of night shift workers (Addler, 1991:102; Swartz, 2006:17). However, limited research has been done on this topic in South Africa. Also, no literature or policies could be found stating what the maximum period is that one should be allowed to work night duty. It is against this background that the study was undertaken.

1.4 RESEARCH QUESTION

The first step in evidence-based practice is to ask a question. This question leads to the research study and is therefore the foundation of the study (LoBiondo-Wood & Haber, 2006:28). The research question should reflect a refinement of the researcher's initial question and presents the problem that is to be examined (LoBiondo-Wood & Haber, 2006:28-29). This study was guided by the following research question:

What influence does night shift work have on the health and wellbeing of nurses?

1.5 AIM OF THE STUDY

The aim of the study was to describe the influences that night shift has on the health and wellbeing of nurses.

1.6 OBJECTIVES

The objectives of the study were to:

- Identify and describe sleeping problems of night shift nurses;
- Describe energy levels of night shift nurses;
- Describe current health and wellbeing;
- Identify and describe amounts of stimulants used; and
- Describe the presence of anxiety and depression.

1.7 SUMMARY OF RESEARCH METHODOLOGY

The current chapter provides a summary of the research methodology that was applied in the study. A more detailed report is provided in Chapter 3

1.7.1 Research design

A quantitative approach with a descriptive design was applied for the study.

1.7.2 Population and sampling

The target population included all categories of nurses working night shift at the time of the study at six private hospitals in the northern suburbs of the Cape metropole

1.7.3 Instrumentation

The questionnaire, the validated Standard Shift work Index, developed by Shift work Research Team (2005) MRC/ESRC Social and Applied Psychology Unit, was used in this study (Appendix 1). The questionnaire has three sections and addresses all objectives of the study. The questionnaire consists mainly of four to five-point Likert scale questions and a few open-ended questions.

1.7.4 Data collection and analysis

The researcher personally collected all the data. Questionnaires in sealed envelopes were hand-delivered to all participants on their scheduled working nights at the respective hospitals. The researcher collected the sealed container the next morning at the end of the shift. A qualified statistician at Stellenbosch University assisted the researcher with data analysis and interpretation.

1.7.5 Ethical considerations

Ethical approval was obtained from the Health Research Ethical Committee at the Faculty of Medicine and Health Sciences at Stellenbosch University (Appendix 2). Institutional permission to conduct the study (attached letter; Appendix 3) was obtained from the heads of the various participating hospitals (Appendix 4). Informed consent was obtained from participants prior to the study (Appendix 5). Other applicable ethical principles that were maintained were the right to self-determination, privacy, confidentiality and anonymity.

1.8 DEFINITIONS OF THE TERMS

1.8.1 Shift work/Night shift

Shift work/night shift is defined as working out of daytime hours, including irregular rotating schedules, evening and night work (Kim et al., 2013:1204).

1.8.2. Registered nurses

A registered nurse is a person qualified and competent to practice comprehensive nursing to the prescribed level and able to assume responsibility and accountability for such practice (Republic of South Africa, 2005:25).

1.8.3 Enrolled nurses

Enrolled nurses have completed a two-year academic course that includes 2000 practical hours. They help registered nurses and lower categories with their duties when needed (Republic of South Africa, 2005:25).

1.8.4 Enrolled nursing assistants

They ensure that all the needs and comfort of patients are met (Republic of South Africa, 2005:25).

1.8.5 Melatonin

Melatonin is a hormone secreted by the pineal gland, responsible for regulating our sleep-wake cycle and promoting sleep (Schwartz & Roth, 2006:2357).

1.8.6 Circadian rhythm

The circadian rhythm can be explained as the internal body clock or the master clock of the body. The circadian rhythm is the body's endogenous clock, signalling it when to release or withdraw certain hormones (Lange et al., 2010:48).

1.8.7 Vitamin D

Vitamin D is an essential vitamin, also known as calciferol that promotes growth and development, calcium absorption and strengthens bony structures (Pandit, 2011:n.p.; Planton, et al., 2011:9).

1.8.8 REM sleep

REM is an abbreviation for the phrase, rapid eye movement, and refers to a phase of sleep recognised by the eyes moving rapidly due to total relaxation and deep sleep. REM sleep is essential for total, i.e. mental and physical, wellbeing (Carskadon & Dement, 2007:20; Fox, 1999:44; Horne, 2000:777).

1.9 THE CONCEPTUAL FRAMEWORK RELATING TO HEALTH AND NIGHT SHIFT WORK

A framework is an intangible, logical structure of meaning. The framework directs the researcher in the development of a study and enables the researcher to link the findings to evidence-based practice. It is sometimes called a theoretical or conceptual framework (Burns & Grove, 2011:238).

The conceptual framework of research is a structure of concepts pulled together as a map, indicating the relationship between these concepts (LoBiondo-Wood & Haber, 2006:57). The links between these concepts are intricately connected to create the knowledge base for the nursing phenomenon being investigated (LoBiondo-Wood & Haber, 2006:57).

The conceptual framework in Figure 1 below illustrates the conditions under which night shift work should take place, to reduce the negative influence that this activity has on health. The researcher based the framework on concepts set forth by Gaultney & Collins-McNeil (2009:132) and Takahashi (2012:6).

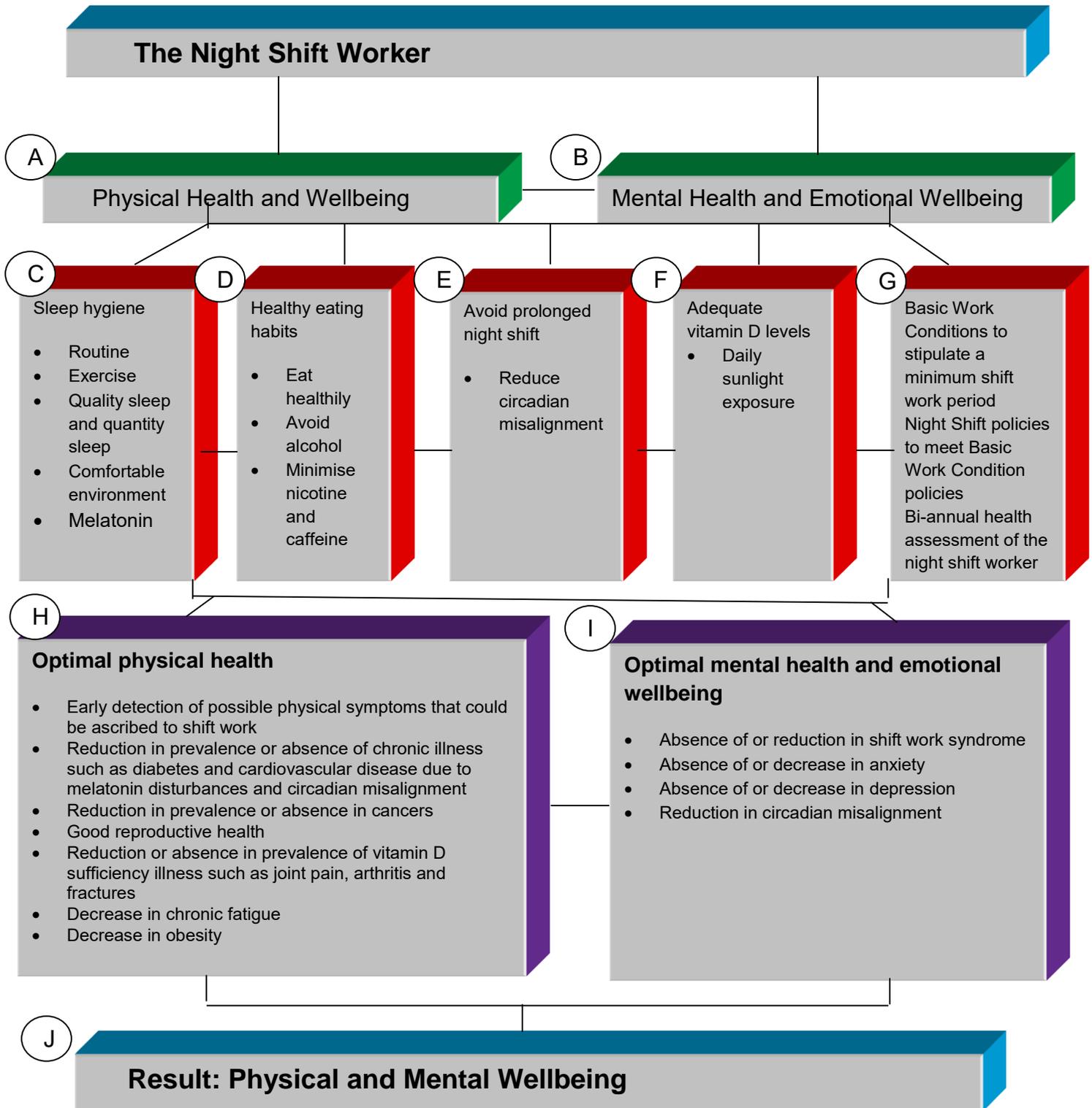


Figure 1.1: Conceptual framework

1.9.1 Discussion of the Conceptual Framework (Figure1)

The concepts in the framework are labelled with letters A –J. These labels are for explanation purposes only and do not indicate an order. This conceptual framework should be read from top to bottom to grasp the message the researcher wants to convey. Lines indicate that there is a relationship between concepts, for instance, sleep hygiene affects healthy eating habits, or mental health and emotional wellbeing are dependent on adequate melatonin levels and sunlight exposure, etc.

The green blocks, A & B, indicate the components of health, i.e. physical health and mental health and wellbeing, which are affected by night shift work. Physical and mental health is inter-dependent and contributes to the general wellbeing of a person (Gaultney & Collins-McNeil, 2009:132).

Red blocks, C-G, indicate the variables which, if manipulated, may influence the development of diseases that relate to mental and/or physical health or the absence thereof.

1.10 SUMMARY

The literature suggests that working night shift sends the body into chaos and that illness that relates to night shift work may occur amongst nurses working night shift. Working night shift is linked to numerous diseases and health effects, including sleep disorders, depression, diabetes and hypertension. The influences on health, according to literature, are related to circadian misalignment, and melatonin and vitamin D deficiency (Gaultney & Collins-McNeil, 2009:132; Takahashi, 2012:6).

This study aspired to investigate these phenomena through a descriptive quantitative approach. A succinct summary of the relevant research methodology and a conceptual map were presented.

The following chapter contains an in-depth discussion of the relevant literature.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

The previous chapter contains a discussion about the scientific background of the study and a concise summary of the methodology. The current chapter presents a review of literature on the influences that working night shift has on the health of nurses. The literature review therefore describes the background to the problem studied as advised by Burns and Grove (2011:189).

2.2 SELECTION AND REVIEW OF LITERATURE

The literature review on influences working night shift has on the health of nurses was completed over a period of eighteen months. A variety of electronic databases were searched such as PubMed, Cinhal, Science Direct, Google Scholar and Medscape. Keywords used to conduct the search were “nursing and night shift”, “health and working night shift,” “diabetes and working night shift”, “chronic illness and working night shift,” “night shift health effects”. These keywords produced results, however most articles were older than ten years old, but the researcher selected the most recent studies as far as possible. A few seminal studies could not be excluded due to their relevance and the value they add. Most night shift studies were not done on nurses but for the purpose of this study the term night shift nurse will be utilised.

The literature revealed that night shift workers tend to develop various diseases that could be related to night shift work. This review is presented under the following headings:

- Policies regarding night shift;
- Circadian misalignment;
- REM sleep and deep sleep;
- Quantity of sleep;
- Sleep deprivation;
- Circadian rhythm sleep disorders;
- Energy levels and Fatigue;
- Melatonin;
- Cancer;

- Digestive problems;
- Obesity and weight gain;
- Diabetes;
- Vitamin D;
- Psychological influences of working night shift; and
- Preventative measures.

2.3 POLICIES REGARDING NIGHT SHIFT

The Basic Conditions of Employment Act No. 75 of 1997 contains the prescribed working conditions for employees in South Africa. Section 17 of the Act relates to night shift work (Republic of South Africa, 1997:11). The Act defines night shift work as work performed after six p.m. and before six a.m. the next day. The Basic Conditions of Employment Act prescribes that employers should inform employees working night shift about the health hazards associated with night shift work (Republic of South Africa, 1997:11). It also stipulates that the employee has the right to undergo health evaluations, at the expense of the employer on a regular basis. However, it does not stipulate the frequency of these health evaluations. Furthermore, it states that an employee should be informed within due time when they are required to perform night duty. Other stipulations include: a maximum work schedule of forty-five hours per week (as discussed in Chapter 1), appropriate intervals between shifts (at least twelve hours), a weekly rest period of at least thirty-six hours, and that an employee should be transferred to day duty if the health of the employee does not allow them to work night duty (Republic of South Africa, 1997:11). The Act therefore acknowledges possible health risks related to working night shift.

The Terms and Conditions of Employment Act of 1998 No. 1833 of the United Kingdom (UK), has some similarities to the South African Act in that it states that employees are entitled to free health evaluations and that an employee should be informed within due time if he is required to do night shift. In the UK, night work hours are usually between eleven p.m. and six a.m. but can be flexible, as agreed between employer and employee. Workers may not work more than eight hours over a twenty-four-hour period. However, it is specifically stated that this eight-hour limit does not apply to industries that need to deliver a twenty-four-hour service, such as hospitals and emergency services. Furthermore, it states that the employer must be aware that the stress levels of a night worker may increase because of night shift (United Kingdom, 1998:5). Neither of these Acts specifies a limit on the period that a night shift worker should be allowed to work night shift.

The researcher approached four private hospitals to obtain information regarding their night shift policies. None of the persons contacted was willing to share information either electronically or in hard copy. However, certain information was conveyed telephonically. One company reported an annual compulsory three-month night shift period. Two of the other hospitals reported that they do not have a specific night shift policy but that the nurse's work profile states that they are required to work night shift. The fourth hospital reported that they do not have a specific night shift policy and that night shift work agreements with employees differ among the various wards. All the hospitals reported that no limit is placed on the period a night shift worker can work night shift.

2.4 CIRCADIAN MISALIGNMENT

All living beings have a circadian rhythm. The circadian rhythm is the body's endogenous clock or master clock, signalling the body when to be asleep or awake (Lange et al., 2010:48). The word, circadian, was derived fifty years ago from the Latin term *circa* (about) and *diem* (day) (Block, 2014:n.p.). Human beings are diurnal creatures, being wakeful during daylight and having a rest period during the night, as illustrated in Figure 2.1 (Vimalananda, Palner, Gerloven, Wise, Rosenwig, Rosenberg & Ruiz Narvaez, 2015:3481). The circadian rhythm controls the sleep-wake cycle, modulates physical activity, food consumption, heart rate, muscle tone and hormone secretion (Colten & Altevogt, 2006:13).

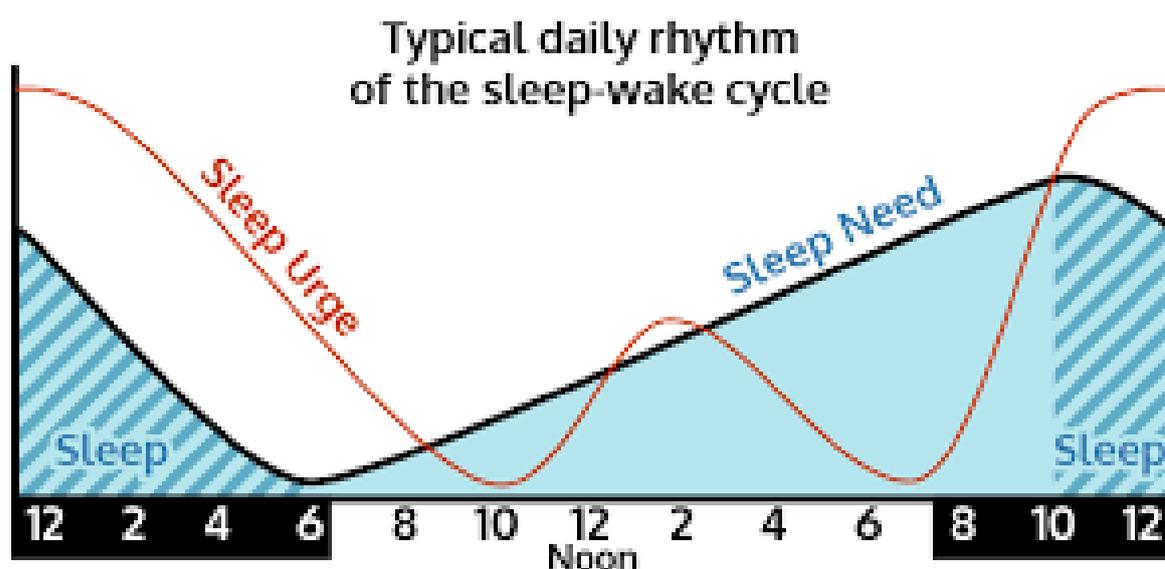


Figure 2.1: Circadian rhythm (Robins, 2017)

The suprachiasmatic nucleus, a small group of cells located in the hypothalamus of the brain, is responsible for regulating circadian rhythms in all living organisms. The suprachiasmatic nucleus receives direct input from the retina and thus acts as a brightness detector. Therefore,

eyes and light play an important role in the circadian rhythm (Colten & Altevogt, 2006:13). The circadian rhythm i.e. sleep urge, rises and dips (due to the influence of melatonin) during certain times of the day, as illustrated in Figure 2.1. In the night shift worker, who is subjected to light conditions during the night, the circadian rhythm is profoundly disrupted and therefore essential protective bodily functions may not occur in the person (Price, 2011:38).

The circadian clock is difficult to manipulate because of its inflexibility. One would expect adjustment of the circadian rhythm to occur after working night shift for some time – interestingly, this never fully happens. Only marginal adjustments of the circadian rhythm occur in night shift workers (Akerstedt, 1998:169).

Akerstedt (1998:169) states that the influences of night shift on health cannot be reversed only reduced. This is congruent with the argument of Price (2011:38) who states that all the sleep in the world cannot make up for circadian misalignment. Therefore, the night shift worker will constantly encounter health issues unless the circadian rhythm is properly aligned again by sleeping at night and being awake during the day as soon as possible. However, certain health influences which were found to be related to night shift work such as diabetes, are irreversible. Continuing with night duty will only exacerbate these influences (Price, 2011:38; Vimalananda et al., 2015:3480).

2.5 MELATONIN

The brain oversees a wide variety of biological maintenance and essential functions during sleep. One of these is the secretion of the hormone melatonin (Admi et al., 2008:250). Melatonin is scientifically known as N-acetyl-5-methoxy tryptamine. Melatonin is secreted by the pineal gland during sleep under normal night conditions such as complete darkness and cooler temperatures (Claustrat, Brun & Chazot, 2005:11). The optimal performance and secretion of melatonin is thus dependent on optimal night time sleep (DuPont, 2013:n.p.; Smith et al., 2013:n.p.; Jockers, 2011:n.p.; Srinivasan et al., 2010:796). Melatonin, in turn, controls several essential processes in the body, as illustrated in Figure 2.2. A few of these functions are highlighted below.

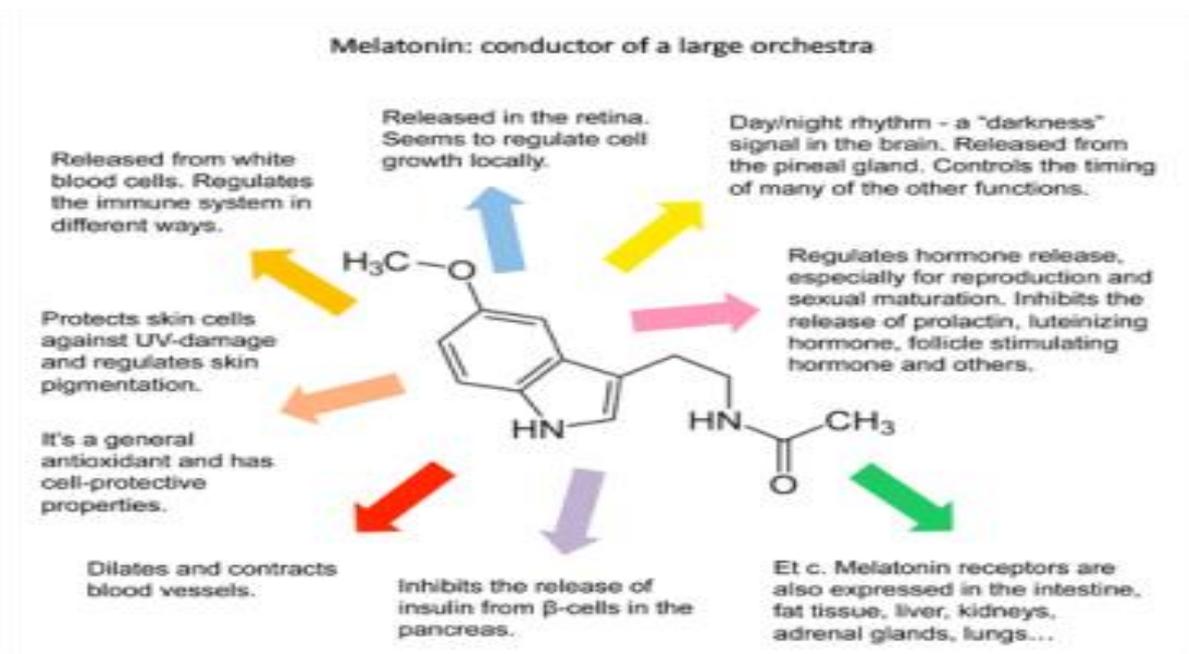


Figure 2.2: Essential functions of melatonin (Hardeland, Cardinali, Srinivasan, Spence, Brown, & Pandi-Perumal, 2011:350)

Firstly, in preparation for sleep, melatonin extracts oxygen and active hormones from the body, leading to a drop in body temperature, heart rate and respiration, allowing the body to sleep and recuperate (DuPont, 2013:n.p.; Jockers, 2011:n.p.; Smith et al., 2013:n.p.; Srinivasan et al., 2010:796).

Importantly, melatonin adjusts and protects the circadian rhythm of the body (Claustrat et al., 2005:11). When melatonin levels increase, sleep drive increases. Melatonin levels decline instead of increase in the night shift worker during the night time, due to the body fighting its natural sleep drive while working night shift. Thus, the circadian rhythm is disrupted, making the individual susceptible to illness. In a non-nightshift working individual, melatonin levels are highest during night time. Figure 2.3. illustrates normal melatonin levels in a non-night shift working individual. In an individual working night shift, these levels will either be at their lowest where they are supposed to be highest or never reaching high levels at all.

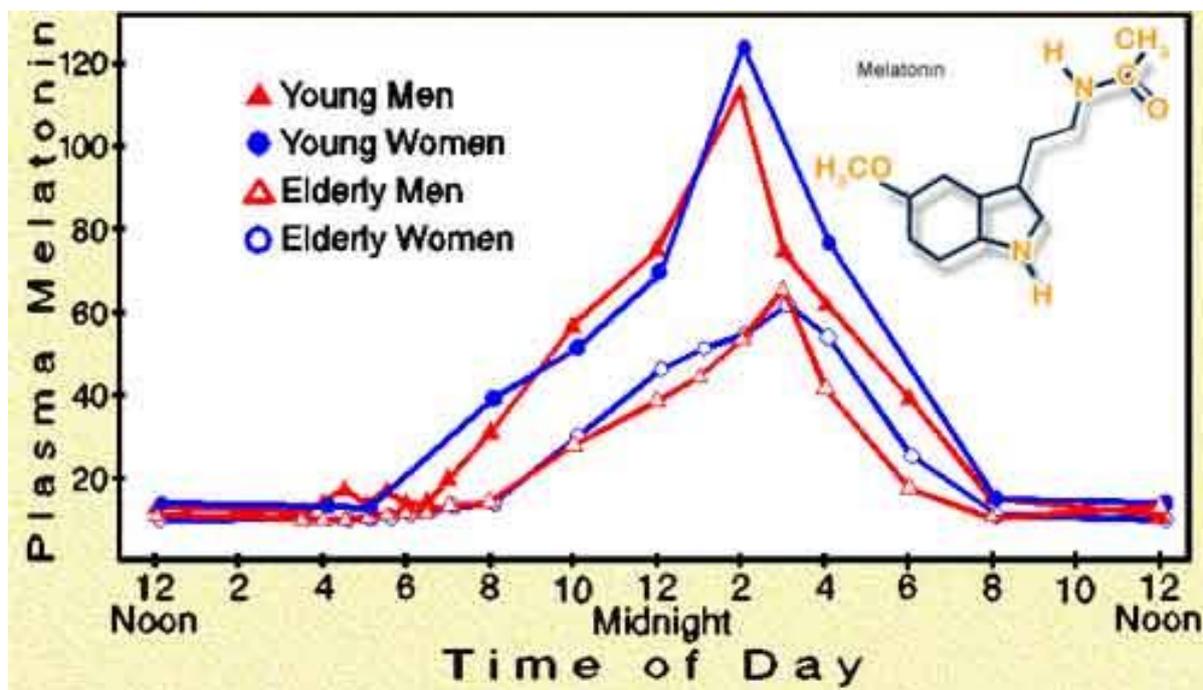


Figure 2.3: Melatonin levels over a 24-hour period (Nisbet & Rogers, 2012:n.p.)

