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**MOTIVATIONAL INTERVIEWING FOR INCREASING PHYSICAL
EXERCISE TO INFLUENCE COMPASSION AND FITNESS OF
NURSES IN EMERGENCY DEPARTMENTS**

by

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DECLARATION

I, Mary-Ann Smith, declare that this dissertation, titled “MOTIVATIONAL INTERVIEWING FOR INCREASING PHYSICAL EXERCISE TO INFLUENCE COMPASSION AND FITNESS OF NURSES IN EMERGENCY DEPARTMENTS” is my own work. All sources referenced and quoted have been mentioned and acknowledged in a full reference list. Furthermore, I declare that this work has not been submitted for any other degree at any other institution.

Researcher's signature

Date

DEDICATION

I dedicate this study to my husband and sons who have stood by me and supported me not only in this research but in my career as an ED nurse and the challenges of moving from South Africa to New Zealand.

ACKNOWLEDGEMENTS

I extend my sincere appreciation to my supervisor Prof Tanya Heyns and her co-supervisor Prof Mostert, Andries the statistician and to all the participating ED nurses and those who so kindly participated in the intervention and assisted with the data collection, including Virgin Active for the use of their Loftus gym.

ABSTRACT

Background

It is generally accepted in the literature and in the medical profession that emergency nursing places substantial vocational stress on ED nurses who nurse in often high-pressured, unpredictable, physically demanding and stressful environments with a high exposure to trauma and human suffering. The physical and psychological impact of this environment on ED nurses' personal and professional lives has academic recognition and the subject of considerable research. One of the academically classified consequences of such impacts is that ED nurses are vulnerable to compassion fatigue with its two components, burnout and secondary traumatic stress. With this recognition the question arises on what should be done to mitigate such vocational stress and build resilience to manage the inescapable stressors of emergency nursing.

It is against this background that the general fitness and well-being of an ED nurse becomes critical in order to avoid compassion fatigue, with its two components of burnout and secondary traumatic stress, and maintain compassion satisfaction. There is universal evidence that physical fitness contributes to a person's general well-being and this study sought to use motivational interviewing, to inspire a sample of ED nurses to improve their physical fitness and determine whether such fitness, after an intervention, has an influence on compassion levels.

The purpose of the study was to determine whether there was any correlation between compassion satisfaction in ED nurses and their health related physical fitness, using motivational interviewing and method, before and after the six week intervention.

Research Design and Methods

The study adopted a prospective quantitative design which consisted of a six week physical exercise intervention in a pre-test / post-test method of one group of ED nurses. Motivational interviewing was used for the intervention and introduced to the ED nurses as a method of exploring and resolving ambivalence and centres on motivational processes within a person

to facilitate behavioural change. The sample population of ED nurses who volunteered to participate in the study were working in emergency departments in State and private hospitals in the Pretoria area. Demographical data was collected using a questionnaire and compassion levels data was collected and analysed using the ProQOL tool. The results of the physical fitness levels of the ED nurses relating to the five components of physical fitness, before and after the six week intervention, were collected using Microsoft Excel spreadsheets and analysed in terms of a data analysis plane using descriptive statistics such as means, standard deviations, ranges, and proportions.

Results

The sample showed high levels, 44% (n=18) high, 56% (n=23) average levels of compassion satisfaction in the ED nurses pre- test with no levels of low compassion satisfaction. In the post-test 10% (n=3) of the ED nurses showed low compassion satisfaction 56% (n=23) scored average levels of compassion satisfaction and 44% (n=18) scored high levels of compassion satisfaction. However, despite the average to high levels of compassion satisfaction of ED nurses, a high percentage scored average levels of burnout pre-test 70.7% (n=29) of the participants scored average levels of burnout; 2.4% (n=1) scored high levels of burnout, and 26.8% (n=11) scored low levels of burnout), but there was a significant decrease post-test with none of the ED nurses scoring any burnout after the intervention. Notwithstanding a smaller sample post-test, secondary traumatic stress also reduced after the intervention. In the pre-test: 80.5% (n=33) had average, 19.5% (n=8) had low, and none (0%) had high levels of secondary traumatic stress and post-test 100% (N=30) of the participants scored low levels of burnout, and none scored high or average levels of burnout. The only correlation of significance between the data of the physical fitness measurement results and compassion levels pre- and post-test, was reduced waist circumference and reduced burnout post-test.

Conclusion

Despite the limitations of the study, the study and findings justify that further research is necessary to find appropriate interventions, which include physical exercise, to build resilience and to mitigate the unavoidable stressors of emergency nursing and the negative effects of compassion fatigue. This justification for further research is additionally supported by the statistical trends of reduced compassion fatigue after the intervention albeit with a smaller sample.

Key Words

Compassion, compassion fatigue, burnout, secondary traumatic stress, motivational interviewing, physical exercise, physical fitness.

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LIST OF ABBREVIATIONS	
ACOG	American Congress of Obstetrics and Gynaecologists
ATS	American Thoracic Society
BMI	Body mass index
ED	Emergency Department
FITT	Frequency, Intensity, Time, and Type
HR	Heart Rate
KG	Kilogram
MTLI	Muscle tendon unit length
NHS	National Health Service

1RM	One Repetition per Minute
ProQoI	Professional Quality of Life Scale
ROM	Range of Movement
SANC	South African Nursing Council
SLR	Straight Leg Raise
6MWT	Six minute walk test
WHO	World Health Organisation

CHAPTER 1

ORIENTATION OF THE STUDY

1.1 INTRODUCTION

The researcher is an ED nurse with more than thirty years' experience, as well as being a professional exercise instructor and identified that many of her peers were experiencing some form of excessive fatigue and burnout from demanding workloads and exposure to traumatic events in the ED. In addition, she found that many ED nurses appeared to be physically unfit and many overweight with an unbalanced lifestyle which was not only impacting their ability to do certain tasks, such as cardio pulmonary resuscitation and to stay alert and energised for twelve hour shifts, but also affecting their compassion, their personal lives and caring for patients. This experience motivated her to research the reasons for burnout and fatigue and what was needed for ED nurses to cope with the mental and physical demands of emergency nursing, having personally found that having a physically fit and healthy lifestyle enabled her to build resilience to mitigate such unavoidable stressors and have a high level of compassion and job satisfaction.

ED's in South Africa are burdened with excessive trauma which has been described as a "malignant epidemic" with a ratio of 17 per 1000 of the population seeking hospital care for trauma which places enormous physical and mental pressures on ED nurses. (Lutge, Moodley, Tefera, Sartorius, Hardcastle & Clarke 2015:135-140) South African EDs are not only extremely busy but also resource constrained which requires ED nurses to use more physical endurance in ongoing lifting and moving patients. A review of studies on of the incidence of trauma in South Africa, which is seen as a preventable disease, evidences the major burden of trauma on healthcare facilities as significant and aggravated by low staffing levels in ED's, insufficient basic resuscitation and X-ray/CT-scanner facilities and a lack of nurses trained to manage trauma and emergency cases (Hardcastle, Oosthuizen, Clarke & Lutge 2016:2).

Research has shown that in the context of excessive stressors in ED's there is an inevitable impact both mentally and physically on ED nurses leading to negative consequences for ED nurses to give compassionate care and have compassion satisfaction in caring for others. It is logical that ED nurses, who are physically unfit to cope with the demands of typical twelve-hour shifts, would be compromised in ensuring good patient outcomes if they are fatigued with burnout and stress. This study seeks to determine whether physical exercise could be a positive contributor to compassion satisfaction among ED nurses using the motivational interviewing technique.

Compassion has been identified as an essential element of nursing and is directly linked to quality nursing care (Blomberg, Griffiths, Wengström, May & Bridges 2016:137). Quality nursing care, as measured in patient outcomes and patient experiences, is dependent on nurses not only being professionally competent, but also demonstrating compassion when caring for patients and their families during times of vulnerability, trauma and stress. When compassion is absent, the effect on nurses' well-being can be devastating and affect their ability to care for others (Braunschneider 2013:14). Nursing is universally recognised as a 'caring profession' and compassion is pivotal in caring with public scrutiny of 'compassionate care' by the nursing profession (Blomberg et al 2016:139).

Compassion lies at the heart of caring for others (Hamilton, Tran & Jamieson 2016:100; Burnett & Wahl 2015:3) and is a pre-requisite for, and a core value, in nursing. (Petleski 2013:1). Nurses' compassionate care is part of a holistic approach to 'nursing-being present' for patients and forming a connection with patients. Such an approach embodies the caring profession and may therefore, affect patient outcomes and research suggests that compassion affects the effectiveness of treatment (Cornwell & Goodrich 2009:15). The nurse's emotional, spiritual and physical well-being determines the level of compassion and is causally linked to nurses' levels of compassion, in other words, if a nurse's well-being is compromised so is her ability to professionally care and be compassionate (Braunschneider 2013:14). Physical exercise is linked to the physical well-being of nurses as it lowers stress and may therefore positively affect compassion (Bhabhi, Das, Clemmons, Kemble, Schreier, & Mahar 2017:231).