An additional function of melatonin is to convey information concerning the daily cycle of light and darkness, to body functioning. This information is used to organise functions such as withdrawing or releasing hormones and the shutting down of mental activity, in preparation for sleep, detoxifying the body and enhancing the immune system (Claustrat et al., 2005:12).

Lowered levels of melatonin in the blood of numerous shift workers suggest the probability that night shift workers often sleep during the day and are awake during the night. These inadequate levels of melatonin cause conflict in the body, which leads to fatigue, mood disorders, performance problems, immunity imbalances and shift work syndrome (Smith et al., 2013:n.p.). Night shift workers are forced to sleep during the day; consequently, the daytime indoor lighting is bright enough to suppress sufficient melatonin production. Moreover, night shift workers are exposed to brighter than usual light conditions during the night which, yet again, suppresses the adequate production of melatonin. This, once again, leads to constant inadequate melatonin levels and thus, melatonin functioning is also inadequate. The lower levels of melatonin tend to aggravate health problems such as digestive problems and cancers, due to the inadequacy of melatonin's antioxidant and detoxification effect (Smith et al., 2013:n.p.).

A disruption in melatonin secretion therefore seems to influence the health of the night shift worker in several ways. Consequently, it is frequently referred to throughout the literature review.

2.6 REM SLEEP AND DEEP SLEEP

Another possible influence on health in the night shift worker is the interruption of REM sleep and deep sleep. Sleep, which is a universal need in all humans, has different forms, some of which are more beneficial to humans than others. Sleep unfolds in a series of recurring stages that are very different from one another. According to Smith et al. (2013:n.p.) and Carskadon and Dement (2007:16), a complete sleep cycle encompasses four stages. Smith et al. (2013:n.p.) describes these as follows:

Stage 1: Transition to sleep stage: A person relaxes with eyes closed. The waking brain wave alpha rhythms disappear and are replaced by less regular low amplitude waves. Mental activity is dreamlike.

Stage 2: Light sleep: Thoughts are wandering, and mental activity is mundane. The person is easily awoken from this stage.

Stage 3: Deep sleep: Brain waves are slow. This stage is referred to as delta sleep. Muscles relax and body temperature drops. The body recuperates.

Stage 4: REM sleep: Brain waves are deep and slow. It is difficult to be awakened from this stage.

The most rest and revitalisation occurs during the REM and deep sleep stages. During deep sleep, the body repairs itself, recuperates, maintains growth and development and repairs muscles, tissues and the immune system. Deep sleep is recognised by slow brainwaves and is the deepest stage of sleep. Equally important is the REM sleep phase which is essential for mental health and renewing of mind and neural chemicals such as dopamine and serotonin. These two chemicals regulate mood, social behaviour, appetite, digestion, sleep and memory (Smith et al., 2013:n.p.).

REM sleep and deep sleep are essential for total (i.e. mental and physical) wellbeing (Carskadon & Dement, 2007:17; Smith et al., 2013:n.p.). Conditions which are conducive to these sleep stages are minimal light and noise, cool environment temperatures and a comfortable body position (Morgenthaler, 2013:n.p.).

The night shift worker often experiences sleep loss during the REM and deep sleep phases. Subsequently, they are often deprived of quality sleep (Smith et al.). This loss of REM and deep sleep is due to excessive light and noise during daytime sleep (Smith et al., 2013:n.p.). As a result, sleep obtained during the day is of a poorer quality than normal night time sleep because of imperfect sleeping conditions (Admi et al., 2008:250-257; Smith et al., 2013:n.p.).

Sleep under optimal conditions stimulates the essential physiological changes in certain body systems, for example the cardiovascular system, which leads to a decrease in blood pressure and heart rate (Colten & Altevogt, 2006:13). Other physiological changes that occur during night time sleep under optimal conditions include decreased cerebral blood flow, which is associated with a reduction in the flow of white blood cells and metabolism and is necessary for recuperation of the brain. Changes that relate to the renal system include decreased excretion of sodium, potassium, chloride and calcium. These changes in renal function that occur during sleep are complex and include changes in renal blood flow, glomerular filtration, hormone secretion and sympathetic neural stimulation (Colten & Altevogt, 2006:13). Sleep under optimal conditions, also leads to a decrease in the respiratory rate and rib cage movement, and an increase in upper airway resistance due to loss of tone in intercostal and upper airway muscles (Colten & Altevogt, 2006:13). Subsequently, sleep under optimal conditions, that is, night time, benefits the human body, since it allows for maximum recuperation.

To sum up, the quality of sleep directly influences the quality of a person's waking life. It impacts emotional balance, physical vitality, health and even weight. No other activity delivers so these benefits with so little effort (Smith et al., 2013:n.p.; Maldonado, 2003:52).

2.7 QUANTITY OF SLEEP

As just described, quality sleep comprises deep and REM sleep. Quantity of sleep has a direct influence on the quality of sleep because it also determines whether these sleep phases are reached and how often during recurring sleep cycles.

The amount of sleep needed to be refreshed and function optimally is very individual, depending on factors such as age, pregnancy and previous sleep deprivation, and therefore varies from person to person. Adults need roughly seven to eight hours of quality sleep out of twenty-four hours (Morgenthaler, 2013:n.p.). With time, regular cuts in sleep inevitably cause mental and physical breakdown (Smith et al., 2013:n.p.).

Quantity and quality of sleep are equally important (Smith et al., 2013:n.p.). Insufficient sleep affects working life, and the influences thereof, such as fatigue and or low energy levels seem to linger on, even on off-duty days (Admi et al., 2008:250-257; Akerstedt, 1998:168).

2.8 SLEEP DEPRIVATION

Sleep deprivation is the condition of not having adequate sleep; it can be either chronic or acute. A chronic state of sleep deprivation can affect the body in various ways such as causing fatigue, clumsiness, and/or poor judgement. Sleep deprivation leads to sleep debt, which refers to the amount of sleep a person gets, in relation to the amount of sleep that is needed.

It is a deficit that increases each time that night time sleep is cut short (Smith et al., 2013:n.p.). Nurses working night shift are particularly prone to sleep deprivation due to irregular sleeping hours, reduction in sleep hours and absence of deep sleep, during the daytime (Johnson, 2007:310). Losing even one hour of sleep per day results in sleep debt and may lead to chronic sleep deprivation and chronic fatigue.

The effects of sleep deprivation are numerous. Sleep deprivation tends to negatively influence the individual's mood, energy, and the ability to handle stress and health (Smith et al., 2013:n.p.). Physical symptoms of sleep deprivation include neurological effects such as tremor and shakiness, hyperactive gag reflex, sluggish corneal reflexes, droopiness in eyelids and a reduced threshold for seizures. Changes in vital signs also tend to occur, such as a decrease in body temperature and sleep apnoea. Evidence of hormonal changes has also been found, which includes compromised release of growth hormone and thyroid complications. Major health effects are also cited, such as an adverse impact on metabolism, leading to impaired glucose tolerance, weight gain, suppressing of immunity, frequent illness and, in extreme cases, even death. REM sleep deprivation leads to anxiety, depression, mental illness and hallucinations due to the neurotransmitter imbalance caused by a lack of REM sleep (Peters, 2011:n.p.). Other less serious signs of sleep deprivation include feeling sluggish in the afternoon, feeling the need to sleep-in on weekends, becoming drowsy when driving, becoming sleepy in meetings or lectures and having difficulty in waking up (Smith et al., 2013:n.p.). In addition to the association of lack of sleep with serious health problems, sleep deprivation mimics the effects of drinking alcohol, for example slurred speech, nystagmus, slight tremor of the hands and various neurological reflexes which may be subtle and not easily noticeable (Croskerry & Cosby, 2009:261; Lange et al., 2010:48; Peters, 2011:n.p.).

Sleep-deprived individuals may not even realise that they are suffering from sleep deprivation and do not even know what it feels like to be well-rested. A night shift study in Birmingham that surveyed 289 licensed nurses revealed that fifty six percent were sleep deprived and did not realise it (Johnson, 2007:310). This inability of the night shift worker to recognise sleep deprivation in its early stages, leads to various sleep problems (Gaultney & Collins-McNeil, 2009:148).

By working night shift, the human body is subjected to constant stress, sending the body into chaos. Such stress can give rise to permanent sleep disturbances and impacts mental and physical health (Price, 2011:38). The human body performs more essential bodily functions to protect itself against illness, such as fighting disease, during night time sleep. Therefore, sleep during daytime instead of night time disrupts this protective mechanism that the body has

against illness. Thus, disturbed sleeping patterns influence the immune system negatively and it is easier for the body to develop illness (Jockers, 2011:n.p.).

Bouncing back from chronic sleep deprivation is not easy. The only way to deal with sleep debt is to sleep under optimal conditions. Optimal sleep conditions include absolute darkness, reduction in noise and adequate levels of melatonin (Peters, 2011:n.p.). More information regarding sleep debt is given in Section 2.16, Preventative measures.

2.9 CIRCADIAN RHYTHM DISORDERS

The *Diagnostic and statistical manual for mental disorders V* defines circadian rhythm sleep disorder as a persistent pattern of sleep disruption. The disruption is primarily due to a misalignment between the endogenous circadian rhythm and the sleep-wake cycle schedule required by an individual's physical environment or social or professional schedule (Block, 2014:n.p.). Each circadian rhythm sleep disorder involves at least one of the following: difficulty falling asleep, waking up frequently during sleep, waking up too early and then not being able to fall asleep again or sleep of poor quality (Block, 2014:n.p.).

Numerous night shift workers suffer from sleep disorders, such as patterns of involuntary sleep and insomnia. Over twenty percent of workers in industrialised nations are night shift workers and about ten percent of them are diagnosed as having sleep disorders. Sleep disorders cause chronic fatigue syndrome (Cherry, 2013:n.p.; Schwartz & Roth, 2006:2357; Suzuki et al., 2005:445).

People who work night shift are more likely to have poor sleeping habits and sleep disorders such as insomnia, trouble falling asleep, unrefreshing sleep and waking prematurely (Smith et al., 2013:n.p.). These disorders can be ascribed to a constant lack of sleep, chronic sleep restriction, and circadian rhythm disruption or deficiencies in melatonin production (Cherry, 2013:n.p.; Schwartz & Roth, 2006:2357; Suzuki et al., 2005:446).

Circadian rhythm sleep disorders lead to excessive sleepiness or insomnia, or both. The sleep disturbance causes clinically significant distress or impairment in social, occupational, physical and other important areas of functioning (Cherry, 2013:n.p.; Schwartz & Roth, 2006:2357; Suzuki et al., 2005:447).

2.9.1 Types of circadian rhythm sleep disorders:

Delayed Sleep Phase Disorder occurs when a person cannot fall asleep early and wakes up late. Sleep and waking times of people suffering with this disorder are considered abnormal. Although people suffering with Delayed Sleep Phase Disorder might find early morning responsibilities difficult, they typically have a stable sleeping pattern (Block, 2014:n.p.).

Hyper-nycthemeral Syndrome: is a circadian rhythm disorder type where the individual falls asleep later each day. Generally, the delay is about an hour or two each day. This means that for part of the month, the individual will be asleep at night and awake during daytime, but the other part of the month the person will be functioning during night time. This can be very disturbing, depressing and debilitating for a person living with this disorder. The lack of a stable sleep routine makes it very difficult for a person with Hyper-nycthemeral Syndrome to maintain general responsibilities, such as employment, appointments, marriage and family life (Block, 2014:n.p.).

Advanced Sleep Phase Syndrome: is characterised by bedtime and wake time occurring much earlier than normal. A person with Advanced Sleep Phase Syndrome typically falls asleep at about six to eight p.m. and wakes up seven to eight hours thereafter. This disorder is not very common, or it may be diagnosed less often, since people with the disorder are able to maintain a normal life (Block, 2014:n.p.).

Irregular Sleep-Wake Disorder: is characterised by at least three sleep episodes per twenty-four-hour period, occurring irregularly from day to day. The person suffering from Irregular Sleep-Wake Disorder has a sleep-wake cycle that is undefined. Sufferers complain of chronic insomnia, excessive sleepiness, or both. Irregular Sleep-Wake Disorder can also cause social, familial and work problems (Block, 2014:n.p.).

Although shift workers can suffer from any of the above-mentioned circadian rhythm sleep disorders, the most common type of circadian rhythm sleep disorder among them is shift work sleep disorder, hence the name: shift work sleep disorder.

Shift Work Sleep Disorder: is a disorder that relates to difficulties with sleeping, experienced specifically because of working night shift. Shift work sleep disorder occurs when a person's work hours are scheduled during the normal sleeping period; in other words, the person works when the body dictates that he/she must sleep (Block, 2014:n.p.). Shift work sleep disorder is characterised by symptoms such as not being able to be alert at work, not being able to sleep, either during daytime or night time, not being able to concentrate, lack of energy, irritability or depression, and sleep that feels non-restorative. Shift work sleep disorder causes chronic sleep deprivation, in which a person appears never to catch up with sleep and carries significant sleep debt with them. This chronic loss of sleep has a serious implication for health, productivity and safety (Cherry, 2013:n.p.; Schwartz & Roth 2006:2357; Suzuki et al., 2005:450).

2.10 ENERGY LEVELS AND FATIGUE

Some information regarding energy levels and fatigue was already mentioned under Section 2.7 Quantity of Sleep, Section 2.8 Sleep Deprivation and Section 2.9 Circadian Rhythm Disorders. The current section contains additional information.

Fatigue is a decline in mental and physical abilities due to exertion, lack of quality sleep or disruption in circadian rhythms. Fatigue in the night shift worker results from an imbalance between work demands and periods of rest and recovery. The latter seems to be problematic when working several consecutive shifts. Working night shift therefore tends to result in low energy levels and fatigue (Health and Safety Authority, 2012:6). Chronic fatigue is associated with adverse health influences and illness. Chronic fatigue resulting from night shift work is associated with gastro-intestinal illness such as abdominal pain, chronic gastritis, peptic ulcers, and cardiovascular disease such as hypertension and coronary heart disease (Kivimäki, Jokela, Nyberg, Singh-Manoux, Fransson, Alfredsson, Bjorner, et al., 2015:n.p.).

2.11 CANCER

Shift work involving disruption of circadian rhythms has been classified as a probable cause of human cancer by the International Agency for Research on Cancer (Pronk, Ji, Shu, Xue, Yang, Li, Rothman, Gao, Zheng & Chow, 2010:953). In studies regarding night shift work and cancer, associations were found between suppressed melatonin and cancer prevalence (Wang, Armstrong, Cairns, Key & Travis, 2011:78; Parent, El-Zein, Rousseau, Pintos & Siemiatycki, 2012:75). Melatonin plays a role in detoxifying the body and protecting against cancer; melatonin thus has oncostatic properties (Moukangoe, 2013:20). It signals the pineal gland to perform oncostatic activities, thus, when melatonin levels are inadequate, these oncostatic activities cannot take place (Parent et al., 2012:751). In preparation for sleep, melatonin extracts certain hormones from the body. With melatonin lacking in the night shift worker, reproductive hormone levels are altered, putting the night shift worker at risk for cancer and malfunctioning of the reproductive system. Night shift workers also exhibit poor eating habits (Maldonado, 2003:49). Altered reproductive hormone levels, together with decreased melatonin levels and poor eating habits, immediately put the night shift worker in a high-risk category for hormone-related diseases such as breast cancer (Admi et al., 2008:250; Davis & Mirick, 2006:539). Epidemiological studies suggest that females engaging in regular night shift work are more prone to breast cancer and colorectal cancers (Admi *et al.*, 2008:250; Davis & Mirick, 2006:539). A greater prevalence of breast cancer was found in female night shift workers sleeping less than six hours a day (Kakizaki, Kuriyama, Sone, Ohmori-Matsuda, Hozawa, Nykaya, Fukudo & Tsuji, 2008:1502; Pandit, 2011:n.p.; Planton et al., 2011:10).

2.12 DIGESTIVE PROBLEMS

Night shift workers with sleep disorders tend to have higher rates of digestive tract problems (Addler, 1991:103; Admi et al., 2008:250; Planton et al., 2011:10; Schwartz & Roth, 2006:2357). Digestive problems in shift workers are due to poor eating habits, eating at abnormal times and insufficient melatonin (Jockers, 2011:n.p.).

Melatonin performs certain digestive functions and can therefore be found in all the segments of the digestive tract, as well as the liver and pancreas. Melatonin in the digestive system is produced in entero-endocrine cells of the gastrointestinal tract. The role of melatonin in the digestive tract is to control free radicals, since melatonin has powerful antioxidant properties (Jockers, 2011:n.p.). Thus, a decreased level of melatonin in the digestive tract causes digestive problems and low immunity because of its interference with the control of free radicals.

In the digestive tract, melatonin is also an important regulator of motility and inflammation. Each night of poor sleep or no sleep reduces the functioning of the immune system and cell formation (Jockers, 2011:n.p.). Melatonin promotes immune reaction and thins out micro flora in the digestive tract to restore a healthy balance. This process also targets viruses, pathogenic bacteria, man-made chemicals and foreign proteins in the digestive tract. Without adequate sleep, melatonin is unable to effectively enhance immunity to clean up microflora and other toxic debris in the gastrointestinal system (Jockers, 2011:n.p.).

2.13 OBESITY AND WEIGHT GAIN

Night shift work disrupts normal eating habits, causes changes in food intake and has an impact on overall health (Reeves, Newling-Ward & Gissane, 2004:216). Night shift workers consume food over a longer period of the twenty-four-hour day, meaning during the day as well as at night while at work. The day time worker might consume more food but over a shorter period of the day, since the day time worker is asleep at night (Reeves et al., 2004:216). Therefore, the digestive problems, such as spastic colon, dyspepsia and gastric ulcers, which night shift workers tend to develop, are not necessarily related to the amount of food that they eat. The problems are related more to the quality of the food that they eat and due to night time eating, when the digestive system should rest (Reeves et al., 2004:216-221).

Furthermore, these eating patterns lead to obesity. Obesity is a risk factor for chronic disease (Flegal, Carroll, Kit & Ogden, 2012:491; Kim et al., 2013:1204). The prevalence of obesity and overweight increased significantly as night shift work duration increased. In the study by Kim et al. (2013:1), obese participants were also more likely to have diseases such as hypertension, diabetes, and hyper-lipoedema or breast cancer.

Flegal et al. (2012:491) conducted a study about night shift workers and reported that overweight and obesity are more prevalent among night shift workers than day workers. The authors found that 65.4 percent of the participants working night shift were overweight or obese (Flegal et al., 2012:491). The findings of the study also revealed that nurses working night shift have a higher Body Mass Index (BMI), were less likely to exercise, and tended to be older than daytime workers.

2.14 DIABETES

Another possible result of working night shift is diabetes. This may be due to altered eating habits, circadian misalignment, reduction of melatonin and Vitamin D deficiency (Reeves et al., 2004:220).

A researcher from North America conducted a study in 2008 to determine the prevalence of metabolic syndrome in police shift workers. Metabolic syndrome is a condition characterised by a combination of symptoms that contribute to poor health and diabetes, including large waist circumference, elevated triglyceride levels, high cholesterol, high blood pressure and high levels of glucose when fasting. The findings of the study revealed that the officers who most frequently worked the eight p.m. to four a.m. shift had the highest prevalence of metabolic syndrome (Price, 2011:38). Thus, it appears that officers working the night shift period are more prone to metabolic syndrome.

The findings of a cohort study involving 28 041 African American women, found that more years of night shift work were associated with a greater risk of Type 2 diabetes, irrespective of adjustments that were made to eating habits and BMI. The study findings suggest that the prevalence of diabetes in the night shift worker cannot be due only to poor eating habits and diet, but also to the duration of night shift work. Those with the longest night shift duration had an increased incidence of Type 2 diabetes. The association could be ascribed to the fact that alterations in sleep affect the metabolism of the night shift worker. Moreover, the association may also be due to circadian misalignment, which leads to decreased leptin levels, and increased glucose and insulin levels, as well as altered cortisol secretion patterns. However, the precise link between Type 2 diabetes and night shift work is not yet clear (Vimalananda et al., 2015:3480).

2.15 VITAMIN D

The relationship between night shift work and Vitamin D was discussed in Chapter 1, Section 1.2, Background and Rationale. Research findings suggest that there is a strong relationship between Vitamin D deficiency and chronic illness in adults. Although this deficiency can occur at any age, it affects about forty to one hundred percent of night shift workers. Symptoms of

Vitamin D deficiency in night shift workers develop slowly, are non-specific and are frequently overlooked. A recent study on patients with tuberculosis found that Vitamin D supplements lead to an increase in lymphocyte counts, which in turn, leads to clearance of mycobacterium tuberculosis from the sputum (Singh, Atta, Gupta, Mengi & Malhotra, 2014:224). The presence of Vitamin D in optimal levels (>20ng/ml) in the blood can also reduce the prevalence of Type 2 diabetes by stimulating insulin secretion in the pancreas (Singh et al., 2014:224). The risk of common cancers has been shown to be reduced in the presence of normal Vitamin D levels (>20ng/ml), probably due to Vitamin D enhancing normal cell proliferation and differentiation (Singh et al., 2014:224).

2.16 PSYCHOLOGICAL INFLUENCES OF WORKING NIGHT SHIFT

Besides the negative influences night shift has on physical health, the night shift worker may also suffer from poor mental health.

According to Schwartz (2010:19), the psychological influences prevalent in night shift workers are caused by shift work sleep disorder, which was discussed in Section 2.8 of this chapter. When shift work sleep disorder is present, the brain does not rest and recuperate, which may lead to chemical imbalances in the brain. These chemical imbalances are responsible for mental breakdown, stress and anxiety (Potgieter, 1996: 20). The night shift worker suffering from shift work sleep disorder must be diagnosed early and treated, to preserve mental health, among other things (Schwartz, 2010:18).

2.17 PREVENTATIVE MEASURES

Not all individuals exposed to night shift develop the diseases discussed above. Many factors, such as sleep hygiene, how shifts are managed and circadian physiology, may influence an individual's response to shift work (Drake & Wright, s.a.:784). The negative influences of night shift work cannot be avoided altogether; however, certain activities can minimise their impact. This is especially important in cases where domestic situations or other demands prevent workers from relinquishing night shift work (Health and Safety Authority, 2012:21).

One of the activities for reducing the influences of prolonged night shift work could be to practise sleep hygiene. Sleep hygiene refers to the habits and practices that are conducive to sleeping well and consequently elicit health benefits (Price, 2011:38). Sleep hygiene could be achieved by following regular daytime sleeping patterns. Moreover, the night shift worker should try and create a peaceful environment during the day, to promote uninterrupted sleep by unplugging phones, darkening the room as much as possible, wearing earplugs and sleeping masks, training family and friends to respect sleep time, and by scheduling appointments out of sleep time (Health and Safety Authority, 2012:21). Daytime sleep could

also be improved through avoiding stimulants such as caffeine after midnight; the caffeine consumed at that time interferes with daytime sleep (Morgenthaler, 2013:n.p.).

An additional short nap before the start of a shift or during a lunch break at work could also benefit the health of the night shift worker. This nap, however, should be kept short; approximately thirty minutes. The longer the nap, the more likely it is that one will feel lethargic afterwards. This nap will also boost energy and enhance alertness and functioning (Morgenthaler, 2013:n.p.). In addition, off-duty routines should be kept like on-duty routines: for example, going to bed and waking at the same time on off-duty days as well as on-duty days. This will help to establish some sort of a bodily routine and aid the reduction of some of the confusion in the body that is caused by night shift. Although the circadian rhythm is not fully adaptable, practicing these activities can help an individual to shift the circadian rhythm to a certain extent and reduce the influences of night shift (Price, 2011:38).

Furthermore, sleep debt must be reduced as soon as possible. Sleep debt tends not to reduce spontaneously and needs to be corrected. To prevent chronic sleep deprivation and high sleep debt, the night shift worker should engage in extended sleeping hours (under optimal conditions) as soon as possible. This means that when sleep is lost on a given day, more sleep should be added to a person's twenty-four-hour schedule. If more than twenty-four hours have passed before attempting to reduce the amount of sleep that was lost, additional sleep at a later stage does not have the desired effect. Additional sleep might give the body a boost, yet energy levels will drop, and chronic sleep deprivation will persist (Smith et al., 2013:n.p.).

Many night shift workers engage in more sleep over weekends, to catch up on lost sleep, but this is not adequate since too many hours have passed (Smith et al., 2013:n.p.).