1.2 BACKGROUND

Compassion should be recognised, internalised and intentionally used in everyday nursing care, as it gives meaning to, and an understanding of others' suffering (Petleski 2013:9). Compassion drives the sense of human connection and affirmation of a nurse's work and the more compassion grows, the greater the positive effect on patients and work relationships (Petleski 2013:1). Patients consider it vital that they are cared for and cared about (Davison & Williams 2009:16, Bhabhi, Das, Clemmons et al 2017:231). Compassion includes kindness and consideration for patients, thus enhancing patients' experience of the care they received (Petleski 2013:1).

According to Davison and Williams (2009:17), compassion is 'nursing's most precious asset' and includes two key elements in professional caring: *instrumental caring*, which requires skills and knowledge, and *expressive caring*, which involves the emotional aspects of the relationship between nurse and patient. Expressive caring changes nursing actions into caring. Blomberg et al (2016:139) describe compassion as a set of ideas which include moral attributes of wisdom, humanity, love and empathy. These attributes may be expressed through situational awareness and the nurse's participation in a responsive way to vulnerability and suffering and aimed at relieving suffering and ensuring the patient's dignity through establishing a caring 'pastoral' relationship (Blomberg et al 2016:139).

Compassion has been sub-categorised into compassion satisfaction and compassion fatigue. In 1992, Joinson (1992:119) coined the concept *compassion fatigue* when she noticed that nurses in the emergency department (ED) had lost their 'ability to nurture'. Compassion fatigue describes the feelings of physical, emotional, and spiritual exhaustion from absorbing the problems and suffering of others, whilst compassion satisfaction describes nurses' satisfaction when caring for patients and feeling competent and supported by colleagues (Merk 2018:1)

Compassion fatigue has also been described as the 'cost of caring' for healthcare professionals experiencing repeated trauma (Burnett & Wahl 2015:2; Hamilton et al 2013:101; Petleski 2013:2), which is a secondary form of post-traumatic stress disorder (Cocker & Joss 2016:E618; Hamilton et al 2013:101). Predictors of compassion fatigue include extreme states of tension and preoccupation with the emotional and physical pain of those being cared for (Cocker & Joss 2016:E618), as experienced by nurses in the ED. Compassion fatigue must not be confused with what is termed "burnout", which is associated with a nurse's feelings of hopelessness and apathy (Merk 2018:1).

Compassion fatigue, also sometimes termed secondary or vicarious traumatisation, arises from exposure to traumatic stressors and nurses can develop negative symptoms associated with burnout, depression, and post-traumatic stress disorder (Stamm 2010:8). In essence, compassion fatigue presents as mental, emotional, and physical exhaustion caused by a depleted ability to cope with one's environment, which Petleski (2013:2) describes as a loss of ability to nurture patients. Compassion fatigue is characterised by tiredness, anger, irritability, negative coping methods, reduced ability to feel empathy and sympathy, diminished job satisfaction and impaired ability to make decisions and care for patients (Cocker & Joss 2016:E619). Nurses have described compassion fatigue as an 'unbearable weight on their shoulders', together with a 'lack of support' and feeling 'alone in a crowded room' (Nolte, Downing, Temane & Hastings-Tolsma 2017:4364). Compassion fatigue manifests itself when nurses become emotionally dulled when working with patients and compassion fatigue is thus regarded as a 'maladaptive' coping mechanism to deal with the trauma they are exposed to daily (Petleski 2013:2). Compassion fatigue can have a profound effect on nurses' health and is commonly associated with health problems, such as work-related fatigue, insomnia, headaches, backache, lethargy and hypertension – all of which impact negatively on job performance and relationships, and may lead to feelings of inadequacy (Braunschneider 2013:15). Compassion fatigue, therefore, not only impacts negatively on the well-being of nurses, but also affects general nursing standards (Cocker & Joss 2016:619).

The physical demands and stressful environment place nurses working in the ED at high risk to develop compassion fatigue (Burnett & Wahl 2015:2; Braunschneider 2013:15; Hamilton et al 2013:6). Not only is working twelve-hour shifts physically demanding, but the environment is unpredictable, constantly changing and often presents with violent, abusive and aggressive patients (Adriaenssens, De Gucht & Maes 2015: 649; Hamilton et al 2013:102). These factors, as well as being exposed to patients experiencing trauma and/or distress affect emergency nurses' well-being (Cocker & Joss 2016: E619). To help prevent compassion fatigue, emergency nurses need to be physically fit and strong to cope with the physical demands and stress of such a pressured environment in order to ensure quality care and positive patient outcomes (Terpeluk, Rogen & Gilliam 2016:424).

Physical fitness is not only important for maintaining good health and disease prevention, but is also linked to the well-being of the nurse (Rice, Glass, Ogle & Parsian 2014:155; Bretland & Thorsteinsson 2015:ee891). Well-being is a significant factor in ensuring better quality nursing and consequently positive patient outcomes (Phiri, Draper, Lambert & Kolbe-Alexander 2014:22). Compassion fatigue negatively influences the well-being of nurses (Braunschneider 2013:15). Physical exercise therefore, plays a key role in nurses' well-being

and may affect compassion. Emergency nurses, therefore, need to manage stressors and build resilience to avoid negative impacts on their ability to be compassionate, as stress is unavoidably associated with the nursing profession (Roberts & Grubb 2014:62). Job stress is a major barrier to the attainment of safety, health and wellness among nurses (Roberts & Grubb 2014:62).

Several critical factors contribute to a nurse's ability to be compassionate. Regular physical activity and a healthy lifestyle enhance the prevention of chronic diseases with a direct correlation between volume of physical activity and health status (Warburton, Nicol & Bredin 2006:806). The benefits of physical fitness include personal health benefits, such as an improved body mass index (BMI), gripping strength, flexibility, abdominal and back muscle durability, and cardiopulmonary durability (Yuan, Chou, Hwu, Chang Hsu & Kuo 2009:1409). Physical fitness also has professional benefits, such as less absenteeism from work and increased productivity at work (Sjogaard, Christensen, Justesen, Murray, Dalager, Fredslund & Sogaard 2016:159), better work performance (Terpeluk et al 2014:424), and fostering of teamwork in the workplace, and may help cope with compassion fatigue. One of the identified lifestyle changes which emergency nurses selected to cope with compassion fatigue was to do more exercise (Petleski 2013:33).

The connection between compassion and emergency nurses' physical fitness should be seen in the light of the stressful mental and physical demands of the emergency environment. Stress is common among emergency nurses, which not only negatively impacts on their health (e.g., obesity, fatigue, burnout, decrease in quality of and satisfaction with life), but also affects the quality of care patients receive (Bhabhi, Das, Clemmons et al 2017:231). Self-care strategies, such as physical activity, may contribute to lower stress and consequently enhance nurses' health and ultimately patient health and safety (Bhabhi, Das, Clemmons et al 2017:231).

1.3 PROBLEM STATEMENT

A research problem is "a troubling condition which can be solved by generating evidence through research" (Polit & Beck 2012:73). A problem statement "articulates the problem and describes the need for a study through the development of an argument" (Polit & Beck 2012:73). Emotional and physical stress experienced by emergency nurses in the ED can affect them adversely including their general wellbeing, which may lead to compassion fatigue, consequently impacting negatively on the quality of nursing care and patient outcomes (Chesak, Bhagra, Schroeder, Foy, Cutshall & Sood 2015:38). Positive quality nursing care

can only be delivered if nurses have a high level of well-being (Braunschneider 2013:15) which enables them to offer compassionate care. (Phiri, Draper, Lambert & Kolbe-Alexander 2014:22)

There generally appears to be no professional frameworks or programmes, whether from employers or self-care, for ED nurses to build resilience in order to cope with compassion fatigue, nor to mitigate its affects. The problem is aggravated by a generally perceived lack of physical exercise and low levels of physical fitness among emergency nurses. If not addressed, the problem will have negative consequences, such as staff attrition, resulting in a loss of experienced and skilled nurses, further affecting the quality of patient care (Phiri et al 2014:22). In their study in public hospitals in the Cape Town metropolitan area, Phiri et al (2014:22) found a high prevalence of non-communicable diseases, such as hypertension and diabetes, and general physical inactivity among the nursing work force. This finding confirmed the researcher's experience as an ED nurse for over 20 years that most nurses with whom she worked did not follow a physically active lifestyle. Being physically unfit may have a negative effect on ED nurses' well-being and affect their ability to prevent or cope with compassion fatigue.

Recognising the importance for nurses to be physically fit, Barene, Krustap, Jackman, Brekke and Holterman (2013:990) conducted a study in Denmark to examine the level of physical fitness of female nurses by introducing a 12-week prescribed programme of soccer and Zumba dancing. The study had difficulty in measuring the success of the programme as the measurement scales used were not objective. The researcher found no evidence that public or private hospital groups in South Africa have wellness and/or self-care programmes for nurses to promote their well-being. This was confirmed in personal conversations with clinical facilitators in EDs in the private sector (van Eeden, 2018; van Rooy, 2018) and the public sector (Visagie 2018) despite the fact that compassion fatigue has been identified as a challenge (Hardcastle, Steyn, Boffard, Gossen, Toubkin, Loubser, Moeng, Mucket, Brysiewicz & Wallis 2014:189). In their review of compassion fatigue among healthcare, emergency and community service workers, Cocker and Joss (2016:E621) found that employers and managers in the emergency environment had little evidence on the best way to prevent and/or deal with compassion fatigue in clinical practice, despite knowing the inherent effects of exposure to traumatised patients.