Healthy eating habits, regular exercise and keeping to a routine could have a positive effect on energy levels. Since the body should wind down before bed, exercises should be done soon after waking time, not before preparing for sleep. Night shift workers should resist the temptation to eat junk food and resist using alcohol to aid sleep. Alcohol interferes with REM sleep and deep sleep and should thus be avoided. Healthy lifestyle choices are essential for the wellbeing of the night shift worker (Price, 2011:38; Morgenthaler, 2013:n.p.).

2.18 SUMMARY

This chapter contains a discussion on the relevant literature that relates to the influences night shift has on the health of nurses, as well as a presentation of possible influences. The researcher aimed to explain how certain mechanisms of night shift work can influence health. To understand the influences of night shift work, the benefits, mechanisms and physiology of sleep were discussed.

A discussion of possible preventative measures was also included. In certain instances, the findings of previous research studies were included to aid explanation, provide clarity and evidence. Mostly international articles were used, since only few South African studies could be found.

Night shift is a reality in the nursing profession. Nonetheless, according to the literature, working night shift has numerous negative influences on health, such as diabetes, cancers, psychological influences and cardiac disorders. These might be due to the disruption of the circadian rhythm, melatonin and calciferol deficiencies and poor sleeping habits. Health influences because of shift work, seem to be inevitable. Although these health influences cannot be prevented entirely, certain activities can be performed to reduce the influence of night shift work on health. It appears that sleep hygiene and lifestyle choices are important when working night shift.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 INTRODUCTION

The previous chapters provided a description of the background and rationale for the study, as well as a comprehensive literature review concerning the influences working night shift has on the health of nurses. Chapter 3 comprises a description of the research methodology that was applied to conduct the study.

3.2 AIM OF THE STUDY

The aim of the study was to describe the influences that night shift has on the health of nurses (all categories i.e. registered nurses, enrolled nurses and enrolled nursing assistants), currently employed within the private sector in the City of Cape Town.

3.3 OBJECTIVES OF THE STUDY

The objectives of the study were to:

- Identify and describe sleeping patterns of night shift nurses;
- Describe energy levels of night shift nurses;
- Describe their current health and wellbeing;
- Identify and describe the amounts of stimulants used by night shift workers; and
- Describe the presence of anxiety and depression among them.

3.4 RESEARCH METHODOLOGY

3.4.1 Research design

According to Burns and Grove, (2011:49) a research design is an outline for the conduct of a study that maximises control over factors that could hamper the study's desired outcomes.

A quantitative approach with a descriptive design was applied for the purpose of this study. A quantitative approach was used, since it enabled the researcher to involve many participants without too much effort. A quantitative approach also yields certain benefits such as results being quantifiable and hence more objective (Church & Rogers, s.a.:1).

A descriptive design was considered suitable as it enabled the researcher to obtain more information regarding the characteristics of the influences that working night shift has, on the health of nurses. The descriptive design therefore allowed the participants to relate information pertaining to frequencies of shifts and the presence of physical and psychological conditions

or symptoms thereof. Consequently, the participants could provide their views about the phenomenon of working night duty and its possible influences on health (Burns & Grove, 2011:256).

3.4.2 Research question

The first step in evidence-based practice is to ask a question. This question leads to the research study and is therefore the foundation of the study (LoBiondo-Wood & Haber, 2006:28). The research question should reflect a refinement of the researcher's initial question and presents the problem that is to be examined (LoBiondo-Wood & Haber, 2006:28-29). This study was guided by the following research question:

What influence does night shift work have on the health and wellbeing of nurses?

3.4.3 Population and sampling

The population is a group of individuals who are the focus of the research (Burns & Grove 2011:290). The particular group of people that forms the focus of this study is nurses working night shift in the private health sector of the City of Cape Town. Four private healthcare companies were approached to participate in the study. One company declined participation, thus hospitals of three private healthcare companies were included in the study. The number of hospitals that each company agreed on, to be part of the study, was three, one and two respectively.

The target population included all nurses (all categories i.e. registered nurses, enrolled nurses and enrolled nursing assistants) who were working night shift at the time of data collection in six private hospitals in the City of Cape Town (Illustrated in Table 3.1).

The human resource managers of four participating hospitals, representing two (2) companies, were contacted in February 2015 to obtain the numbers of all nurses working night shift. The third company consented to participate in June 2016. The total of nurses working night shift at the two (2) hospitals of the third company, was received in June 2016. Information received from the hospitals indicated a total population of N=509 nurses working night shift.

Upon ethical approval in August 2015 the nurse managers of the respective hospitals were contacted, via email to obtain institutional approval. By October 2015 the researcher had obtained institutional approval from four hospitals, representing two companies. Approval from the other two hospitals, representing one (1) company, was only obtained in June 2016 and the same procedure was followed. A list of the names of all categories of nurses working night shift was requested from the human resource department of each hospital. The lists with

names were not supplied by the hospitals due to their institutional policies. All six hospitals agreed to give a list of names upon the day of data collection. This list had to be returned after data collection. The number of nurses at the four participating hospitals representing the two (2) companies that provided totals of nursing working night shift in 2015, remained unchanged.

Burns and Grove (2011:40) define sampling as the process of selecting participants who are representative of the population being studied. A representative sample was selected from the predetermined population of N=509 as shown below. Representative means that the sample, the accessible population (portion of the sample to which the researcher has reasonable access) and the target population (individuals that meet the sampling criteria) are similar in as many ways as possible (Burns & Grove, 2011:294).

The calculated sample at each hospital (Table 3.1) was drawn through systematic random sampling. Upon data collection, the researcher allocated the number one to three to each name on the employee list. Employees on leave were omitted from the numbering. A random starting point, numbered 3 and 2 was selected respectively for all the participating hospitals by drawing the number out of a box. A different draw was made for each hospital. In all instances, the designated person from each hospital who accompanied the researcher was the night duty nursing manager.

Sample size:

From a previous study which used a similar population to explore the influences of working night shift on the health of nurses, and the same tool to measure the outcomes, the estimate for the outcome of physical symptoms score in shift workers was 38.39 (standard deviation (sd) 10.77) (Pisarski, Bohle & Callan, 1998:142). Using Power Analysis and Sample Size (PASS) software for sample size calculation, a sample size of ninety-four (eighteen percent) from a population of 500 produces a two-sided ninety five percent confidence interval with a distance from the mean to the limits that is equal to 1.988 when the estimated standard deviation is 10.770. Therefore, ninety-four is the minimum required sample size. However, the researcher included n=153 nurses to constitute a thirty percent sample, as shown in the table below. This sample was obtained by including all participants on the employee list who represented the number 3 and 2 respectively.

Table 3.1: Sample

Hospital	Nurses working night shift currently	30% Sample	Questionnaires accepted	Questionnaires returned	Questionnaires spoiled	Final sample per hospital
Hospital 1	n=166	n=50	53	50	3	47
Hospital 2	n=87	n=26	30	25	0	25
Hospital 3	n=53	n=16	20	17	1	16
Hospital 4	n=55	n=17	20	15	0	15
Hospital 5	n=53	n=16	20	10	0	9
Hospital 6	n=95	n=29	30	14	0	13
Total Sample	N=509	N=153	153	131	4	127
Calculated return rate: $131/153 \times 100 = 85.6\%$						

3.4.4 Inclusion criteria

Sampling criteria, also known as eligibility criteria, include the list of characteristics essential for inclusion in the target population (Burns & Grove, 2011:291).

For the study the inclusion criteria were all categories of permanently employed nurses who were working night shift at the time of data collection.

3.4.5 Instrumentation

A self-report questionnaire was used for data collection purposes. Self-report questionnaires are commonly used in nursing research, as it is most useful in collecting data on variables that cannot directly be observed or measured by physiological instruments (LoBiondo-Wood & Haber, 2006:275).

The questionnaire that was used in this study is the validated Standard Shift work Index, developed by Shift work Research Team (2005) Medical Research Council/Economic and Social Research Council (MRC/ESRC) Social and Applied Psychology Unit. (Appendix1). Permission was granted by Professor Emeritus Simon Folkard, head of the team of Shift work Research Team (2005) MRC/ESRC Social and Applied Psychology to use this instrument (Appendix 2).

The original questionnaire consists of six sections. However, after conferring with Professor Emeritus Simon Folkard the researcher only selected the three sections that addressed the

objectives of the study. These three sections sought to obtain information and insight on specific aspects of the health of the night shift nurse. These three sections have been validated separately. The three selected sections include demographic details and work information, sleep and fatigue, as well as health and wellbeing. The eleven-page questionnaire consists mainly of four to five-point Likert scale questions and a few open-ended questions.

The questionnaire was kept in English and was not translated. The researcher was advised by the supervisor and Head of the Department of Nursing, Professor Anita van der Merwe to keep the questionnaire as is, since the meaning of medical terminology can be lost when translated.

The questions in the questionnaire covered the following:

- Marital status;
- Employment details of partner;
- Support system;
- Dependants;
- Employment details of participant i.e. Work experience, shift system, work hours per week, overtime, hours of work per week;
- Sleep and waking patterns (i.e. naps, fatigue, amount of sleep needed vs amount of sleep taken);
- Sleeping pills needed;
- Use of stimulants;
- Energy levels;
- Digestive problems;
- Presence of cardiac and circulatory problems;
- Weight gain/loss;
- Illnesses developing after engagement in night shift such as back pain, angina, ulcers, sinusitis, tonsillitis, hypercholesterolemia, diabetes, depression, anxiety, arthritis, haemorrhoids, headaches; and

- The use of medications such as ant-depressants, antacids, laxatives, anti-hypertensive medication, diuretics, vasodilators, bronchodilators, painkillers, steroids, anti-inflammatory medication and hormone therapy.

Question 3 in the questionnaire has three options where the participants should either select before starting shift work, since starting shift work and never. The researcher asked all participants to view this question in terms of their current shift system for example before starting night shift, since starting night shift and never.

The researcher also observed that Question 3.7, pertaining to the regularity of menstrual cycle, was frequently omitted. Also, the section relating to when the participants take naps during the night in Question 2.2 was not completed very well. The section at the end of the questionnaire where participants were invited to write any other comments that had not been covered in the questionnaire, was either left blank or comments were added that they were already covered in the questionnaire. The rest of the questions seemed to be understood and were filled in satisfactorily.

3.4.6 Pilot test

The pilot test was conducted at a conveniently selected private hospital in the Western Cape. This hospital was not part of the actual study. Once institutional permission was granted the researcher met with the nursing service manager (27 September 2015) of the hospital in question, to arrange the pilot test. The pilot test was conducted on the 29 September 2015 in the boardroom of the hospital.

The pilot test included respondents that resemble the population. Six nurses working at the hospital were recruited to participate in the pilot test. It was not possible to withdraw more than six nurses at a time because of patient requirements in the wards. The results of the pilot test were not included in the actual research findings (Church & Rogers, s.a.:2). The pilot test assisted with assessing the completion time of the questionnaire and if participants understood the questions.

Informed consent forms were handed out to the six participants and the content thereof explained. All six nurses indicated their willingness to participate and granted their permission. The researcher was present in the boardroom throughout the duration of the pilot test.

Three participants took twenty minutes to complete the questionnaires, two participants took twenty-five minutes and one participant took seventeen minutes; therefore, the average time it took to complete the questionnaires was twenty-two minutes. Participants felt that the questionnaire was too long. They also struggled with understanding a few English terms such

as lethargic, wary and vigour. Subsequently, prior to data collection of the main study, the researcher attached an addendum containing an explanation of these terms to the questionnaire (Appendix 8). During data collection of the main study, participants were notified about the explanations/definitions of terms that are available in Appendix 8

3.4.7 Ethical considerations

According to LoBiondo-Wood and Haber (2006:247), ethical considerations that ought to be addressed before, during and after a study are: informed consent, institutional review boards and human rights.

Ethical approval was obtained from the Health Research Ethical Committee at Stellenbosch University. Institutional permission was obtained from the Heads of the various participating hospitals to conduct the study (Appendix 4). Permission was obtained from participants prior to issuing a questionnaire to a participant (Appendix 5).

Participants were informed that participation is voluntary and that they could withdraw from the study at any stage without penalty. The principle of beneficence was upheld and therefore no participant was harmed in any physical or emotional manner. Personal privacy and anonymity was assured by keeping questionnaires anonymous and therefore no participant could be linked to a specific questionnaire. No names of participants were disclosed and neither participants nor their institutions were referred to by name. Questionnaires were delivered to the participant in a sealed envelope and participants were advised to return it sealed. Questionnaires were in English since it was confirmed telephonically that all target hospitals were predominantly English. In addition, all undergraduate and post graduate programmes at higher institutions in South Africa are conducted in English as set out under the Language Policy for Higher Education of 1997. It was therefore deduced that most participants would be able to understand the content of the questionnaire.

Respondents were supplied with accurate information regarding the aim, benefits and objectives of the study and were therefore not misled or deceived in any way. Furthermore, only the researcher, supervisor, co supervisor and statistician had access to the collected data. All completed questionnaires are kept in a locked cabinet for at least five years after analysis has been completed.

3.4.8 Data collection

In August 2015 documents such as the ethical approval letter from the Health Research Ethical Committee of Stellenbosch University, the research proposal and the questionnaire were submitted via email to the nursing service managers of the respective hospitals. A

number of hospitals granted institutional permission two months after the application process was started. Yet, the researcher had to postpone the data collection process several times, due to hospitals being too busy. Two hospitals declined participation in October 2015 upon which the researcher selected alternative hospitals. However, the alternative hospitals also declined participation in February 2016. Thus, data collection did not occur as planned originally. The rest of the hospitals (four Hospitals) responded promptly. Therefore, data collection took place over a period of seven months, from December 2015 to July 2016. Although the study was only submitted for review in December 2017, all data collection was completed by June 2016. Appendix 4.3 and Appendix 5 reflect the dates originally anticipated by the researcher. On receiving institutional permission from the hospitals, the researcher scheduled appointments with human resource managers and nursing service managers at the respective hospitals to arrange the data collection process. Lists reflecting the names of employees eligible for the study were obtained from the night duty unit manager of each hospital on the day of data collection. Names of employees are required beforehand for systematic sampling; however, as mentioned previously, the hospitals were only willing to provide an employee list on the day of data collection. The researcher proceeded with data collection at the hospitals that granted permission and while awaiting permission from the rest of the hospitals. The researcher collected all the data personally.

Participants were either approached just before the start of a shift (nurses usually arrive for duty twenty minutes before a shift commences for handover purposes) or during visiting hours (seven p.m. to eight p.m.) when nurses were not too busy. The researcher commenced individual recruitment of a participant by explaining the purpose of the study to each participant. Thereafter informed consent was obtained. Participants were also handed an information leaflet that reflected the contact number of the researcher.

Questionnaires in sealed envelopes were hand delivered to all participants. The questionnaires were left with the participants to allow them time to complete them during the shift or at home when they had enough time. The original plan was for the participants to complete the questionnaires during tea or lunch times, but numerous participants requested to complete the questionnaires at home where they were more relaxed and had more time.

The researcher provided a sealed container in which participants could place their sealed responses. The participants were informed about the container during the recruitment phase. The researcher collected the sealed container the following evening.

Table 3.2: Data collection plan

Hospital	Questionnaires handed out shift 1	Questionnaires received shift 1	Questionnaires handed out shift 2	Questionnaires received shift 2
Pilot test	29.9.2015	29.9.2015		
Hospital 1	07.10.2015	08.10.2015	09.10.2015	10.10.2015
Hospital 2	21.10.2015	22.10.2015	23.10.2015	24.10.2015
Hospital 3	25.11.2015	26.11.2015	27.11.2015	28.11.2015
Hospital 4	07.12.2015	08.12.2015	09.12.2015	09.12.2015
Hospital 5	12.12.2015	13.13.2015	14.12.2015	15.12.2015
Hospital 6	12.12.2015	13.13.2015	14.12.2015	15.12.2015

3.4.9 Data analysis and interpretation

Each questionnaire was allocated a subject number on the front and a hospital number on the back. This subject numbering ensured that the researcher could locate a certain questionnaire if any ambiguity arises. The researcher then captured the data in the Statistical Programme for Social Sciences, (abbreviated SPSS, version 23). All data entered was cleaned by checking the dataset twice, as well as verifying the data entered with the questionnaire twice. The datasets were checked for technical correctness, meaning that a dataset should be directly recognised as belonging to a certain variable, in other words, a text variable should be stored as text and a numerical variable as a number (De Jonge & Van der Loo, 2013:12) Corrections were made where needed. The data was analysed by a bio-statistician employed by Stellenbosch University. All scores were calculated based on the guidelines provided by the developer of the questionnaire. The guidelines are available in the Standard Shift work index manual (Appendix 9)

Descriptive statistics were used to describe and summarise demographic data, meaning:

- 1 Categorical variables that are nominal for example gender and domestic situations (whether a participant is divorced, married, single or living with a partner); and
- 2 Categorical variables that are ordinal such as age.

The data was displayed through frequency tables and bar charts to illustrate the differences among age groups, period of working night shift etc. Inferences were made from the sample statistics to the larger populations of nurses working night shift in the private sector hospitals utilising ninety five percent confidence intervals.

All quantitative responses were translated into percentages. These results are displayed in Chapter 4.

Correlations were also sought between variables. Correlation is a technique for measuring the relationship between two variables (Burns & Grove, 2011:394-396). The Pearson correlation coefficient was used to measure the association between two continuous variables e. g. length of night shift and fatigue

The Pearson product-moment correlation coefficient was used to measure the strength of the linear relationship between two variables e. g cardiac health and chronic fatigue.

At the end of each section in the questionnaire, provision was made for any comments pertaining to health that the participant felt was necessary to include. This gave participants an opportunity to add any information that they felt should have been covered by the questionnaire but was not. These comments were manually examined by the researcher for identifying common themes (LoBiondo-Wood & Haber, 2006:93). These comments were statements such as “I am so tired”, “I feel well rested” or “I don’t want to work day shift”.

3.4.10 Reliability and validity

Reliability is the ability of an instrument to measure attributes of a concept consistently. Validity is the extent to which an instrument measures the attributes of a concept accurately. (LoBiondo-Wood & Haber, 2006:287). In addition, a measurement tool is valid if it measures what it is supposed to measure. Internal reliability refers to how well the measuring tool measures what it is supposed to measure. External reliability means that the results of the research can be generalised beyond the current study (LoBiondo-Wood & Haber, 2006:287).

Reliability: The measurement properties and reliability of the questionnaire have been tested as described by various researchers (Smith, Gibby, Zickar, Crossley, Robie & Folkard, 2001:192; Barton, Spelten, Totterdell, Smith, Folkard & Costa, 1995:3-30). According to LoBiondo-Wood and Haber (2006:295) a Cronbach’s alpha of more than 0.70 indicates that an instrument is reliable. This instrument was used in previous similar studies with reliable Cronbach alphas of more than 0.80 (Table 3.3), indicating that the instrument is indeed reliable (Visser, 1999:47).

Validity: The selected questionnaire addresses psychological and physical health issues pertaining to the health of shift workers. Examples of the issues addressed include health influences that according to literature can be ascribed to shift work such as night duty. These influences include depression, illness, weight, circadian misalignment, sleeping problems, diabetes, hypertension, back pain and more (Barton et. al., 1995:3-30). The questionnaire was developed by experts in the field of shift work and addressed all the objectives of the current study. The different sections of the questionnaire were validated separately, and therefore it

was possible for the researcher to only select certain sections of the questionnaire (Barton, Folkard, Smith, Spelten, Totterdell, 2005).

The Cronbach alphas of the Likert scale questions as obtained with the sample in the current study are presented in Table 3.3. The Cronbach alphas of the Likert scale questions are more than 0.70; therefore, reflecting an acceptable measure of reliability.

Table 3.3: Cronbach alpha of the Likert scale questions

Question	Cronbach alpha of current study	Cronbach alpha of a previous study (Visser, 1999:47)
2.4-2.11 Perceptions about sleep	0.82	0.83
2.12a-j General feeling of being tired or energetic	0.85	0.89
3.1a -3.1h Digestive health symptoms	0.84	0.88
3.1i-3.1s Cardiac health symptoms	0.80	0.80
3.8.1 General feelings	0.87	0.81
3.9 Symptoms of anxiety	0.83	0.84

3.5 SUMMARY

In summary, the study employed a quantitative approach with a descriptive design. The focus was to describe the influences working night shift has on the health of nurses. A representative sample of n=153 nurses was selected through systematic sampling. The return rate was 85.6%. An established validated questionnaire, the Standard Shift work Index, was used for data collection. Data collection was completed by the researcher without the assistance of a field worker. Data analysis was completed by a statistician using SPSS computer software. Additional comments from participants were explored qualitatively. Ethical principles such as anonymity, confidentiality, privacy and the right to self-determination (voluntary participation) were upheld as far as possible.

The Chapter 4 concerns the actual findings; meaning data analysis and interpretation.

CHAPTER 4: RESEARCH FINDINGS

4.1 INTRODUCTION

Chapter 4 contains a presentation of the results of the study. The data analysis is presented according to the order of the questions in the questionnaire (Annexure 1).

The quantitative data was first captured on SPSS, then cleaned as described in Chapter 3, and analysed.

Descriptive statistics were applied to describe and summarise the data. These also assisted with the organisation of the data and with giving the data meaning (LoBiondo-Wood & Haber, 2010:310). The descriptive techniques that were used included measures of central tendency and variance. The data is displayed in figures and tables. The responses to the open-ended questions were grouped in themes, using a thematic approach, as substantiated by Burns and Grove (2007:540).

All numbers were rounded to the 1st decimal. A significance level of $p < 0.5$ was used to assess the relationships between variables.

4.2 SECTION 1: GENERAL BIOGRAPHICAL INFORMATION

Section 1 of the questionnaire contains a presentation of the general personal information of the participants and reflects answers to seventeen questions regarding age, gender, domestic situation and work experience. Question 1.1 of the questionnaire relates to the date of data collection. Since data collection dates are reflected in Chapter 3, the dates are omitted in the current discussion. The current discussion commences from Question 1.2.

Most participants were females ($n=119$, 94.4%). The ages of the participants ranged from 21 to 70, with a mean age of 43.2, standard deviation (SD) 11.8 years. In Figure 4.1, ages are categorised and most participants ($n=39$, 32.0%) were between the ages of 50 and 59. This might be indicative of an ageing nursing corps.

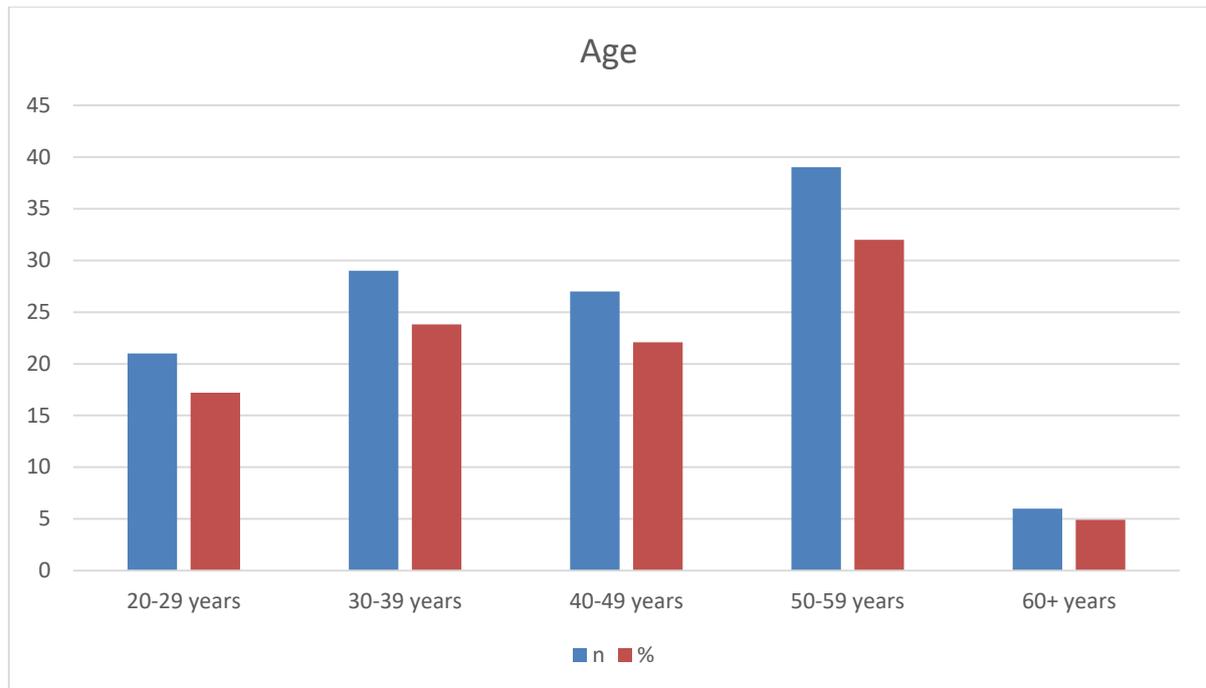


Figure 4.1: Age of participants

Table 4.1 presents the data for questions 1.4 to 1.7, which concerned the domestic situation of the participants. Most participants (n=73, 57.9%) were married or living with a partner.