ED nurses are at risk to develop compassion fatigue. Despite recognising the effect thereof on the ED nurses as well as on the quality of patient care, little is known about strategies

and/or interventions which may prevent compassion fatigue among ED nurses (Blomberg et al 2016:142).

Central to the problem is the question of how levels of compassion are properly measured and what general acceptable tool or instrument has a high measure of accuracy and professional credibility and acceptance. In this study the ProQOL tool is used as more fully described below. (1.6.2)

In essence, therefore, whilst the risks to nursing care of the negative consequences of compassion fatigue in ED nurses is recognised there is a lack of evidence on whether programmes, such as physical exercise interventions would enhance ED nurses' compassion satisfaction and well-being and contribute to better nursing care and patient outcomes. .

1.4 RESEARCH QUESTION

In view of the background and problem statement, the study wished to answer the following research question:

What effect would a six-week personalised physical exercise intervention based on motivational interviewing have on compassion and health-related fitness in ED nurses?

1.5 AIM AND OBJECTIVES

The aim of the study was to determine the effects of health-related physical fitness on compassion satisfaction in ED nurses, using motivational interviewing as a technique and a six-week physical exercise intervention. In this context, the secondary aim was assessing the levels of compassion of the participating ED nurses using the ProQOL tool, to determine their professional quality of life.

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In order to achieve the aim, the primary objectives of the study were to

- Objective 1: Determine the level of compassion before the intervention (pre-test)
- Objective 2: Determine the level of compassion after the intervention (post-test)
- Objective 3: Determine the health-related physical fitness before the intervention (pre-test)
- Objective 4: Determine the health-related physical fitness after the intervention (post test)

- Objective 5: Determine the relationship between the change in compassion with the change in health-related physical fitness from baseline to post-intervention

1.6 FRAME OF REFERENCE

A frame of reference of a study provides a logical structure or guide for developing the study (LoBiondo-Wood & Haber 2014:39). The frame of reference includes the paradigm and assumptions, theoretical framework, the setting in which the study is conducted, delimitations, and role of the researcher.

1.6.1 Paradigm and assumptions

Botma, Greef, Mulaudzi and Wright (2015:40) describe a paradigm as a philosophy that guides research by defining what should be studied, what questions should be asked and how they should be asked, and how answers should be interpreted. A paradigm consists of assumptions and beliefs, which serve as a lens through which the researcher views the reality of the world (Gray, Grove & Sutherland 2017:686).

Assumptions are basic principles that are assumed to be true based on logic and reason, without proof or verification (Brink, Van der Walt & Van Rensburg 2006:25). The researcher's philosophical assumptions guide the research design and the study (Polit & Beck 2012:11).

The researcher selected positivism as the paradigm for the study. Positivism holds that reality exists and there is a real world that is influenced by natural causes. Positivism views people as shaped by external factors and knowledge as "accurate and certain" and constructed depending on the meaning people attach to it (Botma et al 2010:44). In this study, the assumptions were:

- The participants were unique and holistic human beings who could function effectively in an ED with a sound level of compassion and physical fitness.
- The physical exercise intervention would motivate the participants to provide quality compassionate nursing care.
- The participants would complete their booklets accurately and honestly.

1.6.2 Theoretical framework

The study framework is referred to as the conceptual or theoretical framework and guides the development of the study. A theoretical framework is “an abstract, logical structure of meaning” (Burns & Grove 2013:24). LoBiondo-Wood & Haber (2010:57) describe the conceptual or theoretical framework as “a structure of concepts and/or theories pulled together as a map for the study that provides a rationale for the development of a research question or hypothesis”. In this study, the researcher used the Professional Quality of Life: Compassion Satisfaction and Fatigue Version 5 model as the theoretical framework (Stamm 2010:8). The Professional Quality of Life Scale known as the ‘ProQOL’ is the most commonly used measure of the positive and negative effects of working with people who have experienced extremely stressful events (Stamm 2010:12).

Figure 1.1 Theoretical framework of the study illustrates the theoretical framework for the study based on the ProQOL scale and includes the researcher's addition of the link of physical exercise (blue arrow) following motivational interviewing as mitigating compassion fatigue in order to achieve compassion satisfaction. (Adapted from Stamm (2010:8) and refer to Figure 2.1 in Chapter 2 the Literary Review).

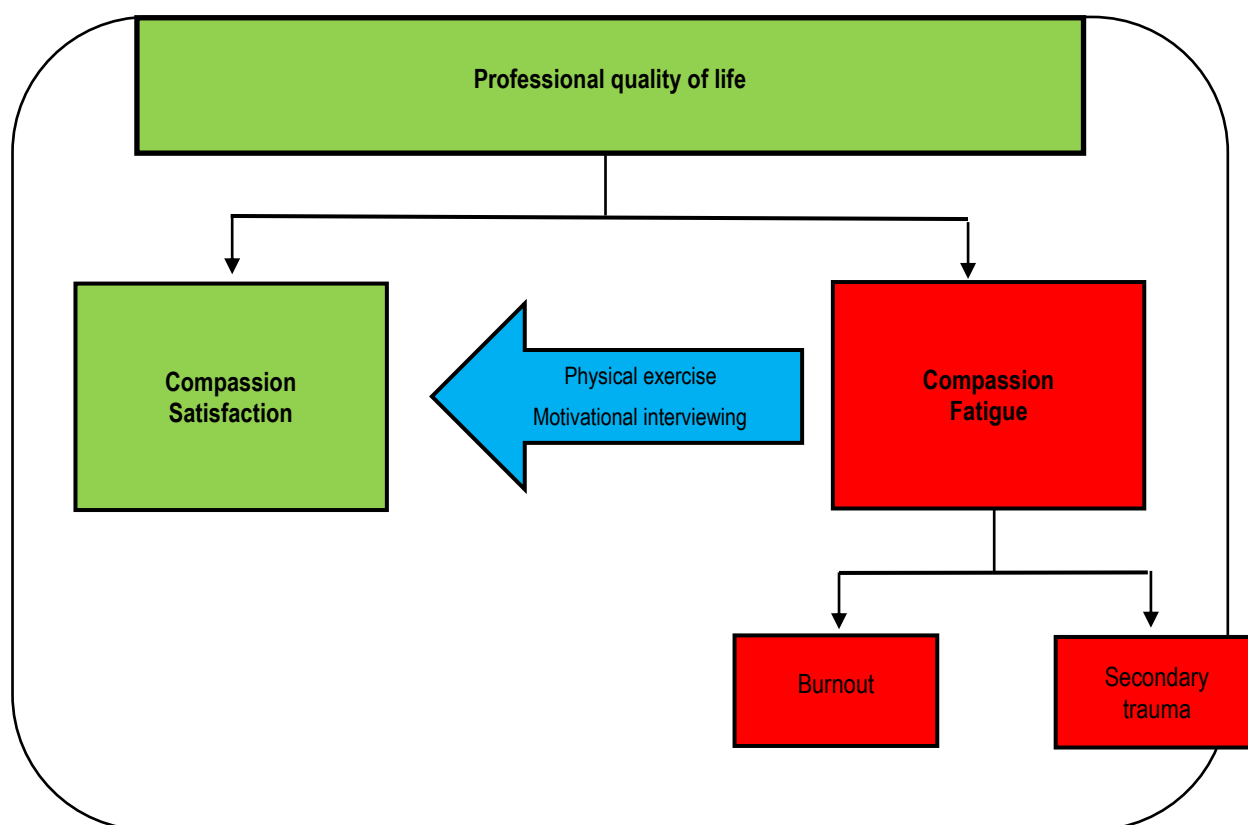


Figure 1.1 Theoretical framework of the study

Stamm (2010:7) defines professional quality of life as “the quality one feels in relation to one’s work as a helper” and maintains that it is particularly relevant to nursing. Moreover, positive (compassion satisfaction) and negative (compassion fatigue) aspects influence one’s professional quality of life. Compassion satisfaction is a professional fulfilment experienced through helping others (Weintruab, Geithner, Strastrup & Waldman 2016:1). Compassion fatigue refers to when nurses are unable to establish a caring relationship with their patients. The theoretical basis underpinning this study was to determine the causal link between the benefits of physical exercise as a contributor to an ED nurse’s well-being and which builds resilience to the stressors of emergency nursing practice, to compassion satisfaction, which enhances an ED nurse’s professional and vocational quality of life. The converse being that where ED nurses suffer burnout and/or secondary trauma leading to compassion fatigue from the negative stressors of ED nursing, they have a low professional quality of life.