Table 4.1: Demographic data: Domestic situation

Question number	Variable	N	%
1.4	Marital Status (n=126)		
	Married	73	57.9
	Separated/Divorced	16	12.7
	Widowed	5	4.0
	Single	32	25.4
1.5	Partner's work hours per week (n=68)		
	0-19	5	7.3
	20-39	20	29.4
	40-59	42	61.8
	60-80	1	1.5
1.6	Work pattern of partner (n=83)		
	Daytime no shifts	44	53.0
	Rotating shifts with nights	16	19.3
	Rotating shifts without nights	4	4.8
	Permanent nights	5	6.0
	Other	14	16.9
Question number	Variable	N	%
1.7	Support from partner (n=80)		
	Extremely unsupportive	6	7.5
	Fairly unsupportive	7	8.7
	Quite indifferent	5	6.2
	Fairly supportive	33	41.3
	Extremely supportive	29	36.3

The work hours of participants' partners varied from being unemployed (zero) to 80 hours per week for those in employment. The median number of hours worked per week was 40, indicating that most participants worked a normal number of hours per week. This variable was categorised as displayed in Table 4.1, showing that (n=42 (61.8%)) of the participants' partners worked between 40 and 59 hours per week.

Most nurses (n=44, 53.0%) had partners that were non-shift workers. The fact that most nurses who work night shift have partners who do not work shifts might affect their domestic situation.

The largest portion of participants (n=33, 41.3%) indicated that their partners are fairly supportive, followed by n=29 (36.3%) who indicated that their partners are extremely supportive. It could thus be concluded that most participants have a support system at home.

Questions 1.8 and 1.9 related to the number of people in the household and the number of dependents of the participants. The number of persons the participants resided with ranged from 0 to 3 for children and young people (0-25 years), from 0 to 6 for adults (25-60 years) and from 0 to 3 for persons over the age of 60. The highest number of participants indicated that they resided with adults. The number of dependents (persons needing looking after) ranged from 0 to 10; with the median being 1, indicating that the participants had few dependents.

Questions 1.10 to 1.17 covered information about the participants' work experience, work pattern and work hours. These variables are important since they provide information about how long the participants have been exposed to working night shift and the intensity thereof, which may influence their health. The results of the continuous variables are presented in Table 4.2.

Table 4.2: Work experience, work pattern and work hours

Question number	Variable	n	Median	Minimum	Maximum
1.10	Number of working years	123	24	2	50
1.11	Length of time working in present shift system (months)	121	66	1	600
1.12	Length of time working shifts (months)	121	180	1	600
1.13	Average work hours per week excluding overtime (hours)	113	42	24	84
1.14	Hours paid overtime per week? (hours)	87	12	0	60
1.15	Unpaid overtime per week (hours)	63	0	0	18
1.17	Length of career break (months)	78	6	0	156

Work experience ranged from 2 years to 50 years, with a median of 24. This indicates that most of the nurses in the study have been working for quite a long time. One of the participants in the study was seventy years old and is also the participant who has been working for fifty years.

The length of time that participants worked night shift ranged from 1 month to 600 months (50 years). This means that some of the participants may have been working night shift for their

entire working career. The median number of months participants worked in their present shift system was 66 months, indicating that most participants work night shift for extended periods.

The length of time that participants in the study were working shifts ranged from 1 to 600 months. The median length of time participants worked shifts is 180 months (15 years), indicating that participants work shifts for most of their career life as nurses.

The minimum number of work hours per week (excluding overtime) is 24 hours, which most likely are participants who occupy a 96 hour per month post. Normal working hours for nurses are usually 40 to 42 hours per week. The maximum number of work hours per week is 84. This implies that the participants work 12-hour shifts every day of the week. The median number of hours worked per week, excluding overtime, is 42, which is in the normal range.

Some participants do not work overtime whereas other participants work as much as 60 hours paid overtime per week. On average, participants work 12 hours paid overtime per week. Since a shift is 12 hours long, it means that nurses tend to work one additional shift on a weekly basis.

Only 63 participants responded to the question related to unpaid overtime. The number of unpaid overtime hours ranged between 0 to 18 hours per week. The average unpaid overtime hours per week is 1.2 (SD 2.8), although the median is 0. Fifty per cent of participants (25th to 75th percentile) worked between 0 to 2 unpaid overtime hours per week. This might be indicative of the fact that nurses often must stay later than scheduled to complete certain tasks, before going off duty. Nurses are also expected to be on duty 20 to 30 minutes before a shift commences for handover purposes. Should the staff for the following shift arrive late, the staff whose shift has ended might leave late; after their shift has ended. In addition, handover sometimes takes longer than anticipated. Considering all these factors, unpaid overtime can amount to 1 hour per work day.

Question 1.16 is not displayed in Table 4.2. This question required of participants to indicate whether they have a second paying job or not. Most participants (n=97, 88.2%) have one paying job, signifying lesser involvement of night shift working nurses in an additional job.

Only 78 participants responded to the question regarding having a career break. The minimum career break in months is zero (0) and the maximum break is 156 months. The median is 6 months, signifying that the nurses who completed the questionnaire had shorter career breaks.

4.3 SECTION 2: YOUR SLEEP AND FATIGUE

The content of Question 2.1 to 2.3 relates to sleep patterns, hours of sleep and naps taken, if any. Question 2.4 to 2.11 relates to the participants' perceptions of how well they sleep.

Question 2.12 relates to fatigue and energy levels and Question 2.13 is an open-ended question, asking participants to comment on their sleep and fatigue levels.

4.3.1 Sleep patterns

The response rate to some of the questions in this section is quite low and might be because this question is long, requires more detail and questions might seem repetitive. Table 4.3 depicts the sleep and wake time, naps and hours of sleep needed, as indicated by the participants.

Table 4.3: Sleep and wake time, naps and sleep needed

Question number	Variable	n	Median	Minimum	Maximum
Sleep and wake time					
2.1 a	Hours of sleep before night shift	90	5	0	17
2.1 b	Hours of sleep between successive night shifts	93	6	0	9
	Hours of sleep after last night shift	92	6	0	12
2.1 d	Hours of sleep before first day off	83	7	0	12
2.1 e	Hours of sleep between successive days off	81	8	3	13
2.1 f	Hours of sleep after last day off	81	8	0	14
Nap time					
2.2 c	Total nap time on night shift	50	1	0	4
2.2 d	Total nap time on days off	50	2	0	11
Hours of sleep needed					
2.3	Hours of sleep needed	115	7	1	10

Sleep and wake time: From the results in Table 4.3 it is evident that participants acquire more sleep on off days than on work days and therefore it can be concluded that night shift impacts the amount of sleep. It further appears that nurses sleep more hours as they approach the end of a range of nights that they had worked (see hours of sleep before 1st day off and between successive days off duty in Table 4.3). The improved sleep might either be because they are more relaxed and less stressed at the end of a range of shifts or more tired after a range of shifts and therefore need more sleep to feel revitalised.

Naps: The median number of hours for naps taken while on duty is 1 hour. Naps taken on days off have a median of 2 hours. It therefore appears that more sleep is acquired on off days. The total nap time while on duty (night shift) ranged from zero (0) to 4 hours. Nap time

on off days ranged from zero (0) to 11 hours with an interquartile range (IQR), indicating the 25th to 75th percentile, of 2 to 3. The participant, who stated that they took a nap of eleven hours in addition to their main sleep, might therefore have misunderstood the question.

Hours of sleep needed: The median number of hours of sleep participants felt they needed is 7 (Range 1-10 and IQR 6 to 8). One hour's sleep is quite a short time to sleep to feel revitalized and might have been an outlier.

4.3.2 Perceptions about sleep

Questions 2.4 to 2.11 related to participants' perceptions about their sleep and were measured on a five-point Likert scale. The participants' responses are displayed in Table 4.4. To simplify the table and ease interpretation, the Likert-scale items were dichotomised and presented as either a positive or negative response.

Table 4.4: Perceptions about sleep

Question number	Main question	Response options	n	%
2.4a	How do you feel about the amount of sleep you get (<i>between successive night shifts</i>) (n=121)	Not enough	85	70.2
		Enough	36	29.8
2.4b	How do you feel about the amount of sleep you get (<i>between successive days off</i>) (n=115)	Not enough	55	47.8
		Enough	60	52.2
2.5a	How well do you normally sleep? (<i>between successive night shifts</i>) (n=125)	Not well	27	21.6
		Well	98	78.4
2.5b	How well do you normally sleep? (<i>between successive days off</i>) (n=117)	Not well	17	14.5
		Well	100	85.5
2.6a	How rested do you normally feel after sleep? (<i>between successive night shifts</i>) (n=125)	Not rested	35	28.0
		Rested	90	72.0
2.6b	How rested do you normally feel after sleep? (<i>between successive days off</i>) (n=118)	Not rested	20	16.9
		Rested	98	83.1
2.7a		No	26	21.5

	Do you ever wake up earlier than you intended? (<i>between successive night shifts</i>) (n=121)	Yes	95	78.5
2.7b	Do you ever wake up earlier than you intended? (<i>between successive days off</i>) (n=117)	No	26	22.2
		Yes	91	77.8
Question number	Main question	Response options	n	%
2.8a	Do you have difficulty in falling asleep? (<i>between successive night shifts</i>) (n=121)	No	57	47.2
		Yes	64	52.8
2.8b	Do you have difficulty in falling asleep? (<i>between successive days off</i>) (n=119)	No	56	47.1
		Yes	63	52.9
2.9a	Do you take sleeping pills? (<i>between successive night shifts</i>) (n=123)	No	100	81.3
		Yes	23	18.7
2.9b	Do you take sleeping pills? (<i>between successive days off</i>) (n=119)	No	101	84.9
		Yes	18	15.1
2.10a	Do you use alcohol to help you to sleep? (<i>between successive night shifts</i>) (n=122)	No	111	90.9
		Yes	11	9.1
2.10b	Do you use alcohol to help you to sleep? (<i>between successive days off</i>) (n=117)	No	105	89.7
		Yes	12	10.3
2.11a	Do you ever feel tired on: (<i>between successive night shifts</i>) (n=122)	No	40	32.8
		Yes	82	67.2
2.11b	Do you ever feel tired on: (<i>between successive days off</i>) (n=118)	No	35	29.6
		Yes	83	70.4

Feelings about the amount of sleep: A lower percentage of participants (47.8%) felt that they needed more sleep between successive days off than between successive night shifts (70.2%). It is therefore concluded that the participants are more satisfied with the amount of sleep when off duty than the amount of sleep between successive night shifts.

Quality of sleep: After reviewing the information in Table 4.4, it is evident that most participants sleep well. However, a higher percentage (85.5%) indicated that they sleep well between successive days off than between successive night shifts (78.4%).

How rested do you feel: It is evident from the results that most participants who answered this question are not well rested after sleep between successive night shifts (n=35, 28.0%). In comparison, participants seem to feel more rested after sleep between days off.

Waking up earlier than intended: For both between successive night shifts and successive days off, it seems that most participants (n=91, 77.8% and n=95, 78.5% respectively) do have a tendency of waking up earlier than intended.

Difficulty falling asleep: More than half of participants (n=64, 52.8%) have difficulty falling asleep. The scores appear quite similar between successive night shifts and successive days off. The level of difficulty in falling asleep participants encounter seems the same, irrespective of whether it is between successive days off or between successive night shifts.

Taking sleeping pills: The use of sleeping pills does not seem to be too common among this population of night shift workers. However, since the use of sleeping pills is not considered a normal practice, the fact that n=23 (18.7%) participants use sleeping pills between successive night shifts and n=18 (15.1%) between successive days off, remains concerning. It seems as if night shift may contribute to participants taking sleeping tablets.

Use of alcohol to aid sleep: As with taking sleeping tablets, alcohol use in aid of sleep is not considered a normal practice and might point to desperation for sleep. Thus, the fact that n=11 (9.1%) participants take alcohol to sleep between successive night shifts and n=12 (10.3%) between successive days off, might indicate that working night shift contributes to sleeping problems that cause participants to use substances in aid of sleep.

Feeling tired: Most participants (n=82, 67.2% and n=83, 70.4% respectively) reported to feel tired between successive night shifts and between successive days off. It thus seems common for a night shift worker to constantly be tired.

Sleep disturbance scores: Responses to the abovementioned questions were coded from 1 through to 5. Questions 2.4 to 2.6 were positively phrased and questions 2.7 to 2.11 were negatively phrased. Questions 2.4 to 2.6 were therefore reverse coded. The responses were summed to calculate an overall sleep disturbance score, excluding Question 2.9 and 2.10 that related to using substances. The Cronbach alpha of the 12 items included in the score is 0.82 (n=104), indicating acceptable internal consistency. The mean sleep disturbance score is 34.0 (SD=7.5) and range between 14 and 54. A high score indicates more sleep disturbance, with

the maximum score being 60. The results therefore indicate high sleep disturbance levels overall.

The scores were further separated into sleep disturbance between successive night shifts and between days off (each out of a maximum score of 30). The scores are displayed in boxplots in Figure 4.2. The sleep disturbance scores were higher between successive night shifts, compared to successive off days.

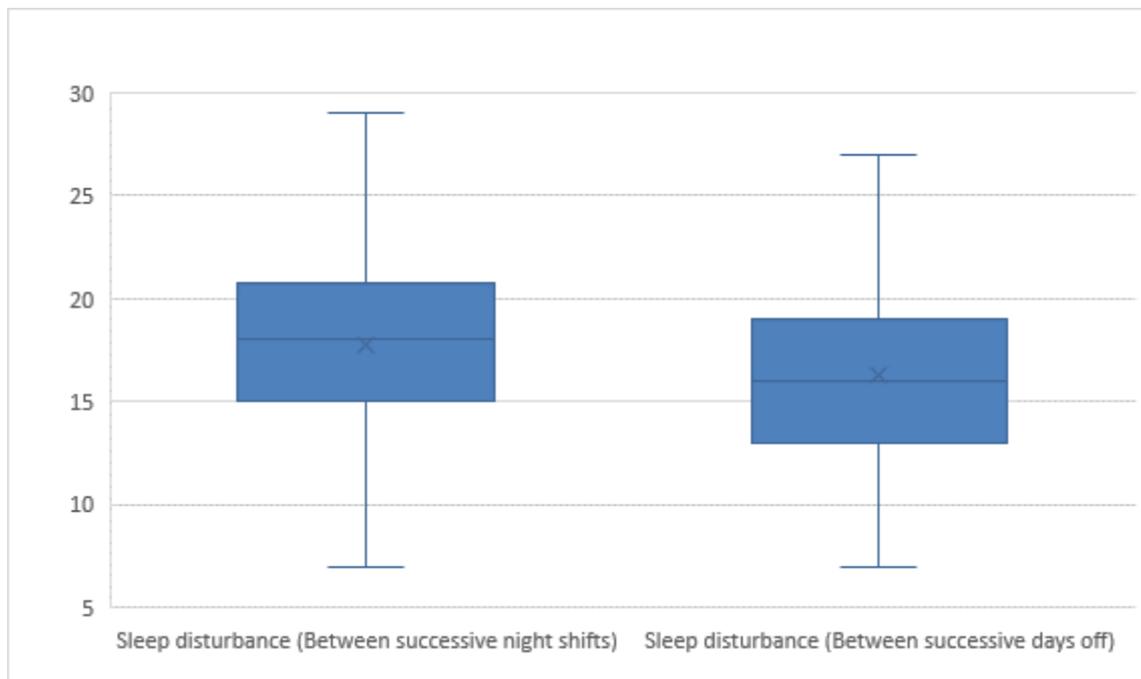


Figure 4.2: Sleep disturbance scores

4.3.3 General feelings of being tired or feeling energetic

This question relates to how energetic or tired the nightshift worker feels in general, irrespective of whether they had enough sleep or have been working very hard. The question has 10 sub-questions. The sub-questions took the form of statements where participants could either agree or disagree with the statement by choosing from options *not at all*, *somewhat* and *very much so*. The results of Question 2.12 are summarised in Table 4.5.

Table 4.5: General feelings of being tired or energetic

Question number	Variable	N	Not at all n (%)	Somewhat n (%)	Very much so n (%)
2.12a	I generally feel I have plenty of energy	123	13 (10.6)	58 (47.2)	52 (42.3)
2.12b	I usually feel drained	124	27 (21.8)	76 (61.3)	21 (16.9)
2.12c	I generally feel quite active	125	12 (9.6)	53 (42.4)	60 (48.0)
2.12d	I feel tired most of the time	123	34 (27.6)	71 (57.7)	18 (14.6)
2.12e	I generally feel full of vigour	119	20 (16.8)	70 (58.8)	29 (24.4)
2.12f	I usually feel rather lethargic	121	37 (30.6)	68 (56.2)	16 (13.2)
2.12g	I generally feel alert	124	7 (5.6)	46 (37.1)	71 (57.3)
2.12h	I often feel exhausted	123	28 (22.8)	69 (56.1)	26 (21.1)
2.12i	I usually feel lively	122	11 (9.0)	51 (41.8)	60 (49.2)
2.12j	I feel weary much of the time	118	40 (33.9)	62 (52.5)	16 (13.6)

Question 2.12 a, c, e, g and i pertains to positive feelings regarding how energetic participants feel, while working night duty. This question addressed aspects such as energy, vigour, alertness and feeling active and lively. The largest number of participants experienced positive feelings regarding these aspects, as evident in their responses which were either *somewhat* or *very much so*. The minority of participants did not experience positive feelings regarding energy levels.

Question 2.12 b, d, f, h and j addressed negative feelings regarding energy levels such as feelings of weariness, lethargy, exhaustion or feeling drained or lethargic. For all these questions most participants selected that they have *somewhat* negative feelings regarding energy levels. The minority experienced negative feelings whereas the remainder of participants did *not* experience negative feelings *at all*.

Responses for this question were scored from 1 to 3. For the negatively phrased questions, the items were recorded. The responses were then summed to create a chronic fatigue score. The score could range from 3 to 30, with a higher score indicating more fatigue. The Cronbach alpha of the 10 items is 0.85 (n=111), indicating acceptable reliability.

The mean score was 17.33 (SD 4.5; 95% Confidence Interval (CI) 16.5 to 18.1), indicating above average fatigue levels. When comparing the chronic fatigue score over categories of length of night shift, no significant differences were found. It appeared as if those working between 7 and 12 months in the current night shift had the highest level of fatigue (Figure 4.3). It may be that those working extended night shifts have adjusted to their shift somewhat.

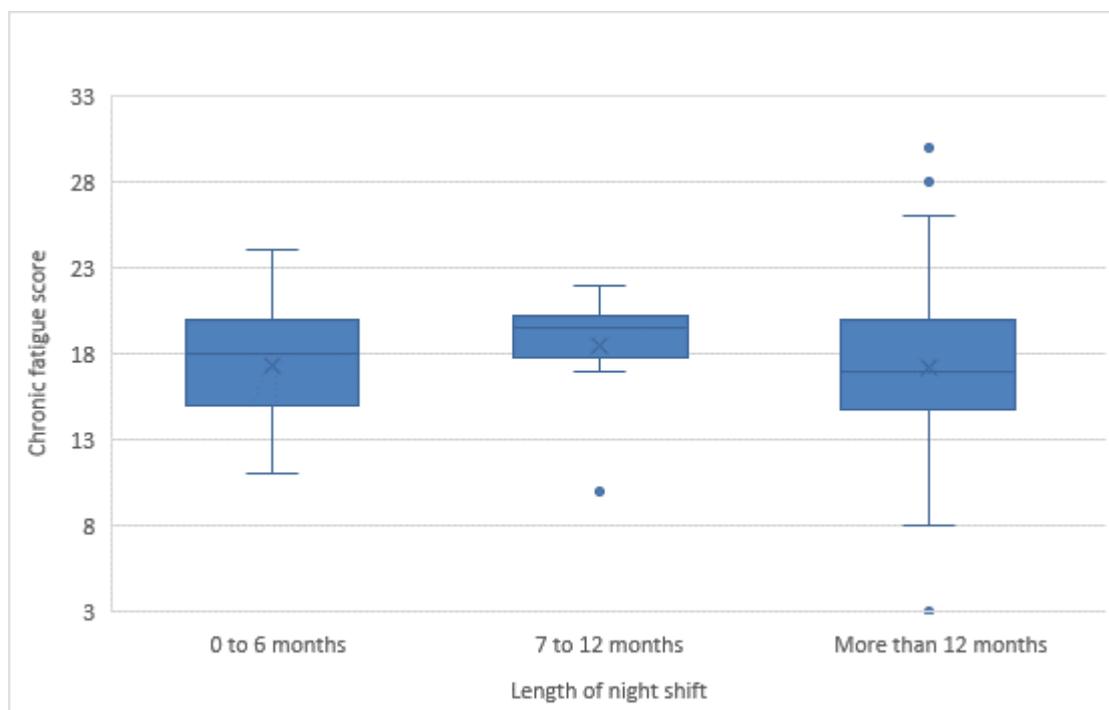


Figure 4.3: Chronic fatigue scores across categories of length of night shift

Age had a significant negative correlation with the chronic fatigue score ($r=-0.18$, $p=0.03$). Although the correlation is weak, it may indicate that younger participants reported higher fatigue levels.

There was a weak positive correlation between the chronic fatigue score and the number of dependents (persons needed looking after) of $r=0.22$, $p=0.02$. This indicates that the more persons in the house the participant needed to look after, the higher their fatigue level.

4.3.4 Comments or observations related to sleep and fatigue

Question 2.13 is an open-ended question and concerns any other comments or observations regarding sleep and fatigue that have not been covered in the questionnaire. Only twenty participants ($n=20$) responded to the open-ended question. Although the comments did not add additional information to the structured questions, it strengthened the responses that were received to the structured questions. These responses were counted manually by the

researcher and then themed. The themes related to sleep disturbances; feelings of fatigue; feeling energetic; feeling emotional and coping.

Ten participants reported on the sleep disturbances they experience. These comments included not being able to fall asleep, waking up in the night and not being able to fall asleep again, struggling with sleep in general, difficulty falling asleep, sleep disturbed by certain activities and sleeping too little.

Four participants reported on feelings of fatigue. These comments included feeling tired constantly, feeling tired during the last part of the day and feeling tired due to working night shift. Two participants reported that they feel very energetic when working night duty.

One participant reported feeling especially emotional and cried easily when working night duty. Conversely, another stated: "*I cope well with night duty.*"

4.4 SECTION 3: YOUR HEALTH AND WELLBEING

Section 3 contains a presentation of the general health of participants. Section 3 consists of Question 3.1 with nine subsections (Questions 3.1 to 3.8). These subsections address the presence of night shift-related ailments, the use of medications and stimulants and the use of hormones. Questions are mostly in the form of Likert scale questions and one open-ended question was included.

4.4.1 Symptoms pertaining to cardiac and digestive health

Participants were asked to indicate how frequently they experience certain cardiac and digestive health related symptoms. Responses ranged from almost never to almost always. Questions 3.1a to 3.1h, that is 8 sub-questions, relate to digestive health. Questions 3.1i to 3.1s (11 sub-questions) relate to cardiac health.

Their responses are summarised in Table 4.6 followed by a discussion.

Table 4.6: Symptoms relating to cardiac and digestive systems

Question number	Variable	n	Almost never n (%)	Quite seldom n (%)	Quite often n (%)	Almost always n (%)
Digestive symptoms / health						
3.1 a	Disturbed appetite	126	46 (36.5)	38 (30.2)	31 (24.6)	11 (8.7)
3.1 b	Watch eating habits to prevent stomach upsets	125	57 (45.6)	26 (20.8)	33 (26.4)	9 (7.2)
3.1 c	Nausea	126	84 (66.7)	27 (21.4)	13 (10.3)	2 (1.6)
3.1 d	Heartburn or stomach ache	126	49 (38.9)	45 (35.7)	22 (17.5)	10 (7.9)
3.1 e	Digestive difficulties	126	66 (52.4)	32 (25.4)	23 (18.3)	5 (4.0)
3.1 f	Bloated stomach or flatulence	126	46 (36.5)	35 (27.8)	34 (27.0)	11 (8.7)
3.1 g	Pain in your abdomen	126	63 (50.0)	45 (35.7)	15 (11.9)	3 (2.4)
3.1 h	Constipation or diarrhoea	126	58 (46.0)	34 (27.0)	23 (18.3)	11 (8.7)
Cardiac symptoms/health						
3.1 i	Heart palpitations	124	69 (54.8)	37(29.4)	17 (13.5)	3 (2.4)
3.1 j	Aches and pains in your chest	126	85 (67.5)	31 (24.6)	9 (7.1)	1 (0.8)
3.1 k	Dizziness	126	74 (58.7)	42(33.3)	8 (6.3)	2 (1.6)
3.1 l	Sudden rushes of blood to your head	126	84 (67.7)	28 (22.6)	10 (8.1)	2 (1.6)
3.1 m	Shortness of breath when climbing the stairs normally	126	57 (45.2)	34 (27.0)	30 (23.8)	5 (4.0)
3.1 n	High blood pressure	126	74 (58.7)	21 (16.7)	24 (19.0)	7 (5.6)
3.1 o	Heart beating irregularly	125	79 (63.2)	28 (22.4)	14(11.2)	4 (3.2)
3.1 p	Swollen feet	125	62 (49.6)	31 (24.8)	23 (18.4)	9 (7.2)
3.1 q	Feel tight in your chest	126	88 (69.8)	22 (17.5)	12 (9.5)	4 (3.2)
3.1 r	Gained weight since beginning of shift work	125	56 (44.8)	19 (15.2)	28 (22.4)	22 (17.6)
3.1 s	Lost too much weight since beginning of shift work	124	107(86.3)	11 (8.9)	4 (3.2)	2 (1.6)

Although the minority of participants answered *almost always*, more participants (between 3.2% and 27.0%) answered *quite often* for all the questions. When considering the responses for *almost always* and *quite often* collectively for all the questions, many night shift workers reported cardiac and digestive symptoms.