Motivational interviewing was used to guide the intervention which was aimed at eliciting behavioural change by assisting the participating ED nurses to increase their uptake of physical exercise, which might affect compassion. Motivational interviewing is an evidence-based client-centred approach, which is designed to promote behavioural change (Howard & Williams 2016:473; Wiedemann, Lippke, Reuter et al 2011:42). Following four key processes, namely engage, focus, evoke and plan, the approach draws on the patient-centred tradition which is based on the principles of warmth and empathy and involves active listening and questioning (Costanza, Atkins, Bolton, Cork, Grigg, Kasser & Kubiszewsk 2017:49). The spirit of motivational interviewing encompassed a collaborative process, using the participants' ideas to autonomously evoke change and proceed with a personalised self-directed exercise programme when ready (Miller & Rollnick 2013:7). Critical elements of motivational interviewing are to clearly set the agenda (increase physical exercise), clarify and define the topics that need to be addressed, and select the right time to discuss behaviour change (Marsh 2004:2). One then needs to ascertain readiness to change in the context of two key dimensions: importance and confidence as techniques to motivate the subjects to contemplate and understand the consequences of not changing (Marsh 2004:3).

1.6.3 Setting

An ED is a twenty-four hour facility found in both public and private hospitals in South Africa. Healthcare professionals, including medical doctors and registered nurses (professional and enrolled nurses registered with the South African Nursing Council), manage patients of all ages admitted with emergencies ranging from non-urgent to urgent. Healthcare professionals in EDs deal with medical emergencies and trauma-related injuries. South Africa established major trauma centres as EDs in both the public and private sectors and as areas of trauma speciality (Hardcastle, Steyn, Boffard et al 2011:189) classify trauma centres into four levels:

- Level I Major trauma centre
- Level II Urban trauma centre
- Level III Community hospital
- Level IV Primary health care centre

Level I and II EDs offer a 24-hour emergency service with specialist care (Hardcastle, Steyn, Boffard et al 2011:1). A Level I facility is a regional resource trauma centre, usually a tertiary care facility central to the trauma care system. The EDs must be capable of providing care for every aspect of injury, from prevention through rehabilitation, and have 24-hour availability of all major specialties (Hardcastle, Steyn, Boffard et al 2011:189). A Level II trauma centre is a

facility that provides initial definitive trauma care regardless of the severity of injury, with 24-hour medical cover, including the common specialties. Depending on location, patient volume, personnel and resources, a Level II trauma centre may be unable to provide comprehensive care similar to a Level I trauma centre (Hardcastle, Steyn, Boffard et al 2011:189). Patients with complex injuries, such as those requiring advanced and extended surgical critical care, may therefore have to be transferred from a Level II to a Level I centre.

The settings in which the study took place were all Level I and II EDs in Pretoria. There are 18 Level I and II ED's in Pretoria: six in public hospitals and 12 in private hospitals (see Table 1.1). Public hospitals are owned, funded and operated by the State whilst private hospitals are part of a corporate group which owns several hospitals. In South Africa, there are three major private hospital groups, namely Life Healthcare, Netcare, and MediClinic, all of which have EDs in Pretoria. Table 1.1 indicates the number of nurses working in Level I and II emergency departments.

Table 1.1 Number of nurses working in Level I and Level II emergency departments

Sector	Full-time employed nurses n=numbers
Public sector	
Emergency department 1	50
Emergency department 2	38
Emergency department 3	65
Emergency department 4	50
Emergency department 5	65
Emergency department 6	68
Private sector	
Emergency department 1	36
Emergency department 2	23
Emergency department 3	15
Emergency department 4	10
Emergency department 5	18
Emergency department 6	27
Emergency department 7	25
Emergency department 8	20
Emergency department 9	32
Emergency department 10	36
Emergency department 11	36
Emergency department 12	17
Total	631

1.6.4 Delimitations

The study centred on the role that physical exercise plays in the compassion of ED nurses who work in both private and public hospitals in the Pretoria area. The study tested whether physical exercise, which included cardiovascular fitness and muscular strength and flexibility, built resilience in ED nurses in maintaining compassion in the context of nursing care. The study investigated the effectiveness of a six-week physical fitness intervention programme, based on the motivational interviewing method, appropriate for ED nurses, to assess whether physical fitness plays a positive role in compassion as an essential element of quality nursing care.

The study did not address lifestyle factors that might influence compassion, such as individual eating habits, use of alcohol or smoking, sleep patterns, mindfulness and meditation. In addition, the quality of care delivered or patient outcomes in the ED were neither measured, nor investigated.

1.6.5 Role of the researcher

The role of the researcher refers to the influences that a researcher brings to the study (Struwig & Stead 2001:227). According to Terre'Blanche, Durrheim and Painter (2014:49), these influences should be considered before data collection commences, since this is the time that the researcher has the most effect. In this study, some of the influences that the researcher could have brought to the study included her status as a registered professional ED nurse and professional exercise instructor, her experience in the clinical environment, and her current position as an ED nurse. These roles had an influence on the choice of research topic, as well as the research methods used to answer the research question.

The researcher's direct role during the data collection was that she was actively involved in the selection of participants as well as the pre- and post-intervention data collection, and the recruitment of research assistants in collaboration with her supervisors (Terre'Blanche, Durrheim & Painter 2014:49).

The researcher also gave each participant the booklet entitled "*My Journey to Physical Fitness*" (See Annexure D) and explained how it should be completed. This booklet contained the principles of motivational interviewing for the six week physical fitness intervention and structured to enable participants to record their physical fitness activities during the intervention.

1.7 RESEARCH DESIGN AND METHODS

The researcher selected a quantitative, interventional, one-group pre-test post-test research design (Bell 2012:2) (see chapter 3 for discussion and description). The design involved obtaining pre-test measures of the participant ED nurses' level of compassion and health-related physical fitness. Their readiness for change was also measured prior to the intervention. The intervention consisted of a motivational interviewing awareness session followed by a six-week personalised, self-directed physical exercise intervention, during which group members supported each other using WhatsApp discussion groups, applying motivational interviewing principles. After the exposure, the same base-line measurements were repeated. Adherence to the exercise intervention was quantified as the number of days exercised per week. The ED participants maintained daily diaries of their physical activities during the six intervention. The data contained in the respective diaries was not analysed nor collected as the measurement of the five components of physical fitness before and after the six-week intervention was central to the design. Table 1.2 outlines the research design and methods.

Table 1.2 Research design and methodology

Population	Sampling/Sample size	Data collection	Data analysis	Rigour
Target population Emergency nurses Inclusion criteria Nurses who worked a minimum of 40 hours a week, full-time in an ED	Sampling Purposive and snowball sampling Sample size Pre-test: 41 Intervention: 41 Post-test: 28	Pre-test ProQOL and from five station physical fitness measurements Intervention Post-test ProQOL and from 5 station physical fitness measurements	Descriptive statistics were used to describe, summarise and synthesise data (Botma et al 2010:148). Descriptive statistics allow data to be sorted, arranged, and presented scientifically (Struwig & Stead 2004:158).	Validity and reliability (see section 3.10)

Chapter 3 discusses the research design and methods in detail.

1.7.1 Definition of key terms

For the purposes of this study, the following key terms were defined as conceptualisations and operational definitions as indicated in Table 1.3. Two important steps in measurement are conceptualisation and operationalisation. Conceptualisation involves defining abstract ideas with specific characteristics which specify exactly what is meant in the research. An operational definition is a set of instructions for what to observe and how to measure a variable (term). The basis for development of operational definitions and putting operational definitions into practice involves specifying each term or variable and indicating how each will be measured in the study (Sequeira 2014:2).

Table 1.3 Definitions of key terms

Key term	Conceptualisation	Operational definition
Compassion	Compassion, as a concept, is a term closely associated with and at the heart of professional nursing care containing elements of empathy, nurturing and sympathy and caring. The abstract nature of compassion makes it intrinsically difficult to measure, although the measure of patient outcomes as well as the job satisfaction and resilience of nurses are indicators. Compassion originates as an empathic response to suffering, as a rational process which pursues patients' wellbeing, through specific, ethical actions directed at finding a solution to their suffering. The term means the sensitivity shown in order to understand another person's suffering, combined with a willingness to help and to promote the wellbeing of that person, in order to find a solution to their situation. Compassion should be a duty in healthcare professionals' daily work (Perez-Bret Altisent & Rocafort 2016:599) Compassion in nursing is often contextualised in both the negative and the positive and used respectively in the concepts of 'compassion fatigue' and 'compassion satisfaction'. In this study, compassion was measured with the ProQOL instrument (Stamm 2010) (see Annexure E.).	Compassion has been defined generally in literature, as involving five elements: recognising suffering in others; understanding the common humanity of this suffering; feeling emotionally connected with the person who is suffering; tolerating difficult feelings that may arise, and acting or being motivated to act to help the person (Strauss, Taylor, Gu, Kuyken, Baer, Jones & Cavanaugh 2016:1). It also includes the elements of burnout and professional quality of life (Stamm 2010:8)
Compassion satisfaction	Compassion satisfaction as a concept can be contextualised when the providers (ED nurses) feel a sense of connection with patients and feel a sense of achievement in	Compassion satisfaction is defined as the positive outcome of compassionate care and is professional fulfilment