Cardiac ailments: The most frequently reported cardiac symptoms were weight gain (n=50, 40.0%), shortness of breath (n=35, 28, 0%) and hypertension (n=31, 25.0%). Participants were less likely to suffer from aches and pains in the chest, sudden rushes of blood and tightness in the chest and weight loss.

Digestive ailments: The most frequently reported digestive symptoms were flatulence (n=45, 36, 0%), disturbed appetite (n=42, 33%) and stomach upsets (n=42, 34.0%). Participants however, do not tend to suffer from nausea, digestive difficulties and pain in the abdomen often.

The responses to the questions were scored 1 to 4. The responses to Questions in 3.1 were categorised into digestion and cardiac-related ailments and then summed to create digestive and cardiac scores. The scores were then calculated as a percentage score to ease interpretation and facilitate comparison. Figure 4.4 graphically represents the scores.

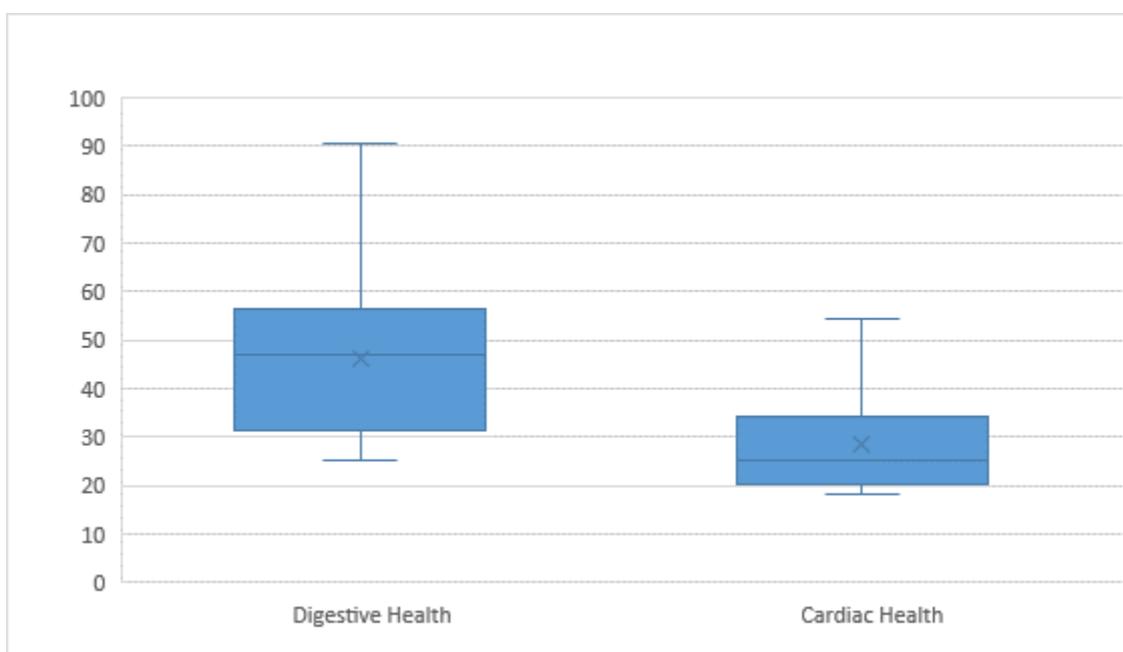


Figure 4.4: Digestive health and cardiac health scores

Digestive health: The mean for digestive health problems was 46.30 (SD 15.9; 95% CI 43.5 to 49.5) and the range was 25 to 91, suggesting variability among participants regarding digestive health problems. The Cronbach alpha of these questions was 0.843 (n=125) indicating acceptable reliability.

Cardiac health: The mean score for cardiac health was 28.46 (SD 9.2), the 95% confidence interval of the mean was 26.8 to 30.1 and the range 18 to 55. The latter suggested a fair amount of variability among the responses, regarding symptoms reflecting cardiac health. The

Cronbach alpha of these questions was 0.809 (n=121), and therefore acceptable. The cardiac and digestive health scores indicated that participants experienced more digestive than cardiac problems.

The cardiac health score had significant positive correlations with the chronic fatigue score ($r=0.27$, $p=0.002$) and sleep disturbance during shifts ($r=0.3$, $p=0.002$), whereas the digestive health score also had significant positive correlations with the chronic fatigue score ($r=0.23$, $p=0.023$) and overall sleep disturbance ($r=0.26$, $p=0.008$).

The digestive health score had a medium positive correlation with the number of unpaid overtime hours ($r=0.33$, $p=0.009$) which may indicate that nurses working more hours of unpaid overtime experienced additional stress which affected their digestive health.

4.4.2 Night shift related illnesses

Participants were asked if they had ever been diagnosed with certain night-shift-related illnesses such as diabetes, hypertension and myocardial infarction. Their responses are summarised in Table 4.7, followed by a discussion.

Table 4.7: Night shift related illnesses

Question number	Variable	N	Never n (%)	Before starting night shift work n (%)	Since starting night shift work n (%)
3.2 a	Chronic back pain	125	86 (68.8)	3 (2.4)	36 (28.8)
3.2 b	Gastritis, duodenitis	124	110 (88.7)	1 (0.8)	13 (10.5)
3.2 c	Gastric or duodenal ulcer	124	115 (92.7)	1 (0.8)	8 (6.5)
3.2 d	Gallstones	124	115 (92.7)	0 (0.0)	9 (7.3)
3.2 e	Colitis	124	119 (96.0)	0 (0.0)	5 (4.0)
3.2 f	Sinusitis, Tonsillitis	123	82 (66.7)	17 (13.8)	24 (19.5)
3.2 g	Bronchial asthma	123	117 (95.1)	1 (0.8)	5 (4.1)
3.2 h	Angina	124	123 (99.2)	0 (0.0)	1 (0.8)
3.2 i	Severe heart attack; MI	124	119 (96.0)	1 (0.8)	4 (3.2)
3.2 j	Hypertension	124	85 (68.5)	11 (8.9)	28 (22.6)

3.2 k	Cardiac arrhythmias	124	115 (92.7)	2 (1.6)	7 (5.6)
3.2 l	High cholesterol	123	107 (87.0)	3 (2.4)	13 (10.6)
3.2 m	Diabetes	124	109 (87.9)	3 (2.4)	12 (9.7)
3.2 n	Cystitis	124	118 (95.2)	2 (1.6)	4 (3.2)
3.2 o	Kidney stones	124	120 (96.8)	2 (1.6)	2 (1.6)
3.2 p	Eczema	124	117 (94.4)	4 (3.2)	3 (2.4)
3.2 q	Chronic anxiety	124	111 (89.5)	0 (0.0)	13 (10.5)
3.2 r	Depression	124	103 (83.1)	3 (2.4)	18 (14.5)
3.2 s	Arthritis	124	110 (88.7)	2 (1.6)	12 (9.7)
3.2 t	Haemorrhoids	124	109 (87.9)	3 (2.4)	12 (9.7)
3.2 u	Varicose veins	124	96 (77.4)	4 (3.2)	24 (19.4)
3.2 v	Anaemia	124	114 (91.9)	3 (2.4)	7 (5.6)
3.2 w	Headache	123	79 (64.2)	15 (12.2)	29 (23.6)

The development of certain illnesses such as cardiac-related illnesses (excluding hypertension and high cholesterol), diseases of the urinary system and anaemia do not seem to be influenced by engaging in night shift work. On the other hand, headaches, gastric related illnesses, hypertension, hypercholesterolemia, diabetes, arthritis, depression and anxiety and haemorrhoids and varicose veins do seem to develop after engaging in night shift work. The diseases that tend to develop the most after engaging in night shift work are chronic back pain, headaches, hypertension, sinusitis and tonsillitis. In addition, when considering the responses indicating the development of illnesses after starting night shift work, 80 participants (64.0%) out of 125 indicated that they had developed at least one of these night shift related illnesses since starting night shift work.

Question 3.2 (x) is an open-ended question where participants could add any other illness that was not covered in the questionnaire.

Only seven participants (n=7) responded to this question. One participant indicated that she struggled to brush her teeth due to acid reflux; however, she did not indicate whether the ailment started before or after starting shift work. Two participants stated that they are struggling with constipation of which one participant suffered from constipation *before starting night shift work* and the other suffered from constipation *since starting night shift work*. One participant complained about diabetic neuropathy, but did not indicate when the condition started; and another participant reported being dizzy all the time, albeit not stating when the dizziness started. One participant reported irritable bowel syndrome since starting night shift work and another reported mood swings since starting night shift work.

4.4.3 Use of medication

This question focused on the use of certain medications for prolonged periods of time (more than three months). Responses are summarised in Table 4.8, followed by a short discussion.

Table 4.8: Medication

Question number	Variable	n	Never n (%)	Before starting night shift work n (%)	Since starting night shift work n (%)
3.3 a	Tranquilizers	121	116 (95.9)	1 (0.8)	4 (3.3)
3.3 b	Sleeping tablet	121	103 (85.1)	1 (0.8)	17 (14.0)
3.3 c	Anti-depressants	121	105 (86.8)	3 (2.5)	13 (10.7)
3.3 d	Antacids	121	93 (76.9)	5 (4.1)	23 (19.0)
3.3 e	Antispasmodics	121	104 (86.0)	2 (1.7)	15 (12.4)
3.3 f	Laxatives	120	103 (85.8)	7 (5.8)	10 (8.3)
3.3 g	Anti-hypertensives	121	84 (69.4)	13 (10.7)	24 (19.8)
3.3 h	Diuretics	120	108 (90.0)	6 (5.0)	6 (5.0)
3.3 i	Heart medicines	120	115 (95.8)	2 (1.7)	3 (2.5)
3.3 j	Vasodilators	120	116 (96.7)	2 (1.7)	2 (1.7)
3.3ki	Bronchodilators	120	108 (90.0)	3 (2.5)	9 (7.5)
3.3 l	Vitamins and tonics	120	78 (65.0)	10 (8.3)	32 (26.5)
3.3 m	Pain killers	120	66 (55.0)	16 (13.3)	38 (31.7)
3.3 n	Steroids	119	115 (96.6)	1 (0.8)	3 (2.5)
3.3 o	Anti-inflammatory medicines	121	88 (72.7)	8 (6.6)	25 (20.7)
3.3 p	Hormones	117	111 (94.9)	3 (2.6)	3 (2.6)

The results for this question, where participants were asked if they had taken any of the listed medication for more than three months, corresponded with the results of Question 3.2 r where participants were asked if they were diagnosed with any of the listed illnesses (Table 4.7). It seemed that participants who reported suffering from certain illnesses also reported using medication for the illness, e.g. n=39 (31%) participants suffered from hypertension and n=37 (30.6%) took anti-hypertensive medication and hence the results correspond.

The medications most frequently used since engaging in night shift work are pain killers, vitamins, tonics, anti-inflammatory medicines, antacids and anti-hypertensive medications. Another issue of concern is the fact that more participants reported the use of anti-depressants and sleeping tablets after starting night shift than prior to starting night shift, indicating that

night shifts might have influenced their sleep patterns and mood. Medications that are seldom used by the night shift nurses are heart medications, vasodilators, tranquilisers and steroids.

Since Questions 3.3 a to 3.3 p did not cover medication for high cholesterol and diabetes, the expectation was that more responses would be received in the “other” section (Question 3.3 q). However, only four participants (3.1%) commented on the use of medication for diabetes and high cholesterol. When examining Question 3.2 l and Question 3.2 m, 16 (13.1%), participants indicated that they suffered from high cholesterol and 15 (12.1%) indicated that they suffered from diabetes. Thus, it can be concluded that most participants who indicated that they suffered from these diseases either did not require treatment or merely forgot to indicate the use of these medications.

4.4.4 Stimulant use

Questions 3.4 to 3.6 address the use of stimulants such as cigarettes and coffee *before and since starting night shift work*. Although alcohol is not technically a stimulant, it is also covered in this section. The results of these questions are displayed in one table (Table 4.9), followed by a short discussion.

Table 4.9: Stimulants

Question number	Variable	n	Median	Mean	Min	Max	SD
3.4 a	Average number of cigarettes (<i>before night shift</i>)	83	0.0	9.33	0	140	22.685
3.4 b	Average number of cigarettes (<i>since night shift</i>)	89	0.0	19.44	0	140	36.040
Question number	Variable	n	Median	Mean	Min	Max	SD
3.5 a	Units of alcohol (<i>before night shift</i>)	89	0.0	0.88	0	10	1.848
3.5 b	Units of alcohol (<i>since night shift</i>)	87	0.0	1.52	0	16	3.007
3.6 a	Caffeinated drinks (<i>before night shift</i>)	105	2.00	2.30	0	8	1.813
3.6 b	Caffeinated drinks (<i>since night shift</i>)	107	3.00	3.84	0	20	3.189

From the data above, the use of stimulants increased when participants engaged in night shift work. This might be because participants needed stimulants to help them stay awake or that participants might need stimulants because they experienced higher stress levels when working night shift.

4.4.5 Menstrual cycle

This question pertains to regularity of the menstrual cycle of female participants. Results are displayed in Table 4.10, followed by a discussion.

Table 4.10: Menstrual cycle

Question number	Variable	n	Extremely irregular n (%)	Fairly irregular n (%)	Fairly regular n (%)	Extremely regular n (%)
3.7 a	How has your menstrual cycle been before starting night shift	72	4 (5.6)	8 (11.1)	36 (50)	24 (33.3)
3.7 b	How has your menstrual cycle been since starting night shift	71	10 (14.1)	9 (12.7)	28 (39.4)	24 (33.8)

Many participants omitted this question. In Question 4.2, Figure 4.1 it is displayed that most participants participating in the study were between the ages of 49 and 55, thus it can be

concluded that most participants in the study might no longer be menstruating. The fact that many participants were not menstruating, some who were male, together with the sensitivity of the question, might be reasons why many of them did not answer the question. If the scores for *extremely irregular* and *fairly irregular* are combined for before working night shift (n=12, 16.7%) and since starting night shift work (n=19, 28.6%) it is observed that the menstrual cycles of these participants (n=19, 28.6%) were more irregular since starting night shift work.

4.4.6 General feelings

Question 3.8 addressed the general feelings (such as feeling happy, depressed, confident, worried and worthy) of participants while working night duty. Although this question referred to general feelings, the symptoms covered in this question also related to symptoms of depression. The question also stated that participants should report feelings of the past few weeks and thus the responses might not reflect the whole night shift working period. These results are summarised in Table 4.12, followed by a discussion. To simplify the table and ease interpretation, the Likert-scale items were dichotomised and presented as either a positive or negative response.

Table 4.11: General feelings

Question number	Main question since working night duty, have you:	Response options	n	%
3.8 a	Been able to concentrate (n=117)	Same or better	95	81.2
		Less	22	18.8
3.8 b	Lost much sleep over worry (n=122)	Not at all or same	88	72.2
		More	34	27.9
3.8 c	Felt that you are playing a useful part in things (n=120)	Same or more	100	88.3
		Less	20	16.6
3.8 d	Felt capable of making decisions (n=121)	Same or more	110	90.9
		Less	11	9.1
3.8 e	Felt constantly under strain (n=122)	Not at all or same	83	68.1
		More	39	32.0
		Not at all or same	93	76.8

3.8 f	Felt you could not overcome difficulties (n=121)	More	28	23.1
Question number	Main question since working night duty, have you:	Response options	n	%
3.8 g	Was able to enjoy normal activities (n=122)	Same or more	92	75.4
		Less	30	24.6
3.8 h	Was able to face problems (n=122)	Same or more	103	84.4
		Less	19	15.6
3.8 i	Had been feeling unhappy and depressed (n=121)	Not at all or same	94	77.7
		Less	27	22.3
3.8 j	Had been losing confidence in yourself (n=120)	Not at all or same	100	83.3
		Less	20	16.7
3.8 k	Had been thinking of yourself as a worthless person (n=121)	Not at all or same	111	91.8
		Less	10	8.2
3.8 l	Had been feeling reasonably happy (n=122)	More or same	102	83.6
		Less	20	16.4

Considerable numbers of participants seem to struggle with sleep loss due to worry, feeling under more strain and feeling depressed. Although most participants (n=102, 83.6%) reported feeling reasonably happy (Question 3.8 l), it remained a concern that 20 participants (16.4%) reported feeling less happy than usual. Some participants also reported positively on night shift in that they felt they could overcome difficulties, being able to face problems and being able to enjoy everyday activities more.

Questions 3.8a to 3.8l were summed to create a general feelings score. The dichotomised responses were coded to represent the presence or absence of the abovementioned feelings and summed to create a general feelings score. The maximum score is 12. The higher the score, the more negative feelings were reported. Table 4.13 contains a summary of the statistics of Question 3.8.

Table 4.12: General feelings scores

Question number	Variable	n	Median	Mean	Minimum	Maximum	Std deviation
3.8.1	General feelings	112	1.00	2.3	0.00	12.00	3.0

For the 12 items, the maximum score was 12 and the minimum 0. The Cronbach alpha for the 12 items was 0.877 (n=112) indicating acceptable reliability. The mean score was 2.3 (SD of 3.0) and thus indicated a low number of negative feelings regarding night shift work. Considering the interquartile range, 50% of the participants reported between 0 and 4 general negative feelings.

General feelings had a medium negative correlation with some experiencing support from their partner (question 1.7) ($r = -0.306$, $p = 0.008$). This meant that more support from their partner was associated with less negative feelings.

Further, general feelings had significant positive correlations with digestive health ($r = 0.368$, $p = 0.00$) and cardiac health ($r = 0.236$, $p = 0.014$). It appeared that the more negative feelings participants experienced, the more likely they were to report illness symptoms. There was thus an association between negative feelings, digestive and cardiac health.

General feelings had a significant positive correlation with the amount of unpaid overtime worked ($r = 0.31$, $p = 0.017$) which was negatively correlated with the number of years worked altogether ($r = -0.259$, $p = 0.007$). Participants who worked more unpaid overtime were more likely to have more negative general feelings. However, participants with longer overall work experience reported fewer negative general feelings.

4.4.7 Symptoms of anxiety

This question concerned the extent to which participants experienced symptoms of anxiety. Participants were required to indicate to what extent they suffered certain anxiety related symptoms. The responses are depicted in Table 4.14.

Table: 4.13: Symptoms of anxiety

Question number	Main question	Response Options	n	%
3.9 a	I perspire	Not at all	69	58.5
		Somewhat	34	28.8
		Very much so	15	12.7

3.9 b	Heart beats faster	Not at all	51	41.5
		Somewhat	49	39.8
		Very much so	23	18.7
3.9 c	Worry too much about something that does not matter	Not at all	51	40.8
		Somewhat	56	44.8
		Very much so	18	14.4
3.9 d	Feeling jittery	Not at all	77	62.6
		Somewhat	37	30.1
		Very much so	9	7.3
3.9 e	Imagine terrifying scenes	Not at all	89	72.4
		Somewhat	25	20.3
		Very much so	9	7.3
3.9 f	I get diarrhoea	Not at all	99	80.5
		Somewhat	22	17.9
		Very much so	2	1.6
3.9 g	Can't keep anxiety provoking pictures out of my head	Not at all	93	76.9
		Somewhat	21	17.4
		Very much so	7	5.8
3.9 h	Feel tense in my stomach	Not at all	67	55.4
		Somewhat	44	36.4
		Very much so	10	8.3
3.9 i	Some unimportant thoughts run through my head and bother me	Not at all	81	65, 0
		Somewhat	32	26.0

		Very much so	10	8.1
3.9 j	I nervously pacing	Not at all	91	74.6
		Somewhat	27	22.1
		Very much so	4	3.3
Question number	Main question	Response Options	n	%
3.9 k	I feel like I am losing out on things because I can't make up my mind soon	Not at all	79	65.2
		Somewhat	31	25.6
		Very much so	11	9.1
3.9 l	I feel physically immobilised	Not at all	87	72.5
		Somewhat	30	25, 0
		Very much so	3	2.5
3.9 m	I can't keep anxiety from provoking thoughts out of my head	Not at all	78	64.5
		Somewhat	32	26.4
		Very much so	11	9.1
3.9 n	I feel it's difficult to concentrate due to uncontrollable thoughts	Not at all	74	60.7
		Somewhat	37	30.3
		Very much so	11	9, 0

Responses to Question 3.9 c, where participants had to state if they worried way too much about things that did not matter, stood out in this table since this was the only question where responses for *somewhat* were more than responses for *not at all*. For all other questions in this table, the response option *not at all* received the most responses, followed by *somewhat*, and *very much so* received the least responses. Although most participants did not suffer from anxiety symptoms, considerable numbers of participants (n=15, 12.7%) perspired when they were anxious, n=18, (14.4%) reportedly tended to worry too much over things that did not matter, and n=23, (18.7%) participants experienced their hearts beating faster when they were anxious. Participants reported the least suffering from diarrhoea, pacing nervously and feeling physically immobilised.

Items were summed to create a somatic anxiety and a cognitive anxiety score. Each of these scores had 7 items. The minimum score is 7 and the maximum score 21. The mean scores for somatic anxiety and cognitive anxiety were similar (10.1) (Figure 4.5).

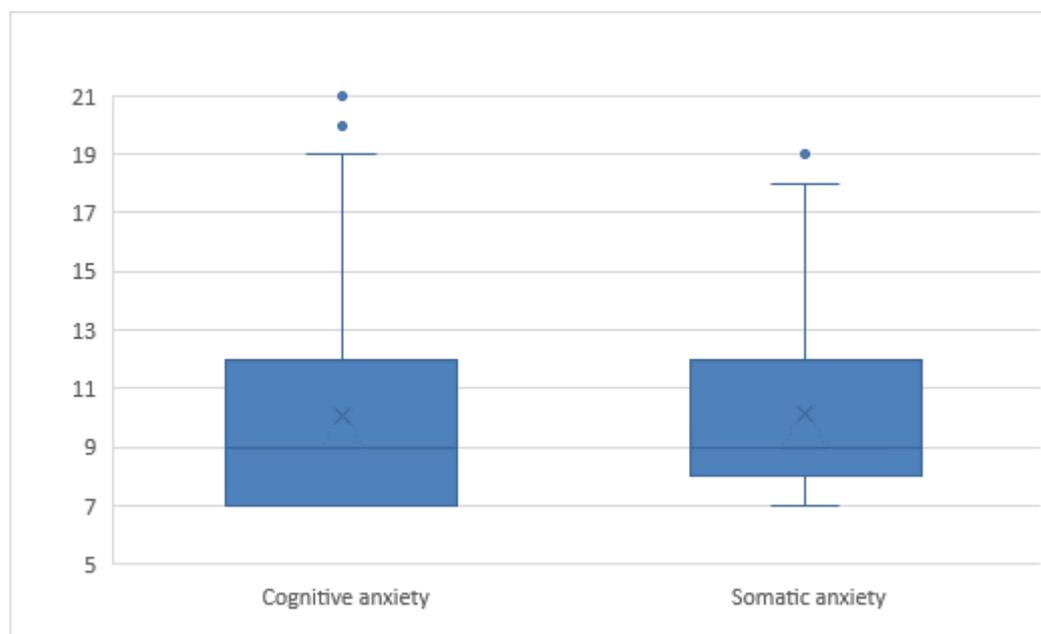


Figure 4.5: Cognitive and somatic anxiety scores

Both scores correlated strongly with the general feelings score ($r=0.54$, $p=0.00$ for cognitive anxiety and $r=0.53$, $p=0.00$ for somatic anxiety). Thus, the more anxiety related symptoms participants experienced, the more negative feelings were reported.

Anxiety had medium amount of correlation with digestive health ($r=0.39$, $p=0.00$ for cognitive anxiety and $r=0.41$, $p=0.00$ for somatic anxiety). This meant that the more anxious a participant felt, the more digestive symptoms are present.

Further, anxiety levels had medium correlations with cardiac health ($r=0.36$, $p=0.00$ for cognitive anxiety and $r=0.33$, $p=0.00$ for somatic anxiety). As with digestive health, the more anxiety a participant experienced, the more cardiac symptoms were present.

4.5 SUMMARY

In this chapter, the data being collected during this study was analysed, described and interpreted. The researcher thoroughly explored and investigated the research question, i.e.:

‘What influence does night shift work have on the health and well-being of nurses?’

By means of a questionnaire, the influences of working night shift on the health of nurses was successfully identified and described.

The following objectives were achieved during the study:

- Describe eating patterns and weight gain;
- Describe energy levels of night shift nurses;
- Describe current health and wellbeing;
- Identify and describe amounts of stimulants used; and
- Describe the presence of anxiety and depression

In the final chapter, Chapter 5 includes a discussion of conclusions and recommendations, based upon the study outcomes being generated during this research.

CHAPTER 5: DISCUSSION, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter 1 contains a presentation of the scientific foundation of the study and Chapter 2 a literature review regarding the possible influence working night shift has on the health of nurses. A description of the research methodology that was applied in the study is presented in Chapter 3, while the results of the study are displayed in Chapter 4.

This chapter includes a discussion of conclusions that were drawn from the study as well as recommendations based upon the findings of the study.

5.2 DISCUSSION

A discussion of how the findings of the research relate to the study objectives follows. Each objective and its findings are discussed separately.

5.2.1 Objective 1: Identify and describe sleeping problems of the night shift nurse

From the data in Chapter 4 it is evident that many participants experienced disrupted sleeping patterns to some degree. Sleeping problems experienced by night shift nurses in the current study related to unrefreshed sleep, difficulty falling asleep, waking prematurely and general poor sleeping habits. Smith et al. (2013:n.p.) completed a study on health and shift work and reported similar findings.

Participants reported sleeping better on off days than on work days and reported feeling more satisfied with their sleep on off days. They seem to fall asleep easier and stay asleep for longer on off days (Table 4.4). Numerous participants in the study reported waking up earlier than intended and that they found it difficult to fall asleep. These problems related to their sleep-wake cycle could be due to circadian misalignment (Price, 2011:38; Vimalananda et al., 2015:3480). Colten and Altevogt (2006:13) confirmed that the circadian rhythm regulates the sleep-wake cycle. Therefore, nurses working night shift who have to sleep during daytime can expect disturbances related to their sleep-wake cycle and that these problems tend to increase with continued engagement in night duty. Also, according to Block (2014:n.p.), circadian rhythm sleeping problems involve at least one of the following: difficulty falling asleep, waking up frequently, waking up too early and then not being able to fall asleep again or sleep of poor quality.

Claustrat et al. (2005:110) had found that non-optimal Melatonin levels in the night shift nurses frequently contributed to sleeping problems such as waking earlier than intended, difficulty

falling asleep and unrefreshed sleep. The participants in the current study reported the same sleeping problems.

Morgenthaler (2013:n.p.) proposes eight hours of daily sleep for adults. Nevertheless, participants in this study reported to an average of eight sleep hours on off days only, indicating that most night shift nurses might be sleep deprived. If sleep is short, not all sleep phases are reached, and this can thus cause sleep deprivation (Smith, et al., 2013:n.p; Morgenthaler, 2013:n.p.).

The participants in the study slept less than eight hours on work days; between five and seven hours. The naps participants took on off days were also longer than on work days (Table 4.3). This might be due to various factors such as stress levels, more free time on off days, being more relaxed on off days. Although the ideal would be that participants sleep eight hours or more on both on and off duty days, sleeping more hours on off days is valuable, since it allows participants to recuperate for their next shift and minimises the impact of sleep debt (Smith et al., 2013:n.p). Most participants reported a need for more sleep in order to feel revitalised. This is yet again a symptom of sleep deprivation. Interestingly, although participants know they need more sleep, they do not sleep more hours. The findings of Gaultney and Collins-McNeil (2009:148) might still apply where most participants indicated that they work night duty to meet family responsibilities during the day hence they do not have time to sleep more hours. Indirectly, the latter might also contribute to sleep deprivation and sleep debt without participants realising it. According to Gaultney and Collins-McNeil, (2009:148) night shift nurses are chronically sleep deprived because of cutting down on sleep or postponing sleep for other activities, without fully realising it and its effects.

Participants indicated that they feel more rested on off days than on work days and were also more satisfied with the amount of sleep they managed on off days (Table 4.4). In general, most participants slept and rested fairly well but admitted that there is room for improvement. Waking earlier than intended seemed to be a common problem for the night shift nurses, irrespective of whether it was on off or working days (Table 4.4). It therefore appeared that sleep might be influenced by working night shift (Admi et al., 2008:250). These findings were strengthened by their responses to their open-ended question (Question 2.13) where participants commented on having difficulty falling asleep, sleeping too little and poor quality of sleep. Another common problem of the night shift nurses is difficulty falling asleep. According to Gaultney and Collins-McNeil (2009:148), difficulty falling asleep contributes to chronic sleep deprivation. A few participants also indicated using sleeping tablets which could be evident of sleeping problems.

Recommendations: As discussed in Chapter 2 participants should practise sleep hygiene by following regular daytime sleeping patterns, sticking to a bedtime routine and creating an optimal sleeping environment (Price, 2011:38). A peaceful sleeping environment can be created by unplugging phones, darkening the room, wearing earplugs and sleeping masks, training family and friends to respect sleep time, and by scheduling appointments out of sleep time (Health and Safety Authority, 2012:21). Daytime sleep could also be improved through avoiding stimulants such as caffeine after midnight (Morgenthaler, 2013:n.p.). Awareness should be created around the benefits and importance of sleep (Health and Safety Authority, 2012:21). Sufficient sleep under the proper conditions, as mentioned above should be a priority for the night shift nurse (Takahashi, 2012:6). Melatonin supplements can be used as a natural substance to aid sleep (Srinivasan et al., 2010:7).

5.2.2 Objective 2: Describe energy levels of night shift nurses

This objective intersects with the previous objective since sleep influences fatigue levels. Sleep disorders cause chronic fatigue syndrome (Cherry, 2013:n. p.). Poor quantity and quality of sleep lead to low energy levels in nurses working night shift (Cherry, 2013:n.p.). The findings of a study regarding the effects of sleep deprivation on fatigue by Williamson and Friswell (2011:690) revealed that sleep deprived individuals suffered from daytime fatigue. In addition, according to Vimalananda et al., (2015:3480) chronic fatigue is a common phenomenon among nurses working night shift. Most participants in the current study reported to experience a measure of fatigue whether fairly or severely. Participants reported the same levels of fatigue, irrespective of whether it was on work days or off days. In addition, most participants reported feelings of lethargy, exhaustion, weariness, feeling drained and tired most of the time. The conceptual framework (Chapter 1, Figure 1) indicates that the amount and quality of sleep are directly related to fatigue and optimal functioning. Considerable numbers of participants report suffering from depression which might also cause feelings of fatigue. It is also evident that the use of vitamins and tonics are common which might signify feelings of fatigue or low energy levels.

What is unique about this study is that positive feelings regarding energy and fatigue levels such as feeling energetic, feeling lively, being alert and active have also been reported by participants. Interestingly similar numbers of participants who state that they are tired also stated that they are in fact energetic, which causes a discrepancy. Nevertheless, it has not been evident from the literature review that nurses feel energetic, alert, lively and active while working night duty. Most participants reported feeling tired on successive work days and especially on successive off days, thus it seems as if participants almost always feel tired. Insufficient sleep affects work life, and the effects thereof, such as fatigue and or low energy

levels, seem to linger on, even on off-duty days (Admi et al., 2008:250). In addition, people who work night shift are awake for longer periods of the day and often suffer from fatigue (Cherry, 2013:n.p.).

Quantity and quality of sleep are regarded as equally important (Smith et al., 2013:n.p.). The conceptual framework in Chapter 1, Figure 1 illustrates that the quality and quantity of sleep influence mental and physical wellbeing. The findings of the current study revealed that participants tend to lose too much sleep. Johnson (2007:310) related that losing even one hour of sleep per day results in sleep debt and leads to chronic sleep deprivation and chronic fatigue. As discussed previously, many participants reported not sleeping enough and thus, as evident from the literature, they would suffer from fatigue.

Marital status or sex was not associated with chronic fatigue levels in the study, thus having a partner does not seem to impact either negatively or positively on energy levels. In the study those working night shift for between seven and twelve months had the highest level of fatigue. These experiences of fatigue may be ascribed to an inability to adjust to night duty (Drake & Wright, s.a.: 784). Although the literature suggested that the body does not fully adjust to night shift work and that only marginal adjustments occur, it might be that those working night shift had somewhat adjusted to their shift (Drake & Wright, s.a.:784). It might also be that the ones working night shift for longer periods have established a better sleeping routine and practise improved sleep hygiene. One study also suggests that a person's body can adapt to sleep restriction or sleep deprivation (Banks & Dinges, 2012:68).

Recommendations: The recommendations that are applicable to Objective 1 are also related to the current objective since a lack of sleep tends to influence one's energy levels and therefore causes fatigue. Although fatigue is largely a result of poor sleeping habits, other factors such as eating habits, exercise and mental health also play a role (Johnson, 2007:310). Consequently, an exercise routine and balanced eating habits are recommended to increase energy levels. Planton (2011:10) also advises the continued use of vitamins and tonics as a way to boost energy levels. A short nap just before work and a nap during the night while on duty might also assist with increasing energy levels (Morgenthaler, 2013:n.p.). Health care institutions should explore the possibility of allowing night shift nurses breaks to take naps while on duty (Stokowski, 2016:n.p.). Also, since night shift nurses tend to have poor eating habits, as evident in the literature review, providing a night shift nurse with a subsidised healthy high energy producing meal can be beneficial. Additionally, a short and light exercise programme during lunch breaks might boost energy.

5.2.3 Objective 3: Describe current health and wellbeing

Substantial evidence was found that nurses working night duty experience poor general health, especially when working night shift for longer than two years (Admi, et al., 2008:250; Kim et al., 2013:369; Vimalananda et al., 2015:3482). According to the literature, due to the influences of circadian misalignment and insufficient melatonin production (as discussed in Chapter 2), nurses working night shift often develop diseases such as cancers, experience digestive problems, gain weight and become obese. Other diseases that nurses working night shift contract are diabetes, hypertension, adverse conditions of the bones and depression (Smith et al., 2013:n.p.). However, although most nurses in the study had been working night duty for longer than two years and although some of them reported suffering from some of these illnesses, most nurses reported to be in good health. Research suggested that although many nurses working night shift had health issues, not all of them developed these issues while working night duty (Lange, et al., 2010:49). In the current study, health problems that tended to surface after engaging in night shift included appetite disturbances, weight gain, back pain, sinusitis and tonsillitis, hypertension and hypercholesterolemia, diabetes, anxiety, depression, haemorrhoids, varicose veins and headaches.

Kim et al. (2013:369) and Peters (2011:n.p.) reported that night shift workers have a high incidence of diabetes, ischemic heart disease, cardiac arrhythmias and hypertension. Conversely, diabetes and heart diseases such as angina, heart attack and arrhythmias were some of the illnesses least reported in the current study. Participants however reported less serious cardiac symptoms such as shortness of breath and weight gain. However, one cardiac related symptom that stood out in this study, since it was one of the illnesses mostly reported on, is hypertension and the subsequent use of anti-hypertensive. Various literatures confirm a link between hypertension and night shift work (Kim et al., 2013:369; Peters, 2011:n.p.; Smith et al., 2013:n.p.). Illnesses that tended to surface mostly after engaging in night shift work were chronic back pain, headaches, hypertension, sinusitis and tonsillitis. The results are displayed in Table 4.7. Pandit (2011:n.p.) and Planton (2009:9-10) aver that painful legs are a common phenomenon among night shift nurses due to their limited exposure to sunlight and subsequent low vitamin D levels. The development of flu-like illnesses such as sinusitis, asthma, tonsillitis and sinusitis are also related to a lack of Vitamin D, since Vitamin D increases immunity (Singh et al., 2014:224). In addition, Melatonin supports the immune system by targeting viruses and pathogenic bacteria (Jockers, 2011:n.p.). Decreased levels of melatonin may therefore also contribute to the development of flu-like illnesses. The conceptual framework provided in Chapter 1 illustrates that optimal physical health is dependent on optimal Vitamin D and melatonin levels.

Participants in the current study reported digestive problems such as flatulence, stomach upsets and disturbed appetite. According to Admi et al. (2008:250), shift workers who suffer from sleep disorders tend to experience digestive tract problems. Jockers (2011:n.p.) ascribes the tendency among night shift nurses to experience digestive tract ailments to lowered melatonin levels and subsequent lowered antioxidant and digestive functions of melatonin.

The participants in the current study seemed to have gained weight as shown in Table 4.6. Johnson (2010:148) stated that the occurrence of obesity and weight gain in the night shift worker is related to sleep deprivation. Furthermore, Flegal et al. (2012:491) and Kim et al. (2013:1204) ascribed weight gain in night shift nurses to poor eating habits while on duty. Since engaging in night duty, numerous reportedly have gained weight. These findings are similar to a study done on Korean nurses by Kim et al. (2013:1204) where the BMI of nurses increased by 7.4%-18.6% as shift work duration increased. In addition, the Conceptual framework in Chapter 1, Figure 1 illustrates that night shift work is a risk factor for diabetes.

Some participants in the current study indicated that their menstrual cycles became irregular after engaging in night duty (Table 4.10). The findings of a study completed by Peters, (2011:n.p.) suggested that reproductive hormones are not affected by working night duty. The findings of a study, albeit not particularly recent, completed by Reeves et al. (2004:216), suggested that women who work night duty experience irregular and painful menstruation due to hormonal effects stemming from the disrupted circadian rhythms. The author also suggested that too few studies have been completed on women working night shift and that more studies on the influences of night duty of the menstrual cycle should be conducted.

Recommendations: The directives of The Basic Conditions of Employment Act, Act No. 75 of 1997 indicate that night shift nurses should undergo regular health evaluations to ensure early detection of illness (Republic of South Africa, 1997:11). To limit the possible influence of night duty on the health of nurses, participants should not be allowed or required to work night duty for longer than three consecutive months (Vimalananda et al., 2015:3483). It is therefore recommended that health institutions develop policies to ensure that nurses do not work night shift for extended periods and ensure that staff members who are assigned to work night duty undergo regular health evaluations. These policies should stipulate how frequently health evaluations are to take place e.g. biannually or quarterly. In addition, the health evaluations should be focused on recognising night shift-related diseases or ailments. Should any symptom of a night shift-related disease or an ailment be detected, employees should be removed from night duty.

5.2.4 Objective 4: Identify and describe amounts of stimulants use

According to Schwartz & Roth (2006:2357) and Morgenthaler (2013:n.p.) night shift nurses tend to use stimulants to stay awake, which in return took its toll on their health. This statement holds true for participants in the study, since they reported an increase in stimulant use after engaging in night shift work, as well as the use of cigarettes. As reported by participants they smoked approximately ten cigarettes more per week after engaging in night shift work. These participants did not report symptoms such as shortness of breath or other asthmatic symptoms.

Participants also reported an increase in the use of caffeinated beverages. Participants drank roughly one cup more coffee per week. Schwartz & Roth (2006:2357) state that night shift nurses sought increased energy levels and a relief from fatigue through the consumption of stimulants such as coffee and smoking cigarettes. The smoking of cigarettes put the night shift worker at risk for developing illnesses such as cancers and cardiac conditions (Schwartz & Roth, 2006:2357).

Unlike the citation of Morgenthaler (2013:n.p) the use of alcohol to aid sleep was not that common in this study. However, a few participants admitted using alcohol to aid sleep.

Recommendations: Ongoing health education in the form of disadvantages and health effects of stimulants might add value. It is also recommended that employers implement programmes to assist employees in smoke and alcohol use cessation. Yet again limiting night shift might be beneficial since participants used fewer stimulants when not on night duty.

5.2.5 Objective 5: Describe the presence of anxiety and depression

The findings confirm the presence of anxiety and depression among participants and the subsequent use of anti-depressants and tranquilisers. A lack of sleep or sleep deprivation was found to be associated with depression (Gaultney & Collins-McNeil, 2009:132; Johnson, 2010:148). According to Peters (2011:n.p.), poor sleeping habits, poor sleep and lack of sleep lead to anxiety, depression, mental illness and hallucinations. The occurrences of these illnesses among night shift workers are apparently due to neurotransmitter imbalances that are caused by a lack of REM sleep. Chemical imbalances in the brain, that cause anxiety and depression, occurs when a person's work hours are scheduled during the normal sleeping period, in other words, forcing one's body to work when it should be resting. This causes confusion in the body and in bodily chemicals (Block, 2014:n.p.). Depression and anxiety are characterised by symptoms such as not being able to be alert at work, able to sleep, either during daytime or night time, not able to concentrate, lack of energy, irritability and sleep that feels non-restorative. Participants in this study reported some of these symptoms (Table 4.13).

A number of participants reported feeling less happy, feeling under strain and losing sleep over worry. Additionally, participants also reported symptoms of anxiety (see Table 4.14) such as worrying over trivial matters, tachycardia and perspiring. Chemical imbalances are responsible for symptoms of anxiety, depression and subsequent mental breakdown (Schwartz, 2010:18). The presence of symptoms of anxiety, depression together with poor sleeping, might indicate shift work disorder. Shift work disorder is a night-shift-related disease caused by poor sleeping patterns, resulting that the brain does not receive sufficient rest and hence cannot recuperate between normal work days. From the data in Chapter 4, it seemed as if some participants might suffer from shift work syndrome since they report symptoms such as anxiety, depression and sleeping problems.

Recommendations: As recommended previously, the night shift nurse should have the privilege of regular health evaluations. Health evaluations should be holistic and should focus on mental wellbeing as well and not just physical wellbeing. It should focus on early detection of night shift related diseases such as depression and shift-work-disorder (Schwartz, 2010:18). Limiting prolonged night shift work or relinquishing night duty in cases such as these is therefore recommended. Support groups at work for employees suffering from mental illnesses such as depression might add value.

5.3 LIMITATIONS OF THE STUDY

Since the study was limited to six private hospitals in The City of Cape Town, the findings of the study cannot be generalised to nurses in the public health sector. Moreover, not equal numbers of the same hospital groups consented for participation in the study; thus, certain hospital groups were represented more than others. Although participants were thoroughly informed about the purpose of the study, participants seemed hesitant to complete the questionnaires since they were afraid of being removed from night duty. This might have impacted on the truthfulness in answering questions. Considering the different levels of training of nurses and the scientific languages used in the questionnaire, it is possible that not all the nurses had the same understanding of the questions. In addition, the questionnaire did not include the eating habits of night shift nurses. Information relating to the eating habits of the participants might have contributed to a clearer picture of the health of nurses working night shift.

5.4 FUTURE RESEARCH

The following recommendations for future research are proposed:

- That future research also includes nurses in the public health sector
- That the research also includes the eating habits of the night shift worker

5.5 DISSEMINATION

The findings of the study will be communicated to the participating hospital groups. The findings will be dispersed in the form of articles and published in accredited health journal. The study will be presented at nursing conferences.

5.6 CONCLUSION

The discussions in this final chapter were based on the achievement of the set objectives in the study. The results confirmed that night shift nurses experience health related symptoms that could be ascribed to working night shift. Various health influences, mental, physical and social were explored during this study. From the results, it was evident that headaches, gastric related illnesses, hypertension, hypercholesterolemia, diabetes, arthritis, depression and anxiety, back pain, sinusitis and tonsillitis, headaches, haemorrhoids and varicose veins seemed to have developed after commencing with night shift work.

It can therefore be concluded that the research question, i.e. “***What influence does night shift work have on the health and wellbeing of nurses?***” has been answered since the researcher was able to describe health-related illnesses reported by nurses who had participated in the study.

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APPENDICES

Appendix 1: Data collection instrument

STANDARD SHIFT WORK INDEX

We are an independent research team engaged on a research programme looking at the problems which people may experience as a result of working shifts. We have no particular "axe to grind" within an organisation; our primary aim being to help identify and reduce the problems experienced by individual shift workers.

Please note that any information you provide in the questionnaire will be treated in the strictest confidence and will not be divulged to anyone (including yourself). No individual will be identified in connection with any of the research findings. We are primarily concerned with the information obtained from groups of shift workers.

Throughout this questionnaire the terms "Morning", "Afternoon" and "Night" shifts are used. Please ignore the fact that these terms may differ from the ones used in your organisation. For example, you may call your "Morning" shift an "Early" one, while your "Afternoon" shift may be referred to as a "Late", "Evening" or "Swing" shift.

It is possible that completing this questionnaire may draw your attention to problems you experience as a result of shift work. If you are worried that these are serious we would advise you to contact your GP (see back page).

We are also looking for volunteers to help us in subsequent stages of our research. If you would be willing to help us, please do not forget to fill in the page at the back of this questionnaire.

If there is a loose page inserted relating to your particular job, please make sure that you complete it, and return it to us together with the main questionnaire in the prepaid envelope provided. Thank you for your co-operation.

Developed by the:

Shift work Research Team,
MRC/ESRC Social and Applied Psychology Unit

Any enquiries regarding the Standard Shift work Index should be addressed to:

Professor Emeritus Simon Folkard D.Sc.

email: s.folkard@swan.ac.uk

of the following age groups (excluding yourself)?

- (a) 0 to 5 years _____
- (b) 6 to 12 years _____
- (c) 13 to 18 years _____
- (d) 19 to 24 years _____
- (e) 25 to 60 years _____
- (f) 60 years + _____

- 1.9 How many of these need looking after by **you**? _____
- 1.10 How long have you worked altogether? _____ years
- 1.11 How long have you worked in your **present** shift system? _____ years _____ months
- 1.12 How long **altogether** have you been working shifts? _____ years _____ months
- 1.13 On average, how many hours do you work each week excluding overtime? _____ hours _____ minutes
- 1.14 On average, how many hours **paid** overtime do you work each week? _____ hours _____ minutes
- 1.15 On average, how many hours unpaid overtime do you work each week, (e.g. over-run of shifts)? _____ hours _____ minutes
- 1.16 Do you have a second paid job in addition to your main one?
(*tick one*) _____ yes _____ no
- 1.17 If you have taken a career break (or breaks), how long was this for in total? _____ years _____ months

2. Your Sleep and Fatigue

- 2.1 At what time do you normally fall asleep and wake up at the following points within your shift system? **Please note that, depending on your shift system, some of the sleeps listed may be the same as one another. If so, please indicate this by writing "same as e"; "same as g", etc.** Please use 24h time (e.g. 22:30) or clearly indicate "am" or "pm".

	FALL ASLEEP	WAKE UP
NIGHT SHIFT		
(a) Before your first night shift	_____	_____
(b) Between two successive night shifts	_____	_____
(c) After your last night shift	_____	_____
DAY OFF		
(d) Before your first day off	_____	_____
(e) Between two successive days off	_____	_____
(f) After your last day off	_____	_____

- 2.2 If you normally take a nap/naps in addition to your main sleep, either at work or at home, at what time do you take it/them?

(a) On night shifts from _____ to _____ and from _____ to _____

(b) On days off from _____ to _____ and from _____ to _____

- 2.3 How many hours sleep do you feel you usually need per day, irrespective of which shift you are on?