Key term	Conceptualisation	Operational definition
	their work (Stamm 2010). In order to feel compassion satisfaction, it is essential that caring for others and providing support outweighs the difficulties that nurses feel when doing their job. Establishing and maintaining a high level of professional quality of life is essential for a nurse to feel compassion satisfaction and foster compassion satisfaction. In addition, providing the framework to prevent compassion fatigue will improve nurse caring and potentially provide a sustained improvement in the nurse-patient relationship (Larsen 2016:8)	experienced through helping others (Weintraub, Geithner, Straustrup & Waldman 2016:1)
Compassion fatigue	Cocker and Joss (2016:E618) conceptualise compassion fatigue as stress resulting from exposure to a traumatized individual and has been described as the convergence of secondary traumatic stress and cumulative burnout and is a state of physical and mental exhaustion caused by a depleted ability to cope with one's everyday environment. It is a negative mental and physical state; an aggravated condition of emotional and dispassionate detachment by the emergency nurse in relation to her/his work and patients (West, Wantz, Shalongo et al 2017:12).	Compassion fatigue is defined as having two parts: firstly, symptoms such as exhaustion, frustration, anger and depression typical of burnout and secondly, secondary traumatic stress driven by fear and work-related trauma (Stamm 2010:8) It is a sub-section of the ProQOI instrument that measures compassion (see Annexure E).
Physical exercise	Physical exercise is a specific form of physical activity that is planned, purposeful and performed with the intention of gaining specific adaptations in the body, such as stronger muscles, increased flexibility or improved cardiovascular function. Dancing, swimming, cycling, and running are examples of physical exercise which is often termed simply "exercise" Mosby's Medical Dictionary 2001.	Physical exercise is a subset of physical activity, is planned, structured, and repetitive physical activity for the purpose of conditioning the body, improving health, or improving or maintaining fitness (Mosby's Medical Dictionary 2001:421) In this study physical exercise referred to activities from all the domains of physical fitness (see pages 11 & 12 in the My Journey to Physical Fitness booklet) (see Annexure D)
Physical fitness	The concept of physical fitness is a set of attributes which are either health- or skills-related. The degree to which people have these attributes can be measured with specific tests (Caspersen et al 1985:126)	Is determined and defined by five components 1. cardiovascular or cardiorespiratory fitness, 2. muscular strength, 3. muscular endurance, 4. flexibility, and 5. body composition (Percia, Davis & Dreyer 2016:1). In this study, physical fitness was measured by a physical fitness test battery consisting of five tests for muscle endurance, flexibility, muscular strength, anthropometry and cardiovascular and

Key term	Conceptualisation	Operational definition
		cardiorespiratory fitness as defined in Chapter 4.
Motivational interviewing	Motivational interviewing describes a method of exploring and resolving ambivalence and centres on motivational processes within a person to facilitate behavioural change. It differs from a coercive or externally driven method to motivate for change being collaborative as opposed to confrontational. (Miller & Rollnik 2002:1).	Is defined as a directive, client-centred counselling style for eliciting behaviour change by helping clients explore and resolve ambivalence. Sensitivity, and empathy, are key elements to motivational interviewing and is a collaborative, conversational style of approach for strengthening a person's own motivation and commitment to change (Firth 2016:1). In this study, group motivational interviewing was applied in a workshop followed by six-weeks of WhatsApp support of participants to each other for physical activity, applying the principles of motivational interviewing (see pages 8 to 11 in the booklet, Annexure D)
Readiness for change	Readiness to change in the context of motivational interviewing has two key dimensions: importance and confidence as techniques to motivate the subject to contemplate and understand the consequences of not changing (Marsh 2004:3).	The readiness for change was measured using an instrument for readiness for physical activity (Section C of the questionnaire in Annexure D)
Six-week personalised exercise intervention	In this study, each participant ED nurse selected his/her own exercise prescription or programme and set weekly goals over six weeks. Every week the number of exercise sessions had to be recorded (see the booklet in Annexure D)	An exercise programme is the prescription or plan of physical exercises over a period of time in terms of a wide range of physical exercise (from the health-related fitness domains), intensity (low, moderate and high), duration, frequency and progression.
Level of adherence	Adherence is also referred to as compliance behaviour and includes devotion or loyalty to pre-determined rules, prescripts or standards.	Number of days per week that the participant ED nurses exercised as recorded in the booklet (see pages 11 and 12 of the booklet, in Annexure D)
Nurse	The concepts "nurse" and "ED nurse" refer to persons who are qualified and registered as nurses with the South African Nursing Council. In this study, the focus was on emergency department nurses and no distinction was made for participants between nurses who practise in the ED in relation to their qualifications from diploma to graduate and postgraduate.	In this study, a nurse is a person registered as such with the South African Nursing Council. The World Health Organisation (WHO Official Website at the Nursing and Midwifery Homepage) defines a nurse as a qualified and registered person who encompasses autonomous and collaborative care of

Key term	Conceptualisation	Operational definition
		individuals of all ages, families, groups and communities, sick or well and in all settings. The WHO definition includes the promotion of health, the prevention of illness, and the care of ill, disabled and dying people.

1.7.2 Ethical considerations

Ethics deals with matters of right and wrong. When humans are used as study participants, care must be taken in ensuring that their rights are protected (Polit & Beck 2012:748). In this study, the researcher upheld the ethical principles of the Belmont Report, 1979. In the Belmont Report, the National Commission for the Protection of Human Subjects of Biomedical and Behavioural Research identified the basic ethical principles that should underlie the conduct of biomedical and behavioural research involving human subjects and developed guidelines to assure that such research is conducted in accordance with those principles.

Accordingly, the researcher obtained permission to conduct the study, and observed the ethical principles of respect for persons, beneficence, and justice (Polit & Beck 2012:748).

1.7.3 Permission

The researcher ethical approval and obtained permission to conduct the study from the Research Ethics Committee of the Faculty of Health Sciences, University of Pretoria (see Annexure A).

1.7.4 Respect for persons

Respect for persons recognises that individuals should be treated as autonomous agents. In cases where participants have diminished autonomy, researchers are required to protect them. There were no participants with diminished autonomy in this study.

The participants were informed of the purpose of the study and what it entailed, and that they were free to participate or withdraw at any stage (see Annexure A). The researcher assured the participants that she would respect their social, cultural and religious beliefs, and would treat any participants who wanted to withdraw in a non-prejudiced way (Polit & Beck 2017:124).

1.7.5 Beneficence

The principle of beneficence requires researchers to do good and above all do no harm. Beneficence imposes a duty on researchers to minimize harm to study participants and maximize benefits (Polit & Beck 2017:139).

In this study, the nature of the physical exercise intervention was such that the possibility of physical harm was unlikely. The questionnaire and information talk at the pre-test informed the participants of the benefits and limitations of the study. All the participants contributed to medical insurance cover. The participants were asked to contact the researcher without delay for referral to their general practitioner or to a pre-arranged medical doctor at Steve Biko Academic Hospital's ED, in the event of injury.

1.7.6 Justice

The principle of justice refers to participants' right to fair treatment and to privacy (Polit & Beck 2017:141). The researcher selected the participants fairly and assured them of confidentiality and anonymity. The participants were telephonically pre-screened, using the 2017 Par-Q+ instrument, and gave the researcher their email addresses. The researcher emailed the information about what was expected of them and inclusion criteria to each participant. The participants signed informed consent on the day of the pre-test.

Confidentiality of the participants' identity was maintained by the two supervisors (facilitators) who allocated a number to each participant, so that the pre-and post-measurements could be compared for participants. Furthermore, the research assistants were asked to keep the names of the participants confidential. The research assistants were not remunerated. The researcher obtained informed consent from participants in their private capacity (Fouka & Mantzourou 2011:2). Written permission to use and/or adapt the ProQOL questionnaire was obtained (see Annexure B).

1.8 SUMMARY

This chapter discussed the problem, aim and objectives, research design and methods of the study, and defined key terms. Compassion is essential in emergency nursing practice. Currently compassion fatigue and its related manifestations of burnout and secondary trauma are topical and relevant to ED nursing. Nurses' levels of compassion determine their professional quality of life, which is of direct relevance to the quality of nursing care and patient

outcomes and patient experiences in emergency nursing. Emergency nursing is stressful and can lead to compassion fatigue. This study therefore wished to measure the effects of physical exercise on compassion satisfaction in ED nurses, using motivational interviewing as a technique for a positive professional quality of life

Chapter 2 discusses the literature review undertaken for the study.

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CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Chapter 1 described the problem, aims and objectives, theoretical framework and research design and methodology of the study.

The theoretical basis underpinning this study was to ascertain the causal link between the benefits or effect of physical exercise as a contributor to an ED nurse's well-being and which builds resilience to the stressors of emergency nursing practice, to compassion satisfaction, which enhances an ED nurse's professional and vocational quality of life.

This chapter discusses the literature review of the key concepts as linked in the aim and framework of the study and reviews compassion and professional quality of life in the context of nursing care, physical exercise, and motivational interviewing as a technique for the six-week physical exercise intervention.