_____ hours _____ minutes

2.4 How do you feel about the amount of sleep you normally get? *(Circle one number for each)*

		Nowhere near enough	Could do with a lot more	Could do with a bit more	Get the right amount	Get plenty
(a)	Between successive night shifts	1	2	3	4	5
(b)	Between successive days off	1	2	3	4	5

2.5 How well do you normally sleep? *(Circle one number for each)*

		Extre- mely badly	Quite badly	Moder- ately well	Quite well	Extre- mely well
(a)	Between successive night shifts	1	2	3	4	5
(b)	Between successive days off	1	2	3	4	5

2.6 How rested do you normally feel after sleep? *(Circle one number for each)*

		Definite- ly not rested	Not very rested	Moder- ately rested	Quite rested	Extre- mely rested
(a)	Between successive night shifts	1	2	3	4	5
(b)	Between successive days off	1	2	3	4	5

2.7 Do you ever wake up earlier than you intended? *(Circle one number for each)*

		Almost never	Rarely	Some- times	Frequ- ently	Almost always
(a)	Between successive night shifts	1	2	3	4	5
(b)	Between successive days off	1	2	3	4	5

2.8 Do you have difficulty in falling asleep? (*Circle one number for each*)

	Almost never	Rarely	Some- times	Frequ- ently	Almost always
(a) Between successive night shifts	1	2	3	4	5
(b) Between successive days off	1	2	3	4	5

2.9 Do you take sleeping pills? (*Circle one number for each*)

	Almost never	Rarely	Some- times	Frequ- ently	Almost always
(a) Between successive night shifts	1	2	3	4	5
(b) Between successive days off	1	2	3	4	5

2.10 Do you use alcohol to help you to sleep? (*Circle one number for each*)

	Almost never	Rarely	Some- times	Frequ- ently	Almost always
(a) Between successive night shifts	1	2	3	4	5
(b) Between successive days off	1	2	3	4	5

2.11 Do you ever feel tired on: (*Circle one number for each*)

	Almost never	Rarely	Some- times	Frequ- ently	Almost always
(a) Night shifts	1	2	3	4	5
(b) Days off	1	2	3	4	5

3. Your Health and Well-Being

3.1 Please indicate how frequently you experience the following, by circling the appropriate number:

	Almost never	Quite seldom	Quite often	Almost always	
(a) How often is your appetite disturbed?	1	2	3	4	
(b) How often do you have to watch what you eat to avoid stomach upsets?	1	2	3	4	
(c) How often do you feel nauseous?	1	2	3	4	
(d) How often do you suffer from heartburn or stomach-ache?	1	2	3	4	
(e) How often do you complain of digestion difficulties?	1	2	3	4	
(f) How often do you suffer from bloated stomach or flatulence?	1	2	3	4	
(g) How often do you suffer from pain in your abdomen?	1	2	3	4	
(h) How often do you suffer from constipation or diarrhoea?	1	2	3	4	
(i) How often do you suffer from heart palpitations?	1	2	3	4	
(j) How often do you suffer from aches and pains in your chest?	1	2	3	4	
(k) How often do you suffer from dizziness?	1	2	3	4	
(l) How often do you suffer from sudden rushes of blood to your head?	1	2	3	4	
(m) Do you suffer from shortness of breath when climbing the stairs normally?	1	2	3	4	
(n) How often have you been told that you have high blood pressure?	1	2	3	4	
(o) Have you ever been aware of your heart beating irregularly?	1	2	3	4	
(p) Do you suffer from swollen feet?	1	2	3	4	
(q) How often do you feel "tight" in your chest?	1	2	3	4	
(r) Do you feel you have put on too much weight since beginning shift work?	1	2	3	4	
(s) Do you feel you have lost too much weight since beginning shift work?		1	2	3	4

3.2 Have you suffered from any of the following (diagnosed by your doctor)?

	Before starting shift work	Since starting shift work	Never
(a) Chronic back pain
(b) Gastritis, duodenitis
(c) Gastric or duodenal ulcer
(d) Gall stones
(e) Colitis
(f) Sinusitis, tonsillitis
(g) Bronchial asthma
(h) Angina
(i) Severe heart attack (myocardial infarction)
(j) High blood pressure
(k) Cardiac arrhythmias
(l) Hypercholesterolaemia
(m) Diabetes
(n) Cystitis
(o) Kidney stones
(p) Eczema
(q) Chronic anxiety
(r) Depression
(s) Arthritis
(t) Haemorrhoids
(u) Varicose veins
(v) Anaemia
(w) Headaches

(x) Others

3.3 Have you taken any of the following medications for prolonged periods (more than three months)?

	Before starting shift work	Since starting shift work	Never
(a) Tranquillizers
(b) Sleeping tablets
(c) Anti-depressants
(d) Antacids
(e) Antispasmodics
(f) Laxatives
(g) Drugs to control high blood pressure
(h) Diuretics
(i) Heart medicines
(j) Vasodilators
(k) Bronchodilators
(l) Vitamins, tonics
(m) Pain killers
(n) Steroids
(o) Anti-inflammatory medicines
(p) Hormones (except contraceptive pills)
(q) Others
.....

		Before starting shift work	Since starting shift work
3.4	On average, how many cigarettes have you smoked per week?
3.5	On average, how many units of alcohol have you drunk per week? (e.g. 1 unit = 1/2 pint lager/ bitter or 1 glass of wine or 1 measure of spirit)
3.6	On average, how many cups of caffeinated coffee/ tea/cola have you drunk each day?

3.7 If appropriate, and you are not taking a birth control pill, has your menstrual cycle been:

		Extremely irregular	Fairly irregular	Fairly regular	Extremely regular
(a)	Before starting shift work	1	2	3	4
(b)	Since starting shift work	1	2	3	4

- 3.8 The following questions deal with **how you have felt in general over the past few weeks**. Please circle the most appropriate answer for each question. Remember to concentrate on present and recent complaints, not those that you have had in the distant past.

Have you recently:

- | | | | | | |
|-----|---|--------------------|--------------------|------------------------|----------------------|
| (a) | been able to concentrate on what you are doing? | Better than usual | Same as usual | Less than usual | Much less than usual |
| (b) | lost much sleep over worry? | Not at all | No more than usual | Rather more than usual | Much more than usual |
| (c) | felt that you are playing a useful part in things? | More so than usual | Same as usual | Less than usual | Much less than usual |
| (d) | felt capable of making decisions about things? | More so than usual | Same as usual | Less than usual | Much less than usual |
| (e) | felt constantly under strain? | Not at all | No more than usual | Rather more than usual | Much more than usual |
| (f) | felt you could not overcome your difficulties? | Not at all | No more than usual | Rather more than usual | Much more than usual |
| (g) | been able to enjoy your normal day to day activities? | More so than usual | Same as usual | Less than usual | Much less than usual |

(h)	been able to face up to your problems?	More so than usual	Same as usual	Less than usual	Much less than usual
(i)	been feeling unhappy and depressed?	Not at all	No more than usual	Rather more than usual	Much more than usual
(j)	been losing confidence in yourself?	Not at all	No more than usual	Rather more than usual	Much more than usual
(k)	been thinking of yourself as a worthless person?	Not at all	No more than usual	Rather more than usual	Much more than usual
(l)	been feeling reasonably happy all things considered?	More so than usual	About the same	Less so than usual	Much less than usual

3.9 Below are listed some descriptions of **symptoms of anxiety**.

Please indicate the degree to which you **generally** or **typically** experience the symptom when **you are feeling anxious**.

		Not at all		Some- what		Very much so
(a)	I perspire	1	2	3	4	5
(b)	My heart beats faster	1	2	3	4	5
(c)	I worry too much over something that doesn't really matter	1	2	3	4	5
(d)	I feel jittery in my body	1	2	2	4	5
(e)	I imagine terrifying scenes	1	2	3	4	5
(f)	I get diarrhoea	1	2	3	4	5
(g)	I can't keep anxiety provoking pictures out of my mind	1	2	3	4	5
(h)	I feel tense in my stomach	1	2	3	4	5
(i)	Some unimportant thought runs through my mind and bothers me	1	2	3	4	5
(j)	I nervously pace	1	2	3	4	5
(k)	I feel like I am losing out on things because I can't make up my mind soon enough	1	2	3	4	5
(l)	I feel physically immobilised	1	2	3	4	5
(m)	I can't keep anxiety provoking thoughts out of my mind	1	2	3	4	5
(n)	I find it difficult to concentrate because of uncontrollable thoughts	1	2	3	4	5

Do you have any other comments or observations relating to your experiences as a shift worker that have not been covered in this questionnaire? If so, please try to describe them here:

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

GENERAL INFORMATION

Some people experience severe health, sleep or emotional problems as a result of working shifts. It is possible that completing this questionnaire may have drawn your attention to problems you experience as a result of shift work and/or other factors. If you feel that talking to someone might help with these problems we would strongly advise you to contact your GP. If they cannot help you they should be able to put you in contact with someone who can.

Can you please check that you have answered all the questions, but please do not alter any of your answers.

**Thank you for filling in this
questionnaire.**

Appendix 2: Ethical Approval



UNIVERSITEIT • STELLENBOSCH • UNIVERSITY
jou kennisvennoot • your knowledge partner

Approval Notice

Response to Modifications- (New Application)

20-Aug-2015

Bruce, Renetia RO

Ethics Reference #: S15/05/109

Title: Describing the influences that night shift work has on the health of nurses.

Dear Mrs. Renetia Bruce,

The **Response to Modifications - (New Application)** received on **05-Aug-2015**, was reviewed by members of **Health Research Ethics Committee 1**

via Expedited review procedures on **20-Aug-2015** and was approved.

Please note the following information about your approved

research protocol: Protocol Approval Period: **20-Aug-2015 -**

20-Aug-2016

Please remember to use your **protocol number (S15/05/109)** on any documents or correspondence with the HREC concerning your research protocol.

Please note that the HREC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

After Ethical Review:

Please note a template of the progress report is obtainable on www.sun.ac.za/rds and should be submitted to the Committee before the year has expired. The Committee will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Translation of the consent document to the language applicable to the study participants should be submitted.

Federal Wide Assurance Number:
00001372 Institutional Review
Board (IRB) Number: IRB0005239

The Health Research Ethics Committee complies with the SA National Health Act No.61 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 Part 46. This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki, the South African Medical Research Council Guidelines as well as the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health).

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Contact persons are Ms. Claudette Abrahams at Western Cape Department of Health (healthres@pgwc.gov.za Tel: +27 21 483 9907) and Dr Helene Visser at City Health (Helene.Visser@capetown.gov.za Tel:

+27 21 400 3981). Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and documents please visit: www.sun.ac.za/rds

If you have any questions or need further assistance, please contact the HREC office at 0219399657.

Included Documents: Declaration R Bruce Protocol Synopsis Checklist

CV R Bruce

Appendix 4_Letter requesting
research consent MOD
Response to modifications
documents Protocol

Declaration M van
der Heever
Appendix
5_Consent form

Appendix 1_Standard Shift
work Index Application form

Appendix 3_Standard Shift work
Index Manual Appendix

2_Request for Standard Shift
work Index CV M van der Heever

Sincerely, Franklin Weber

HREC Coordinator

Health Research Ethics Committee 1

Investigator Responsibilities

Protection of Human Research Participants

Some of the responsibilities investigators have when conducting research involving human participants are listed below:

1. Conducting the Research. You are responsible for making sure that the research is conducted according to the HREC approved research protocol. You are also responsible for the actions of all your co-investigators and research staff involved with this research.
2. Participant Enrolment. You may not recruit or enrol participants prior to the HREC approval date or after the expiration date of HREC approval. All recruitment materials for any form of media must be approved by the HREC prior to their use. If you need to recruit more participants than was noted in your HREC approval letter, you must submit an amendment requesting an increase in the number of participants.
3. Informed Consent. You are responsible for obtaining and documenting effective informed consent using **only** the HREC-approved consent documents, and for ensuring that no human participants are involved in research prior to obtaining their informed consent. Please give all participants copies of the signed informed consent documents. Keep the originals in your secured research files for at least fifteen (15) years.
4. Continuing Review. The HREC must review and approve all HREC-approved research protocols at intervals appropriate to the degree of risk but not less than once per year. There is **no grace period**. Prior to the date on which the HREC approval of the research expires, **it is your responsibility to submit the continuing review report in a timely fashion to ensure a lapse in HREC approval does not occur**. If HREC approval of your research lapses, you must stop new participant enrolment, and contact the HREC office immediately.
5. Amendments and Changes. If you wish to amend or change any aspect of your research (such as research design, interventions or procedures, number of participants, participant population, informed consent document, instruments, surveys or recruiting material), you must submit the amendment to the HREC for review using the current Amendment Form. You **may not initiate** any amendments or changes to your research without first obtaining written HREC review and approval. The **only exception** is when it is necessary to eliminate apparent immediate hazards to participants and the HREC should be immediately informed of this necessity.
6. Adverse or Unanticipated Events. Any serious adverse events, participant complaints, and all unanticipated problems that involve risks to participants or others, as well as any research-related injuries, occurring at this institution or at other performance sites must be reported to the HREC within **five (5) days** of discovery of the incident. You must also report any instances of serious or continuing problems, or non-compliance with the HRECs requirements for protecting human research participants. The only exception to this policy is that the death of a research participant must be reported in accordance with the Stellenbosch University Health Research Ethics Committee Standard Operating Procedures www.sun025.sun.ac.za/portal/page/portal/Health_Sciences/English/Centres%20and%20Institutions/Research_Development_Support/Ethics/Application_package All reportable events should be submitted to the HREC using the Serious Adverse Event Report Form.
7. Research Record Keeping. You must keep the following research-related records, at a minimum, in a secure location for a minimum of

fifteen years: the HREC approved research protocol and all amendments; all informed consent documents; recruiting materials; continuing review reports; adverse or unanticipated events; and all correspondence from the HREC

8. Reports to the MCC and Sponsor. When you submit the required annual report to the MCC or you submit required reports to your sponsor, you must provide a copy of that report to the HREC. You may submit the report at the time of continuing HREC review.

9. Provision of Emergency Medical Care. When a physician provides emergency medical care to a participant without prior HREC review and approval, to the extent permitted by law, such activities will not be recognised as research nor will the data obtained by any such activities should it be used in support of research.

10. Final reports. When you have completed (no further participant enrolment, interactions, interventions or data analysis) or stopped work on your research, you must submit a Final Report to the HREC.

11. On-Site Evaluations, MCC Inspections, or Audits. If you are notified that your research will be reviewed or audited by the MCC, the sponsor, any other external agency or any internal group, you must inform the HREC immediately of the impending audit/evaluation.

Appendix 3: Request for institutional consent

Renetia Bruce
2 Kantbos Crescent
Annandale
Kuilsriver
7580

Xxx Hospital

For Attention: Hospital Manager

Dear Mr. XX

I am a professional nurse currently enrolled as a Masters in Nursing (MNurs) student at the Stellenbosch University (Faculty of Medicine and Health Sciences, Division of Nursing). My supervisor is Mrs. M .Van Der Heever.

I received ethical approval for the research study entitled: Describing the influences of night shift work on the health and wellbeing of nurses. I hereby request permission to conduct the research study at your institution. Attached please find the proposal structured questionnaire and proof of ethical clearance.

Thanking you in advance.

Renetia Bruce (Student No. [REDACTED])

Email address: [REDACTED]

Work: [REDACTED]

Appendix 4.1 Approval to conduct research in Hospital Group 1

!R!PSRC100;EXIT;!R!MTYP99;EXIT;!R!spsz8;stm0;exit;



Life College of Learning
Head Office
Oxford Manor, 21 Chaplin Road, Illovo 2196
Private Bag X13, Northlands 2116
Telephone: +27 11 219 9000
Telefax: +27 11 219 9001
www.lifehealthcare.co.za

16 May 2016

ATTENTION: Renetia Bruce

SUBJECT: APPLICATION TO CONDUCT RESEARCH

TITLE: Describing the influences that night shift work has on the health of nurses.

Our previous correspondence refers.

The Research Ethics Committee hereby conditionally approves your request.
Approval number: 20160501. Valid until 2017/05/31.

The approval is conditional to your agreement on the following provisos:

1. You must request permission (in writing) from the Hospital Manager and Nursing Manager of the Life Healthcare (LHC) facility in which you intend conducting your research, accompanied by this letter.
2. LHC will not be liable for any costs incurred during or related to this study.
3. Should patient or institutional confidentiality be compromised, LHC has the right to withdraw the permission and take legal action.
4. The researcher will provide LHC Research Ethics Committee with an update on the progress of the study every four months.
5. An electronic copy of the final research report is submitted to the Life Healthcare Research Ethics Committee *prior* to publication.
6. No direct reference is made to LHC or its various facilities in the research report or any publications thereafter.
7. The Company and its facilities are not in any way identifiable in the study.
8. On completion of the degree, an electronic (.pdf) copy of the research report will be provided to LHC. This copy will be uploaded to the institutional repository.
9. Kindly clear copy-right issues with your supervisor and/or Higher Education Institution prior to accepting these terms and conditions.

Please sign this letter as indicated below and return to the sender within 5 working days:

I, Renetia Bruce, hereby agree to the provisos (points 1-9) as listed above.

Signature: _____

Date: _____

We wish you the best in your studies and look forward to the final results.

Yours sincerely

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Anne Roodt

on behalf of the Research Ethics Committee.

Appendix 4.2: Letter confirming knowledge of non-trial research to be conducted in Hospital Group 2

Netcare Christiaan Barnard Memorial Hospital



Tel: +27 (0) 21 480 6111
Fax: +27 (0) 21 424 0826
181 Longmarket Street, Cape Town, South Africa
PO Box 15364, Vlaeberg, 8018, South Africa
www.netcare.co.za

LETTER CONFIRMING KNOWLEDGE OF NON-TRIAL RESEARCH TO BE CONDUCTED IN THIS NETCARE FACILITY

Dear Rentia

Re: Describing the influences that night shift work has on the health of nurses.

We hereby confirm knowledge of the above named research application to be made to the Netcare Research Operations Committee and in principle agree to the research application for Netcare Christiaan Barnard Memorial Hospital, subject to the following:

1. That the data collection may not commence prior to receipt of FINAL APPROVAL from the Netcare Research Operations Committee.
2. A copy of the research report will be provided to the Netcare Research Operations Committee once it is finally approved by the tertiary institution, or once complete.
3. Netcare has the right to implement any recommendations from the research.
4. That the Hospital/Site/Division Management reserves the right to withdraw the approval for research at any time during the process, should the research prove to be detrimental to the subjects / Netcare or should the researcher not comply with the conditions of approval.

We wish you success in your research.

Yours faithfully



Signed by Hospital/Site/Division Management

4/11/15
Date

Nursing Manager

107

(Specify designation)

Appendix 4.3: Letter of approval to conduct research at Hospital Group 3

REFERENCE: 201510-001

ENQUIRIES:

Ms Renetia Olivia Bruce

2 Kantbos Crescent

Annandale

Kuilsriver, 7580

11 November 2015

Dear Ms Bruce

RESEARCH PROPOSAL: Describing the influences working night shift has on the health of nurses

Your application to conduct the above-mentioned research in xxx Hospital; has been approved subject to the following conditions:

1. Hospital Manager, Unit Manager and Registered Nurses are under no obligation to assist you in your investigation, participation is voluntary.

2. Hospital Manager, Unit Manager, Registered Nurses and the facility should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Scheduled duties and responsibilities of the Registered Nurses are not to be interrupted.
5. The Study is to be conducted from **11 November 2015 until 31 January 2016**
6. Should you wish to extend the period of your survey, please contact Yolandi Pedro at the contact details provided quoting the reference number?
7. A photocopy of this letter is submitted to the Unit Manager in charge of the hospital when the intended research is to be conducted.
8. Your research will be limited to xxx Hospital only
9. A brief summary of the content, findings and recommendations is provided to the Training and Development Manager.
10. Xxxx receives a copy of the completed report/dissertation/thesis addressed to:

The Training and Development Manager

We wish you success in your research.

Kind regards.

Appendix 4.4: Letter of research approval from Hospital Group 4

From:

Dear Ms Bruce

Following our previous correspondence and your submission of the required documents, the company has approved your research project subject to the conditions set out below:

1. The company will be provided with a complete copy of the final research project/thesis once it has been submitted and graded.
2. Any interviews or surveys will be done only at the designated hospitals and you must contact the HR Manager directly to discuss your visit to the respective facilities.
3. The research process may not interrupt the daily operations of the hospitals and should preferably take place during off-peak times.
4. The HR Manager may limit the amount of staff that is allowed to participate in the research project subject to operational requirements.

Approved facilities are xxxx and xxxx. Please contact the HR Manager, of the applicable facilities for further arrangements.

Kind regards

Manager | Employee Relations

Appendix 5: Participant consent

Investigator: Renetia Bruce Student no [REDACTED]

Dear participant

I am Renetia Bruce, currently registered as a Masters student (MNurs) at Stellenbosch University. I am inviting you to participate in my study.

Kindly read the information contained in this leaflet as it explains the details about the study. Previous research has indicated that night shift work tend to affect the health of nurses. Therefore this study focuses on the effects that night shift has on the health of nurses in a South African context. The study will be conducted in 6 private health care hospitals in Western Cape, South Africa.

Written consent will be obtained from each nurse who accepts the invitation to participate in the study. Each participant will be provided a questionnaire (and a sealed envelope) that addresses the possible effects that night shift have on health. Kindly place the questionnaire in the envelop once you have completed it; and then in the sealed box (the boxes are in the ward where you are working) provided by me. I will collect the questionnaires the morning after it was issued.

The information obtained from the questionnaires will assist in exploring the effects of night shift work on health. Once data is analysed it will assist in enhancing evidence-based practice.

Do not write any personal details such as your name on the questionnaire. All information contained in the questionnaire will be treated confidentially.

The completion of the questionnaire will take approximately 20 minutes. Please read the instructions on the questionnaire. The information provided through the questionnaires will not be linked to your name or the institution where you are working. Your honest response is extremely important to this study.

Please note that if you choose not to participate in the study, it will not be held against you. You may withdraw from the study at any stage.

The results of this study will be made available **by the end of 2018**. You may request results from the researcher after the recommended period. You can call me on 0 [REDACTED] if you have any queries - your queries will also be confidential.

Thank you for completing this questionnaire. Your participation is valued.

I understand what is expected of me and hereby give my consent to participate. I understand that my participation is voluntary and that I may withdraw at any time.

Signature of participant _____

Date _____

Appendix 6: Consent to use data collection instrument (SSI)

From: Folkard S. [mailto:]
Sent: 25 June 2014 07:46 PM
To: Bruce, Renetia
Subject: RE: Night shift Questionnaire/ Instrument/ Quantitative

Dear Renetia,

Re: Standard Shift work Index (SSI)

Thank you for your recent enquiry about a night shift questionnaire. You can download the SSI, a manual describing the source and scoring of the various scales, and an abridged version of the SSI, the Survey of Shift workers (SOS), from the website of the Working Time Society. Namely:

<http://www.workingtime.org/technical>

Note that with the exception of the Circadian Type Inventory (CTI – Section 6.2 of the SSI), the scoring of the various scales remains unchanged. An improved scoring for the CTI is given in:

Di Milia, L., Smith, P. A. & Folkard, S. (2005). A validation of the revised circadian type inventory in a working sample. *Personality and Individual Differences*. 39, 1293-1305.

Please email me if you would like a PDF copy of this paper.

You are welcome to use any or all of the scales in any non-profit making research.

Good luck with your research!

Simon

Simon Folkard DSc

Professeur Associé , Institut de Psychologie, Université Paris Descartes, France.

Professor Emeritus, Department of Psychology, Swansea University, UK.

Email: s [REDACTED] or s [REDACTED]

From: Bruce, Renetia
Sent: Wed 25/06/2014 16:59
To: [REDACTED]
Subject: FW: Night shift Questionnaire/ Instrument/ Quantitative



This e-mail and attachments are confidential/legally privileged and any unauthorised use, distribution or disclosure thereof, in whatever form, by anyone other than the addressee is prohibited. If you have received this e-mail in error, please destroy it. The views and opinions in this e-mail and attachments may not necessarily be those of the Directors and management of the Mediclinic Group of Companies. The aforementioned does not accept any liability for any damage, loss or expense arising from this e-mail and / or from accessing any attachments.

From: Bruce, Renetia [[mailto:\[REDACTED\]](mailto:[REDACTED])]
Sent: Wednesday, June 25, 2014 2:11 AM
To: Monk, Timothy; [REDACTED]
Subject: Night shift Questionnaire/ Instrument/ Quantitative

Good day

I am a Masters student in Nursing at the Stellenbosch University South Africa. I wish to do research in the Influences working night shift has on health. I am looking to find a validated instrument which I can use on my participants. Could you assist please? Thank you

RENETIA BRUCE

TRAINING AND DEVELOPMENT CONSULTANT

MEDICLINIC LOUIS LEIPOLDT
BROADWAY
BELLVILLE 7530

P O BOX 369

BELLVILLE

7535

TEL [REDACTED]

FAX + [REDACTED]

FAX TO E-MAIL [REDACTED]

CELL [REDACTED]

[REDACTED]

Appendix 7: Consent to use only certain sections of the data collection instrument

From: Folkard S. [mailto:s.]
Sent: 11 November 2014 03:47 PM
To: Bruce, Renetia
Subject: RE: SSI

Dear Ms Bruce,

Details of the validation are given in Barton et al (attached).

Many users have simply selected the individual scales that interest them.

I hope this helps.

Simon Folkard DSc

Professeur Associé , Institut de Psychologie, Université Paris Descartes, France.

Professor Emeritus, Department of Psychology, Swansea University, UK.

Email: s. or s.

From: Bruce, Renetia
Sent: Tue 11/11/2014 12:11
To: Folkard S. (s.)
Subject: SSI

Good day Prof Folkard

I have spoken to you before regarding permission to use the SSI. I would like to know if I may use only certain parts of the questionnaire. Has each section been validated separately? I would like to only use the Health and Wellbeing as well as Coping section. May I use only certain sections?

RENETIA BRUCE

TRAINING AND DEVELOPMENT CONSULTANT

MEDICLINIC LOUIS LEIPOLDT
BROADWAY
BELLVILLE 7530

P O BOX 369

BELLVILLE

7535

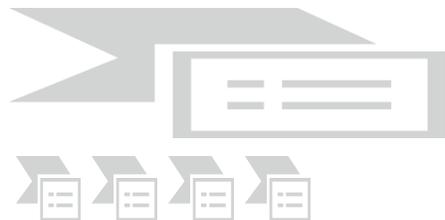
TEL + [REDACTED]

FAX + [REDACTED]

FAX TO E-MAIL [REDACTED]

CELL [REDACTED]

[REDACTED]



Appendix 8: Meaning of some difficult terms

Weary: feeling or showing extreme tiredness

Vigour: physical strength and good health

Lethargic: sluggish or lacking energy

Exhausted: very tired

Appendix 9: Permission to use questionnaire

SSI MANUAL

J Barton, S Folkard, L R Smith, E R Spelten, P A Totterdell

Shift work Research Team, MRC/ESRC Social and Applied Psychology Unit

All enquiries regarding this manual should be addressed to:

Professor Emeritus Simon Folkard D.Sc.

email: s.folkard@lancaster.ac.uk

IMPORTANT:

It should be noted that many of the scales within the SSI are under development, and may be subject to revised methods of scoring. It is important to follow the revised scoring methods where appropriate, and to check for further developments in this area before proceeding with any extensive analyses.

INTRODUCTION

The apparent lack of standardised methods in shift work research inevitably limits the degree to which meaningful comparisons can be made concerning the problems which individuals experience, and the relationship this might have with the type of job they perform, or the culture in which they work. In response to this situation the Scientific Committee on Night and Shift Work of the International Congress of Occupational Health have requested the development of a standardised battery of questionnaires. In conjunction with our own current research on shift work in nursing and midwifery, we have tried to select a core group of questionnaires for this purpose, which could be used in all shift work research. Such standardisation of methods is essential if recommendations concerning the selection of workers, and various aspects of shift scheduling, including the length and timing of shifts are to be based on a scientific foundation. In addition, since many of the questionnaires selected were not constructed for use with a shift working population exclusively, comparisons with non-shift working populations are also possible.

The aim was to produce a core of about 200 questions in total, covering the selected areas of interest. All of the measures included are independent of each other, producing individual scores, though it is intended that the whole battery be used in future research projects, with additional measures being included to reflect the special interests of individual researchers.

Based on existing knowledge of the problems associated with working shifts, the measures chosen fall broadly into two categories; variables which are thought to modify an individual's response to shift work, such as, individual circumstances (age, marital status, children to look after), personality variables (morningness/eveningness, extraversion/neuroticism, rigidity and vigour), and coping strategies; and personal outcomes for the individual including, physical and psychological health, sleep disturbances and social and domestic disruption.

A series of formal discussions were set up between ourselves and colleagues from various other shift work research groups in order to select the appropriate questionnaires. A number of questionnaires were considered in terms of their psychometric properties, length, scoring procedure, and any additional information, the final selection being made in terms of these criteria. Where there appeared to be gaps in terms of suitable questionnaires available for particular measures, new scales have been constructed which we are hoping to test out in our nursing research.

A copy and description (including the source) of each of the questionnaires which were chosen are attached.

1. GENERAL JOB SATISFACTION

(Section 1. Question 1.42)

SOURCE Hackman, J.R. and Oldham, G.R. (1975)
Development of the Job Diagnostic Survey.
Journal of Applied Psychology, 60, 159-170.

A five item overall measure of the degree to which the employee is satisfied and happy with the job. This scale forms part of the larger Job Diagnostic Survey (Hackman and Oldham 1975), the five items being inserted in two different sections of the questionnaire.

Various studies have been conducted using both the long and short versions of the questionnaire, the internal consistency reliabilities being approximately 0.77 and 0.76 respectively.

SCORING

A seven point response option is provided range from disagree strongly through disagree, disagree slightly, neutral, agree slightly, agree to agree strongly, scored 1 to 7 with a mean score being computed.

Items B and E should be reversely scored

2a. SLEEP QUESTIONNAIRE

(Section 2. Questions 2.1 - 2.11)

SOURCE SAPU Shift work Research Team, Sheffield.

Existing sleep questionnaires were not considered appropriate or extensive enough for the present study. As a result the questionnaire which was constructed consists of 11 items, and is loosely based on the sleep section of the Telecom 'Quality of Life' questionnaire constructed by Meredith Wallace, with further additions.

The present questionnaire aims to identify sleep habits according to which shift is being worked, e.g. early, late or night, or if on a rest day, as well as the extent to which sleep is disturbed depending on which shift has been or is about to be worked. On the questions relating to sleep disturbances a 5 point response option is provided with descriptors for each e.g. almost never, rarely, sometimes, frequently, almost always.

SCORING

Questions 2.1 - 2.3 are concerned with sleep habits and can be coded appropriately.

Questions 2.4, 2.5 and 2.6 should be reverse coded.

Questions 2.4 - 2.8, and 2.11 form a scale of overall sleep disturbance, which can be broken down to give a measure of disturbance associated with each of the shifts (early, late, night) and rest days.

Questions 2.9 and 2.10 are coded independently and do not form part of the scale.

A Likert scale is used, with values ranging from 1 - 5, a score of 5 being associated with high sleep disturbance.

For a total sleep disturbance score, all responses from the individual shift related scales are added together, a higher score indicating greater sleep disturbance.

For a measure of disturbance associated with each of the shifts, individual scores for each shift are summed separately, thus giving four independent measures of sleep disturbance. Again, higher scores are associated with greater sleep disturbance.

REFERENCES

Wallace, M. 'Quality of Life Survey' for Telecom Australia. Brain-Behaviour Research Institute, School of Behavioural Sciences, La Trobe University, Melbourne.

2b. CHRONIC FATIGUE

(Section 2. Question 2.12)

SOURCE SAPU Shift work Research Team, Sheffield.

A measure of chronic fatigue was specifically constructed for the initial survey. An attempt was made to develop as 'pure' a measure as possible through reference to existing fatigue scales (e.g. the acute and chronic fatigue scales developed by Paul Verhaegen), the literature, and through consultation with colleagues familiar with this area.

Chronic fatigue is defined as a general tiredness and lack of energy irrespective of whether an individual has not had enough sleep or has been working hard, which persists even on rest days and holidays. The scale is constructed to index this chronic condition. There are ten items, five are positively oriented to index general feelings of vigour and energy; that is to say, the opposite of fatigue (these items are reverse recorded). The other five items are designed to tap general feelings of tiredness and lack of energy. Items are scored on a 1 - 5 point Likert type scale with anchor points of 'not at all', 'somewhat' and 'very much so'.

SCORING

One total score.

Higher score is an indication of more fatigue.

Items a, c, e, g, i should be reversely scored.

REFERENCES

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3a. PHYSICAL HEALTH QUESTIONNAIRE

(Section 3. Questions 3.1 - 3.7)

SOURCE Gianni Costa, Istituto di Medicina del lavoro, Verona.

The physical health questionnaire was specifically constructed for the initial survey, as the standardized health questionnaires which were available were too long to be of use. It contains two subscales, measuring cardiovascular and gastrointestinal disorders, both known to have a high incidence in shift workers, (9 questions on each). Items were selected from existing health measures (Inventory of Subjective Health, Dirken 1967; General Health Questionnaire, Goldberg 1972; Health Survey, Spence et al 1987), and through discussions with colleagues specialising in gastroenterology and cardiology. A 4 point response option is included, to try and avoid a tendency towards a central answer. Subjects are asked to rate how frequently they experience symptoms, such as heart palpitations and digestive difficulties. The response options are: almost never; quite seldom; quite often; almost always. In addition, a question relating to weight loss has been included, though this does not contribute to either scale.

Two general screening questions are included concerning diseases suffered and medicine consumption since starting shift work. Subjects are asked to indicate on a yes/no response option whether or not they have experienced any of the listed diseases (21 in total), or regularly taken any of the listed medications (16 in total) since beginning shift work.

SCORING

The two subscales, digestive and cardiovascular problems are scored separately. Originally questions 3.1 a-h and question r formed the former scale while questions i - q made up the latter.

However, development of the scale (through factor analysis) has led to two of the items being excluded from these scales, one from each. Item r from the digestive scale, and item p from the cardiovascular scale. The new scales thus contain 8 items each.

A Likert type scale is used with response options ranging from 1 to 4, from "almost never" to "almost always" or "definitely not" to "definitely". A total score is then computed for each scale by summing the individual scores. A higher score on each scale is associated with poorer physical health.

Four additional questions have been included: three asking for absolute amounts of alcohol/tea/coffee/cola and cigarette consumption (Q.3.4 - 3.6), and one relating to disturbance of the menstrual cycle, before starting shift work and since starting shift work (Q. 3.7), again scored on a 4-point Likert scale ranging from "extremely irregular" to "extremely regular".

REFERENCES

Dirken, J. (1967). *Work and stress*. Gronigen, Wolters

Goldberg, D.P. (1972). *The detection of Psychiatric illness by questionnaire*. Oxford University Press, Oxford.

Spence, J.T., Helmreich, R. L., Pred, R.S. (1987). Impatience versus achievement strivings in the type A pattern: Differential effects on students' health and academic achievement. *Journal of Applied Psychology*, 72, 4, 522-528.

3b. GENERAL HEALTH QUESTIONNAIRE

(Section 3. Question 3.8)

SOURCE Goldberg, D.P. (1972) *The detection of psychiatric illness by questionnaire*. Oxford: Oxford University Press.

The GHQ is a self-administered screening test for detecting minor psychiatric disorders in the general population, and gives a single measure of mental health. It covers recent levels of self-confidence, depression, sleep loss and problem solving. It is available in 60, 30, 20 and 12 item versions, the latter being chosen for the present study.

Subjects are asked to think about their health over the past few weeks and answer the questions accordingly. Four response options are provided for each item, e.g. better than usual, same as usual, less than usual, much less than usual, with a higher score indicating poor mental health.

There is evidence that the GHQ correlates well with other psychiatric screening tests, e.g. the SCL (Goldberg et al 1976). It has also been shown to reflect the psychological effects of external events which might be expected to increase or decrease stress. Parker (1977) studied the GHQ responses of 68 survivors of a natural disaster, Cyclone Tracy, and showed that the questionnaire was sensitive to the more specific psychological disorders which occurred among them.

A recent study looking at the impact of night work on psychological well-being of shift working nurses used the 12 item version of the GHQ. The main findings were that night work does have a significant impact on psychological well-being, this being moderated by organisational, behavioural and physiological factors, yet personality factors appear to be unimportant in this respect (Bohle et al. 1989).

SCORING

There are two possible ways of scoring the GHQ:

1. A multiple-response scale or "Likert scale", where weights are assigned to each position, e.g. the response options are scored 0, 1, 2 and 3, from "less so than usual" to "much more than usual". A total score is then produced by adding together each of the scores. A higher score would indicate poorer psychological health.
2. A bimodal response scale known as "GHQ" scoring, which is a simple method of scoring and eliminates errors due to "end-users" and "middle-users". In this method, columns 1 and 2 are both scores 0, and columns 3 and 4 are both scored 1. Again, scores are summed, a higher score indicating poorer psychological health.

REFERENCES

Bohle, P., & Tilley, A. (1989). The impact of night work on psychological well-being. *Ergonomics*, 32, 9, 1089-1099.

Goldberg, D.P., Rickels, K., Downing, R., Hesbacher, P. (1976). A comparison of two Psychiatric screening tests. *British Journal of Psychiatry*, 129, 61-67.

Parker, G. (1977). Cyclone Tracy and Darwin Evacuees: On the restoration of the species. *British Journal of Psychiatry*, 130, 548-555.

3c. COGNITIVE-SOMATIC ANXIETY QUESTIONNAIRE

(Section 3. Question 3.9)

SOURCE Schwartz, G.E., Davidson, R.J. & Goleman, D.J. (1978).
Patterning of cognitive and somatic processes in the self-regulation of anxiety:
Effects of meditation versus exercise.
Psychosomatic Medicine, 40, 321-328.

The CSAQ is a measure of trait anxiety and consists of 14 descriptions of symptoms of anxiety; 7 with a cognitive orientation e.g. 'imagine terrifying scenes'; and 7 with a somatic orientation e.g. 'I feel tense in my stomach'. The CSAQ was developed rationally without conducting conventional psychometric analyses, though subsequent factor analysis has tended to be in agreement with the cognitive/somatic distinction, albeit with some differences (Delmonte and Ryan, 1983).

The CSAQ has been compared with other measures purporting to measure cognitive and somatic aspects of anxiety, and is recommended as the most useful measure of these traits (Steptoe & Kearsley 1990). However, this study revealed a discrepancy in the original classification of cognitive and somatic factors made by Schwartz; one item 'I became immobilised' loaded on the cognitive rather than the somatic scale. Since the item is ambiguous in that it can be interpreted either in terms of mental or physical immobility, the wording for the present study has been changed to read 'I feel physically immobilised'.

The scale contains a 5 point response option, ranging from:

1 = not at all, through 3 = somewhat, to 5 = very much so.

Subjects are asked to rate the degree to which they experience each of the symptoms when they are feeling anxious.

This measure has been used in treatment studies, including a comparison of meditation and cue-controlled relaxation by Kirkland and Hollandsworth (1980)

SCORING

Two subscales:	Cognitive anxiety:	Items c, e, g, i, k, m, n
	Somatic anxiety:	Items a, b, d, f, h, j, l

For total scores add items scores per subscale, the higher the score the higher the cognitive or somatic anxiety.

REFERENCES

- Delmonte, M. & Ryan, G. (1983). The Cognitive-Somatic anxiety questionnaire (CSAQ); A factor analysis. *British Journal of Clinical Psychology*, 22, 209-212.
- Kirkland, K. & Hollandsworth, J. G. (1980). Effective test taking; skills acquisition versus anxiety-reduction techniques. *Journal of Consulting and Clinical Psychology*, 48, 431-439.
- Steptoe, A. & Kearsley, N. (1990). Cognitive and somatic anxiety. *Behaviour Research and Therapy*, 28, 1, 75-81.

4. SOCIAL AND DOMESTIC SURVEY

(Section 4. Questions 4.1 - 4.5)

SOURCE SAPU Shift work Research Team, Sheffield.

BASED ON The Quality of Life Survey, Section 4, used by Meredith Wallace
and
The Impairment in Social Activities scale of the 1974-Survey, used by Friedhelm Nachreiner.

The questionnaire consists of 19 items, covering social (e.g. sports, hobbies) and domestic (e.g. childcare, shopping) activities. The questionnaire can be divided into subscales. However, the factor analysis of four studies done by M. Wallace still show some variations, therefore it was decided that the number of items should not be reduced at this stage. The implication is that in the future it might well be possible to reduce the number of items.

The phrasing of the general question has been changed from "do you have (in)sufficient time for" to "are you satisfied with the amount of time". In this way a valuation of the amount of time for a specific activity is included.

A 5 point response option is provided for Questions 4.1 - 4.4, ranging from "not at all" to "very much".

SCORING

Q 4.1 A total score of general satisfaction by adding the item scores. The higher the score the more satisfied. Could be divided into subscales depending on results of factor analysis.

Q 4.2 - 4.4 Separate scores. Alternatively, these can be summed to give a global measure of overall social and domestic disruption.

5. COPING QUESTIONNAIRE

(Section 5. Questions 5.1 - 5.7)

SOURCE SAPU Shift work Research Team, Sheffield.

BASED ON Coping Strategies Inventory by David L Tobin et al

And The Ways of Coping Questionnaire by Folkman and Lazarus.

The questionnaire consists of 32 items, covering 8 basic coping strategies. The subject is asked to indicate to what extent these 8 strategies are used with regard to 4 problem areas concerning shift work: sleep, social life domestic life and work. The questionnaire contains a 5-point response option ranging from 1 = not used to 5 = used a great deal. For reasons of scoring there is no separate "does not apply" category.

At present we do not know of a coping questionnaire specifically aimed at shift workers. The questionnaires that have been considered did not seem suitable. The Ways of Coping Questionnaire was considered to be too general and too long, with no obvious way of shortening it. The Zander Wedderburn Ways of Coping Questionnaire seems to focus primarily on sleep patterns and behaviour.

The 32-item questionnaire is based on the Coping Strategies Inventory, developed by Tobin et al and based on the Ways of Coping Questionnaire. The Coping Strategies Inventory (CSI) seems more appropriate because it has different levels of subscales. The CSI has eight primary scales, four secondary scales and two tertiary scales (hierarchically organised, see below). The hierarchical relation of the subscales makes it possible to reduce the number of items (the original questionnaire is 72 items long). We decided to use the tertiary scales, consisting of 8 items.

We do realise that shift work concerns more problem areas than the four we presently consider. When the questionnaire is revised in the near future this will have to be a point of attention. Another point of attention should be that this questionnaire is theoretically based. To us it seems the best starting point, given the time we had to develop the questionnaire. Ideally we would like a questionnaire that is based on both theory and practice. In the long run this is our aim.

The subscales of the CSI are:

Primary: problem-solving, cognitive-restructuring, social-support, express-emotions, problem-avoidance, wishful thinking, social-withdrawal and self-criticism

Secondary: problem-focused engagement, emotion-focused engagement, problem-focused disengagement and emotion-focused disengagement

Tertiary: engagement and disengagement

Scoring: 2 scores per area; one for engagement and one for disengagement

SCORING

2 sub scales: engagement (items a, b, c and d) and disengagement (items e, f, g and h)

- obtain raw score by adding the item scores per scale per problem area
- obtain overall score by adding the item scores per subscale for all the problem areas together

REFERENCES

User's manual for the Coping Strategies Inventory (1984) by David L Tobin, Ken A Holroyd and Russ V C Reynolds, Department of Psychology, Ohio University.

Manual for the Ways of Coping Questionnaire (1988) by R S Lazarus and S Folkman, Consulting Psychologists Press, Palo Alto, California.

6a. COMPOSITE MORNINGNESS QUESTIONNAIRE

(Section 6. Question 6.1)

SOURCE Smith, C.S., Reilly, C., Midkiff, K. (1989)
Evaluation of three circadian rhythm questionnaires with suggestions for an improved measure of morningness. *Journal of Applied Psychology*, 74, 5, 728-738.

The Composite scale was developed in response to the poor, or lack of reported psychometric properties which appear to be associated with existing published morningness questionnaires e.g. Horne & Ostberg (1976) and Torsvall & Akerstedt (1980). It was constructed by factor analysing the items of the two scales together (26 items), and identifying three reliable factors, relating to morning activities, morning affect and eveningness, and selecting out those which load most highly on each of the factors. Through further examination of the items, 13 were finally selected, 9 from Horne & Ostberg and 4 from Torsvall & Akerstedt.

The psychometric properties of the composite scale appear to be superior to previous scales; interitem correlations are all positive and moderate to high, and the alpha coefficient of the full scale is 0.87, thus indicating that there is high internal consistency reliability. Since the alpha coefficient is high, a single score can be calculated even though the items were derived from multiple factors. On the whole, relationships with the composite scale and external criteria are comparable with or stronger than similar relationships between the previously published scales and external criteria.

The main limitation with the present scale appears to be the inclusion of numeric statements which would thus make cross-cultural comparisons more difficult.

SCORING

Individual items are scored 1 to 4 or 5 depending on the number of response alternatives. The direction of scoring varies across items. Items c, d, e & k are scored from 1 (top alternative) to 4 (bottom alternative). All other items are reverse scored, i.e. from 4 or 5 (top alternative) to 1 (bottom alternative). I.e. if **I** = top alternative and **B** = bottom alternative then:

	I	B		I	B		I	B
a.	5→	1				f.	4→	1
k.	1→		4			g.	5→	1
b.	5→	1				h.	4→	1
l.	4→	1				i.	4→	1
c.	1→	4				j.	4→	1
m.	4→	1						
d.	1→	4						
e.	1→	4						

Evening Type: 22 and less
Intermediate Type: 23 - 43
Morning Type: 44 and above

REFERENCES

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

Torsvall, L. & Akerstedt, T. (1980). A diurnal type scale. *Scandinavian Journal of Work Environment Health*, 6, 283-290.

6b. CIRCADIAN TYPE INVENTORY

(Section 6. Question 6.2)

The Circadian Type Inventory (CTI) consists of 30 items. The questionnaire contains two subscales: vigorousness and flexibility, based on factor analysis. The CTI was developed by Simon Folkard and is based on the Circadian Type Questionnaire. (Folkard S. 1979, Kaliterna L.J. et al 1988, Costa G. et al 1989).

The questionnaire was originally designed to look at adaptation in terms of CR characteristics other than phase.

The Alpha coefficients for the scales are on the whole in order. Interitem correlations are quite low but positive. So far there is good validity evidence.

It was considered to be desirable to shorten the CTI. The loadings of each item were insufficiently consistent across the available studies to enable this. It is thus included in the core 200 questions with a view to future development. One of the aims will be to see if it is possible to produce a shortened version of the questionnaire.

SCORING

How to score the 30 item questionnaire. For each question score:

Almost never	-	1
Seldom	-	2
Sometimes	-	3
Usually	-	4
Almost always	-	5

Factor 1: "**Languidness/Vigorousness**"

Question items: a, e, h, j, k, m, n, p, r, s, w, y, b', c', d'.

Factor 2: "**Flexibility/Rigidity**" (of sleeping habits)

Question items: b, c, d, f, g, i, l, o, q, t, u, v, x, z, a'.

On both factors, high scores indicate a tendency towards the first of the two labels describing the dimension, i.e. languid types or flexible types.

Note that there are 15 questions contributing to each factor, and thus that scores can range from 15 to 75 on each factor. This scoring is based on the factor analysis of a cross-sectional study of some 600 oil-refinery shift workers in Rijeka. Analysis of the results of 200+ 18-year old technical students (entering a longitudinal study, but administered before they had any experience of shift work) yielded a very similar factor structure. The questions used all had a loading of >0.30 on the factor concerned and of <0.25 on the other factor (i.e. they discriminate well).

However, more recent analysis of the scale has resulted in the reduction of both factors. Factor analysis of 1532 nurses and midwives responses has allowed 12 of the items to be dropped. The new scales are as follows:

languidity - a, e, g, h, m, n, p, r, y, c'.

flexibility - b, d, f, i, l, o, q, x.

The new scoring should be used in all future analyses

REFERENCES

- Folkard, S. & Monk, T.H. (1979). Towards a predictive test of adjustment to shift work. *Ergonomics*, 22, 1, 79-91.
- Kaliterna, L.J., Vidacek, S., Radosevic-Vidacek, B. (1988). Concurrent validity of circadian type questionnaires for psychosomatic complaints and quality of sleep in shift workers. Proceedings of the 4th Annual Meeting of the European Society for Chronobiology.
- Costa, G., Lievore, F., Casaletti, G., Gaffuri, E. (1989). Circadian characteristics influencing inter-individual differences in tolerance and adjustment to shift work. *Ergonomics*, 32, 4, 373-385.

6c. EYSENCK PERSONALITY INVENTORY

(Section 6. Question 6.3)

SOURCE Eysenck, S.B.G. & Eysenck, H.J. (1964).

An improved short questionnaire for the measurement of extraversion and neuroticism.
Life Sciences, 3, 1103-1109.

The 12 item EPI is a development of the 57 item Eysenck Personality Inventory, (Eysenck, 1964) which in turn was developed through a series of factor analyses of various sets of items of the former Maudsley Personality Inventory, (Eysenck 1959). Advantages of the EPI over the MPI include the careful rewording of the questions so as to make them understandable for subjects of low intelligence and/or education, and the retest reliability of the EPI is somewhat higher than that of the MPI. Even after periods of several months it is in excess of 0.85.

The 12 item EPI sets out to measure two major dimensions of personality, extraversion and neuroticism (6 items on each). Items were selected on the basis of extensive factor analyses of the 108 items considered for inclusion in the 57 item EPI. Correlations of the short scales with the long are as follows: 0.82 for extraversion and 0.79 for neuroticism. The correlation between the short extraversion and neuroticism scales is - 0.05.

The response format has been changed for the present study, from a 2 option yes/no format to a 4 option almost always, quite often, quite seldom, almost never format, in order to increase the possible range of scores and to introduce more flexibility into responding. Correlations between the two formats for each item were sufficiently high for this change to be made (above 0.8).

SCORING

The two subscales are to be scored separately. Neuroticism - Items No. b, d, f, h, j, l
Extraversion - Items No. a, c, e, g, i, k

There are two possible ways of scoring each of these scales.

1. A multiple-response scale or "Likert scale" where weights are assigned to each position on the response options, e.g. 1, 2, 3 and 4, from "almost always" to "almost never". A total score is then obtained by summing the individual scores. Lower total scores on each of the subscales would indicate higher levels of extraversion and neuroticism.
2. A bimodal response scale where columns 1 and 2 are both scored 0 and columns 3 and 4 both scored 1. This way of scoring is more in keeping with the standardised version of a two-point Yes/No response option. Again, scores for each subscale are summed, lower scores indicating higher levels of extraversion and neuroticism.

REFERENCES

- Eysenck, H.J. (1959). The Maudsley Personality Inventory. London: University of London Press.
- Eysenck, H.J. & Eysenck, S.B.G. (1964). The Eysenck Personality Inventory. London: University of London Press.