2.2 RATIONALE FOR A LITERATURE REVIEW

A literature review involves researching, reading and understanding literature relevant to the study (Brink, van der Walt & van Rensburg 2006:55). A literature review is conducted to establish what is currently known about a topic. Through a literature review, a researcher is informed on the available body of knowledge about the topic under investigation thus preventing duplication. According to Polit and Beck (2012:105), a literature review assists researchers to comprehend and extend their knowledge of the phenomenon under study. It should encompass both positive and negative findings of studies on the topic. Randolph (2009:1) states that a literature review should indicate several aspects of the field of study. This includes knowledge and views on a particular topic, it positions a study within a larger body of research, determines what each source contributes to the topic, indicates the

relationships between various contributions, it justifies the choice of research design, and clarifies how the work fills a gap in the scholarly literature.

The following key elements of the current study have enjoyed scholarly review and provides broad context to the topic.

2.3 PROFESSIONAL QUALITY OF LIFE

The main theme of the current study relates to the concept of compassion in ED nurses, its variables and measurement and its relevance in nursing care and well-being of ED nurses.

The Professional Quality of Life (ProQOL) scale is a measure intended to provide practitioners and researchers with an indication of a caring professional's compassion satisfaction, burnout, and secondary traumatic stress. While this measure has been used extensively in nursing research, owing to the relevancy of patient care associated satisfaction and fatigue in this profession, information regarding the construct validity of this measure is less well represented in the literature (Heritage, Rees & Hegney 2018:1).

The ProQOL is the most commonly used measure of the negative and positive effects of helping others who experience suffering and trauma. The ProQOL has been in use since 1995 and has sub-scales for compassion satisfaction, burnout and compassion fatigue and there have been several revisions over the years.

In the ProQOL Manual (Stamm 2010:8) states that compassion satisfaction and compassion fatigue are two aspects of professional quality of life, which encompasses the positive (compassion satisfaction) and the negative (compassion fatigue) parts of helping others who have experienced suffering. Compassion fatigue has two parts, namely burnout and secondary traumatic stress. Burnout manifests as exhaustion, frustration, anger and depression. Secondary traumatic stress on the other hand, is a negative feeling driven by fear and work-related trauma. Stamm (2010:8) states that it is important to note that some trauma at work can be direct (primary) trauma or in other cases, a combination of both primary and secondary trauma. Furthermore, if working with others' suffering changes one so deeply in negative ways that one's understanding of oneself changes, this is vicarious traumatisation (Stamm 2010:8).

Figure 2.1 depicts the diagram of professional quality of life (Stamm 2010:8 Figure 1) and forms the framework for the study as depicted in **Figure 1.1** in Chapter 1.



Figure 2.1 Diagram of professional quality of life (Stamm 2010:8)

The Professional Quality of Life Scale (ProQOL) measures the pleasure one derives from being able to do one's work well, feelings of hopelessness and difficulties in dealing with work or in doing one's job effectively, and work-related, secondary exposure to extremely stressful events. The reliability and validity of the ProQOL measuring tool is more fully described in Chapter 3 at 3.5.2.1.2)

2.4 COMPASSION

Compassion is fundamental to nursing practice and is a requisite competency for a nurse to repeatedly generate 'compassion energy' to foster connectedness and offer nurturance to those who require nursing care (Boyle 2011:1). Compassion is 'nursing's most precious asset' and a fundamental element of nursing care and one of the strengths of the profession (Schantz 2007:48; Davison & Williams 2009:16).

Compassion is a quality deemed *sine qua non* for nursing and the basis of the nursing profession in its 'larger-than-life scope' (Schantz 2007:48). The term 'compassion' (also referred to as 'compassionate care') does not have a clear definition in nursing scholarship, nor is it widely promoted in contemporary nursing practice (Schantz 2007:48). Notwithstanding this, compassionate care is not only expected by patients, but is seen as a professional obligation of clinicians (Sinclair, Norris, McConnell, Chochinov, Hack, Hagen, McClement and Bouchal 2016:6).

Compassionate care involves being close to patients and seeing their situation as more than just a medical scenario and routine procedures. Sinclair, et al (2016:6) state that two elements are involved in professional caring: *instrumental caring*, which includes the required skills and knowledge, and *expressive caring*, involving the emotional compassionate aspects of the relationship, and the latter changes nursing actions into caring. Lack of compassion might explain why some nurses are technically competent, but do not seem outwardly compassionate (Davison & Williams 2009:36).

In their evolutionary analysis and empirical review of compassion, Goetz, Keltner and Simon-Thomas (2010:351-374) found that despite contrasting conclusions on the subject, three evolutionary arguments could be integrated on the hypothesis that compassion evolved as a distinct affective experience whose primary function is to facilitate cooperation and protection of the weak who suffer. Essentially, the three evolutionary arguments are that compassion evolved firstly as part of a care-giving response to vulnerable offspring; secondly, compassionate individuals were preferred in mate selection processes, and thirdly, compassion emerged as a desirable trait in cooperative relations between non-kin. Compassion is, in effect, a response profile or characteristic and a distinct emotion, which shapes moral judgement and action. Goetz, et al (2010:351-374) conclude that compassion arises out of a distinct appraisal process, with recognisable display behaviours and experiences and is a physiological response.

Compassion has been defined as “the humane quality of understanding suffering in others and wanting to do something about it” (Haslam (2015:6). In addition, compassion may be difficult to describe, but from the context of patient experience, it is generally obvious when care is being delivered, either with compassion, and when it is not. In other words, in determining the true nature of compassion it assists to examine it from a patient experience point of view as evidence of what compassionate care is. Compassion involves demonstrating characteristics, such as empathy, sensitivity, kindness and warmth (Haslam 2015:6). When these four characteristics are lacking, it can lead to a conclusion of poor care where such care is ‘task based’ rather than care being a ‘person-centred’ care. Task-based care (similar to instrumental caring referred to above) is frequently impersonal and not what patients like, as they want to be treated with respect, dignity and compassion. Haslam (2015:6) stresses that the characteristics of empathy, sensitivity, kindness and warmth cost nothing and that there is huge potential of blending the best of evidence-based medicine with real patient-centeredness – what he calls “performing medicine” with patients rather than doing it to them. In essence, Haslam is of the view that compassion often spontaneously flows from empathy - the ability to imagine another’s experience.

Sinclair et al (2016:7) found that the related terms of sympathy and empathy are distinct from compassion with each containing distinct themes and sub-themes. The said authors describe sympathy as an unwanted, pity-based response to a distressing situation, characterised by a lack of understanding and self-preservation of the observer. Empathy, on the other hand, is an effective response that acknowledges and attempts to understand an individual’s suffering through emotional resonance. Compassion enhances the key facets of empathy while adding distinct features of being motivated by love, the altruistic role of the responder, action, and small, supererogatory acts of kindness. The distinguishing feature is that compassion incorporates an inner motivation to take effective action and care. For example, an ED nurse putting up a drip will show more compassionate care, with a caring explanation to a distressed patient about what she is doing and communicating in such a way that the patient feels not only her technical competence, but also her caring, warmth and kindness. Importantly, patients reported that unlike sympathy and empathy, compassion was beneficial and the most preferred and impactful. Furthermore, Sinclair, et al (2016:1-16) found that whilst the terms sympathy, empathy and compassion were used interchangeably, patients distinguished the terms and found compassion to be the most important from a patient experience point of view.

Compassionate practices are significantly and negatively associated with nurses’ emotional exhaustion and positively associated with nurses’ psychological vitality. At clinic level, compassion practices are significantly and positively associated with patient perceptions of

caring shown by nurses and overall patient ratings of the outpatient clinic. In addition, nurse well-being mediates the relationship between compassion practices and patient ratings of their care experience (McClelland Gabriel & DePuccio 2018:4).

When one considers the nature of the above and generally accepted elements of compassion, it appears that it is often considered in conjunction with the term of caring. The National Health Service (NHS) of the United Kingdom Constitution states, “The NHS touches our lives at times of most basic human need, when care and compassion are what matter most” (Goodrich 2016:8). found that with the NHS there was a renewed emphasis on the importance of a compassionate relationship between patient and caregiver. Caregivers emphasised the importance of a compassionate relationship with their colleagues, but more strikingly talked about a two-way relationship with patients, and that patients could help their caregivers to learn to be compassionate.

Fotaki (2015: 613) states in her conclusion, that to recognise the importance of compassion, as an inherent aspect of care, requires explicitly incorporating compassion in ethical training as part of health education and its systematic implementation in relevant policies in institutional healthcare settings. This is essential for embedding and cultivating compassionate attitudes in health professionals and compassion should be seen as an aspect of professional nursing ethics (Fotaki 2015:613).

There is further literature which states that compassion originates as an empathic response to suffering, is a rational process which pursues patients' wellbeing through specific ethical actions directed at finding a solution to their suffering (Perez-Bret, Altisent & Rocafort 2016: 599). According to the said authors compassion means the sensitivity shown in order to understand another person's suffering, combined with a willingness to help and to promote their wellbeing, in order to find a solution to their situation. This should be a duty in healthcare professionals' daily work.

Compassion is regarded as a multi-textured response to pain, sorrow and anguish and includes kindness, empathy, generosity and acceptance and within the cloth of compassion, strands of courage, tolerance and equanimity are woven (Feldman & Kuyken 2011:143). Buddhism describes compassion as the capacity to be open to the reality of suffering and to aspire to its healing. Compassion means to help remove harm and suffering from others. Compassion is considered an important human strength requiring a sense of caring, empathy, and sympathy, each of which would enable one to connect with, and care for another (Mongrain, Chin & Shapiro 2011:1). Mongrain, et al (2011:1) found that in the context of mental

health, compassion not only builds positive relationships with others, but more importantly, is a vital path to releasing the human mind from the effects of harmful negative emotions. The effect of compassion, therefore, may assist in defining the term.

Compassion has different elements. Strauss, Taylor, Gu, Kuyken, Baer, Jones and Cavanaugh (2016:1) state that compassion involves five elements: 1) recognising suffering in others; 2) understanding the common humanity of this suffering; 3) feeling emotionally connected with the person who is suffering; 4) tolerating difficult feelings that may arise; and 5) acting or being motivated to act to help the person.

Jazaieri, Jinpa, McGonigal Rosenberg, Finkelstein, Simon-Thomas, Cullen, Doty, Gross, and Goldin (2012: 1113) state that compassion is a multidimensional process comprising four key elements. The first is an awareness of suffering, (cognitive/emphatic awareness) the second is a sympathetic concern related to being emotionally moved by suffering, (affective component) thirdly a wish to see a relief of that suffering (intention), and fourthly a responsiveness or readiness to help relieve that suffering (motivational). Jazaieri, et al (2012:1113) add that compassion involves a 'connection', a 'noticing, feeling and responding' to others and 'caring' for them and the essential elements of compassion are reconcilable with one another.

It is also stated in the literature that there is no single universal definition of compassion that suffices in all situations but compassion involves a focus on the other with a desire to overcome adversity or to have good things happen to the other (Miller 2007: 223).

The key elements of compassion, then, are recognition and cognitive empathetic awareness of distress or suffering, motivating to emotionally connect with a person's suffering, and positive action to alleviate or relieve the suffering by caring. The response of caring triggered by compassion is positive and contributes to the self-esteem and happiness of the person who alleviates the suffering.

2.4.1 Compassion satisfaction

Compassion satisfaction is the professional fulfilment experienced through helping others (Weintraub, et al 2016:1021). Compassion satisfaction occurs when providers feel a sense of connection with the patients and a sense of achievement in their work (Stamm, 2010). In order to feel compassion satisfaction, caring for others and providing support must outweigh the difficulties that nurses feel when doing their job. Establishing and maintaining a high level of

professional quality of life is essential for a nurse to feel compassion satisfaction and foster compassion satisfaction. In addition, providing the framework to prevent compassion fatigue will improve nurse caring and potentially provide a sustained improvement in the nurse-patient relationship. (Larsen 2017:8).

Critical care nurses gain satisfaction from providing compassionate care to patients and patients' families, but these nurses are also at risk for fatigue. The balance between satisfaction and fatigue is considered *professional quality of life*. According to the authors Stamm below the cumulative experience of both compassion fatigue and compassion satisfaction is described as one's professional quality of life (ProQOL). According to Stamm (2010:8), a sustainable ProQOL is achieved by maintaining a healthy balance between the positive and negative aspects of caring. Compassion satisfaction is the sum of all the positive feelings a person derives from helping others (Sacco, Ciurzinsky, Harvey & Ingersoll 2015:32).

Cocker and Joss (2016:E622) state that compassion satisfaction increases the significance of building resiliency and the transformation from negative to positive aspects. Resilience has a significant negative correlation with compassion fatigue and burnout as well as a significant positive correlation with compassion satisfaction. In their mediation analysis, Burnett and Wahl (2015:1) found that resilience moderately mediated the relationship between compassion fatigue and burnout. According to Burnett and Wahl (2015:324), this suggests that resilience plays an important role in mediating the effects between compassion fatigue and burnout. Resilience refers to the ability to adapt to change or manage adverse life experiences. Burnett and Wahl (2015:319) found that resilience consists of multiple factors, including hardiness, self-enhancement, repressive coping, positive emotion and laughter. Southwick and Charney (2012:80) found ten effective resilience coping mechanisms to manage stress and trauma, namely realistic optimism, facing fear, moral compass, religion and spirituality, social support, resilient role models, *physical fitness*, brain fitness, cognitive and emotional flexibility, and meaning and purpose. [own emphasis].

2.4.2 Compassion fatigue

Compassion fatigue is a combination of physical, emotional and spiritual depletion, associated with caring for patients in significant pain and physical distress (Lombardo & Eyre 2011:3). Nurses enter the field of nursing with the intent to help others and provide empathetic care for patients with critical physical, mental, emotional, and spiritual needs. Empathic and caring nurses can become victims of the continuing stress of meeting the often overwhelming needs of patients and their families, however, resulting in compassion fatigue. Compassion fatigue

affects not only the nurse in terms of job satisfaction and emotional and physical health, but also the workplace environment by decreasing productivity and increasing turnover (Lombardo & Eyre 2011:3). Joinson (1992:273) identified compassion fatigue as a unique form of burnout that affects individuals in care-giving roles.

Compassion fatigue as stress resulting from exposure to a traumatized individual refers to the convergence of secondary traumatic stress and cumulative burnout and is a state of physical and mental exhaustion caused by a depleted ability to cope with one's everyday environment (Cocker & Joss 2016:E621). Compassion and empathy shown by healthcare, emergency and community service professionals can prove psychologically, mentally and economically costly. In essence, exposure to patients or clients experiencing trauma or distress can negatively impact professional's mental and physical health, safety and wellbeing, as well as that of their families, the people they care for, and their employing organizations (Cocker & Joss 2016:E622).

Compassion fatigue is characterized by exhaustion, anger and irritability, negative coping behaviours, including alcohol and drug abuse, reduced ability to feel sympathy and empathy, a diminished sense of enjoyment or satisfaction with work, increased absenteeism, and an impaired ability to make decisions and care for patients and/or clients (Cocker & Joss 2016:622). The negative effects of providing care is aggravated by the severity of the trauma to which one is exposed, such as direct contact with victims, particularly when the exposure is of a graphic nature. This places certain occupations, such as healthcare, emergency and community service workers, at increased risk of developing compassion fatigue and potentially more debilitating conditions, such as depression and anxiety and even post-traumatic stress disorder. These conditions increase sickness absence, psychological injury claims, and job turnover, and negatively impact productivity if the symptoms are not mediated by compassion satisfaction. Compassion fatigue and its opposite, compassion satisfaction, can respectively be seen as the positive and negative consequences of working with individuals who have experienced or are experiencing trauma or suffering (Cocker & Joss 2016:622).

Joinson (1992:273) defines compassion fatigue as "the loss of the nurse's ability to nurture due to repeatedly caring for patients in life-altering or life-threatening situations". Compassion fatigue consists of burnout and secondary traumatic stress (Stamm 2010:10; Pitman 2016:3). Burnout is associated with feelings of hopelessness and difficulties in dealing with work or in doing one's job effectively. Secondary traumatic stress is caused by work-related, secondary exposure to people who have experienced extremely or traumatically stressful events. Pitman (2016:3) states that to understand compassion satisfaction, one must recognise the third

element of the professional quality of life (ProQOL) scale, namely *compassion satisfaction* which is known as “the pleasure one derives from being able to do one’s work well”.

Compassion fatigue within the profession of nursing is of growing concern due to its negative impact on nurses' mental and physical health, productivity, and patient care (Bouchard 2016:11). There is scant qualitative research on compassion fatigue in nursing, but available quantitative data indicates that emergency nurses could especially be at risk for developing compassion fatigue (Bouchard 2016:24). Although compassion fatigue is mainly composed of burnout and secondary traumatic stress, this definition might not adequately fit emergency nurses nor the emergency department setting (Bouchard 2016:15) and that found that organisational (time pressure and lack of resources and leadership support) and patient (clinical uncertainty, reason for seeing care, and witnessing grief) factors contributed to the development of compassion fatigue. (Bouchard 2016: 14). The main symptoms of compassion fatigue were exhaustion, impaired communication, decreased emotional tolerance, coping with dark humour, and detachment/disassociation. These symptoms affected emergency nurses both at work and at home. Bouchard (2016:57-59) recommends self-care activities, debriefing with clinical staff, continuing education, and increasing awareness about compassion fatigue in the work setting, as interventions to address the issue.

In 1992, Joinson (1992:273) coined the term “compassion fatigue” when she found that nurses dealing with trauma lost their “ability to nurture”. In 1995, Figley redefined compassion fatigue as secondary traumatic stress disorder, which seemed a contrast to Joinson's original idea of compassion fatigue (Harris & Griffin 2015:80). Harris and Griffin (2015:80) maintain that Joinson's and Figley's definitions do not capture the comprehensive meaning of the term.

According to the said authors to fully and accurately conceptualise compassion fatigue, one must deconstruct the whole into its parts: **compassion** and **fatigue**, and then develop a definition, which contextualizes the two parts as follows. Compassion is, according to the authors, more than just sympathy or pity and involves wanting to do something to change the state of another. Fatigue, in the nursing context, is a multidimensional, subjective phenomenon lacking specificity that is resultant from prolonged physical and mental activity and is often used synonymously with tiredness or weariness (Harris & Griffin 2015:81-82,). The latter authors define compassion fatigue as the physical, emotional, and spiritual result of chronic self-sacrifice and/or prolonged exposure to difficult situations that renders a person unable to love, nurture, care for, or empathize with another's suffering. The distinction between compassion fatigue and burnout, the authors point out, are two terms, which are, loosely related but the distinctive significant variable is compassion. Nurses must possess compassion to experience the fatigue (or loss) of it. Moreover, nurses suffering from burnout

because of increased workplace demands and work pressure, such as lack of resources, interpersonal stressors, and organizational policy, which lead to diminished caring, cynicism, and ineffectiveness, do not have the prerequisite of compassion (Harris & Griffin 2015:82).

Compassion fatigue has been described as a form of burnout, and as a cumulative state of frustration with a person's work environment that develops over a long time. Burnout was retained as a component of compassion fatigue, with secondary traumatic stress being a feeling of despair caused by the transfer of emotional distress from a victim. Although the elements of compassion fatigue are related, Sacco et al (2015:32) state that secondary traumatic stress is an effect of experiences with specific types of patients, whereas burnout is an effect of environmental stressors and is not unique to health care providers. Sacco et al (2015:32) add that according to the ProQOL model, a caregiver's level of burnout and secondary traumatic stress contribute to compassion fatigue, therefore it would be ideal for a balance between compassion fatigue and compassion satisfaction to be achieved in the workplace and beyond, which emphasizes the importance of a positive work-life balance.

Compassion fatigue is common in healthcare and compassion fatigue is a relational phenomenon for nurses stemming from therapeutic connectedness with patients and families in need. Fatigue, stress, sadness, and the associated decrease in morale and work performance, are all influenced by psychosocial factors that have traditionally been ignored in nursing. These conditions not only impact on retention of staff, but also influence patient satisfaction and patient safety (Boyle 2011:3). Boyle also found that there is little research describing interventions to prevent or minimize the consequences of repeated exposure to traumatic events in the clinical workplace. Boyle (2011:6) states that on-site workplace interventions that address the emotional strain on nurses can be very effective in reducing compassion fatigue and suggests interventions such as counselling, support groups, debriefing, art therapy, massage sessions, and spiritual support.

2.5 PHYSICAL EXERCISE

The terms 'physical exercise', 'physical activity', and 'physical fitness' are often confused with each other, and sometimes used interchangeably (Caspersen, Powell & Christenson 1985:126). Caspersen, et al (1985:126) define the three terms as follows:

- **Physical exercise:** a subset of physical activity that is planned, structured, and repetitive and has as a final or an intermediate objective the improvement or maintenance of physical fitness;

- **Physical activity:** any bodily movement produced by skeletal muscles that results in energy expenditure, where the energy expenditure can be measured in kilocalories and physical activity in daily life can be categorised into occupational, sports, conditioning, household, or other activities;
- **Physical fitness:** a set of attributes that are either health- or skill-related. The degree to which people have these attributes can be measured with specific tests.

Gummelt (2015:1) states that physical exercise is planned, structured, repetitive and intentional movement intended to improve or maintain physical fitness and exercise is a subcategory of physical activity. Gummelt (2015:1) adds that all physical activity positively contributes to overall health and well-being. In addition, physical exercise assists with the improvement of physical fitness, which consists of five specific components: cardio-respiratory fitness, muscular strength fitness, muscular endurance fitness, flexibility fitness, and body composition (Gummelt 2015:1).

Kemmet (2015:1) defines physical activity as any bodily movement such as walking to and from work, taking the stairs instead of elevators and escalators, gardening, shovelling snow and doing household chores. Physical exercise can be accomplished through activities such as cycling, dancing, walking, swimming, yoga, working out at a gym, or running. Regular exercise, depending on the kind, improves aerobic fitness, muscular strength, and flexibility (Kemmet 2015:1).

Physical fitness has five major components, namely cardiovascular fitness, muscular strength, muscular endurance, flexibility and body composition, and can be measured by seven measures (Poplin, Roe, Burgess, Peate & Harris 2015:252). These measures include aerobic capacity/resting heart rate for cardiovascular fitness; handgrip strength for muscular strength; push up and sit up repetitions for muscular endurance; sit and reach distance for flexibility, and percent body fat for body composition.

According to Percia, Davis and Dreyer (2016:1), physical fitness is generally determined by five different components: cardiovascular or cardiorespiratory fitness, muscular strength, muscular endurance, flexibility, and body composition as follows:

- *Cardiorespiratory fitness:* reflects the functional capabilities of the heart, lungs and muscles relative to the demands of a specific exercise. True measures of cardiorespiratory fitness require maximal exertion with collection of expired gases, but there are more simple tests with sub-maximal tests on treadmills or cycling to predict

aerobic capacity by taking exercise and recovery heart rates, which include aerobic endurance, aerobic strength and aerobic power. Cardiorespiratory fitness is also referred to as the ability of the body to take in oxygen (respiration), deliver it to the cells (circulation), and use it all at cellular level to create energy (bioenergetics) for physical work (activity) and as aerobic capacity. Long-term adaptations of cardiorespiratory training are decreased resting heart rate, decreased risk of cardiovascular disease, improved endurance, increased stroke volume and cardiac output (Percia, Davis & Dreyer 2016:1).

- *Muscular strength*: refers to the spectrum of muscular capability, which is the ability to generate an amount of force that a muscle can exert in a singular contraction, and muscular power, which refers to the ability to generate strength in an explosive way;
- *Muscular endurance*: is the ability of a muscle or group of muscles to sustain repeated contractions against a resistance for an extended period of time. It is one of the components of muscular fitness, along with muscular strength and power and assessed by some repetition maximum on a variety of different exercises that involve major muscle groups often against a time scale.
- *Flexibility*: refers to the degree to which a joint moves through a normal pain – free range and varies from joint to joint with tissue elasticity deteriorating with age affecting activity performance. There is no single test for overall flexibility but the ‘sit and reach’ test has been used for the assessment of flexibility of the hamstrings hips and lower back;
- *Body composition*: is the relative proportion of fat and fat-free tissue in the body, also known generally as body mass index (BMI).

Percia, Davis and Dreyer (2016:1) describe the secondary components of fitness, also termed components of *performance-based fitness*, which all relate to physical activity and are necessary for a person’s daily function, as follows:

- *Balance*: the ability to maintain a specific, stationary or moving, body position,
- *Co-ordination*: the ability to use all body parts together to produce smooth or fluid motion,
- *Agility*: the ability to change direction quickly,
- *Reaction time*: the time needed to respond to a specific stimulus,
- *Speed*: the ability to move quickly, also known as rate of motion or velocity,
- *Power*: the product of strength and speed, also known as explosive strength,
- *Mental capability*: the ability to concentrate during exercise to improve training effects, and includes the ability to relax and enjoy the psychological benefits of activity.

Elder (1999:2) states that physical fitness has two categories, namely performance-related fitness, and health-related fitness. Elder (1999:4) found that performance-related fitness referred to the ability of an individual to perform in a test or sports competition, as opposed to health-related fitness, which refers to the components of fitness that are affected by habitual physical activity and relate directly to one's health status. Physical fitness includes body composition, aerobic capacity, muscular strength and endurance, flexibility and balance and is the category used in this study.

Physical fitness is, therefore, a complex term with several components and in the context of individuals has both subjective and objective elements when it comes to the measurement thereof. Measurement of physical fitness determines, what is generally regarded as acceptable levels for good health against a background that higher levels of physical activity are strong indicators for wellness.

2.6 EMERGENCY NURSING

This section discusses emergency nursing with reference to emergency nursing and compassion; compassion, and physical exercise and compassion.

2.6.1 Emergency nursing and compassion

Emergency nursing differs from other nursing specialties because the environment in which emergency nurses work is hectic, unpredictable, constantly changing and often presents with violent, abusive and aggressive patients (Adriaenssens, de Gucht & Maes 2015:649; Hamilton, Tran & Jamieson 2016:101). The physical demands and stressful environment puts nurses working in the ED at a high risk of developing compassion fatigue (Burnett & Wahl 2015:2; Braunschneider 2013:14 ; Hamilton et al 2016:101).

Nurses, and nurses working in the ED in particular, care for the ill, wounded, traumatised and vulnerable patients and are exposed to patients' considerable pain, trauma and suffering on a routine basis (Boyle 2011:1). The life of an ED nurse is fast-paced, physically and mentally demanding and attracts stress and anxiety (Pratt 2011:1).

Compassion and compassionate care must be contextualized with the physical demands, the stressful environment and long hours of ED nursing practice. The nature of an ED department consequently requires ED nurses to be physically fit in order to cope with the physical demands in the ED team to ensure quality care and positive patient outcomes (Davies 2016:1).

Moreover, the nature of an ED environment is such that teamwork is critical to deal with the broad spectrum and often multiple number of patients presenting with trauma injuries and illnesses. In emergency department nursing, ED nurses are often dependent on support from one another and fatigue and stress among ED nurses are a hindrance to effective teamwork in the ED setting and inter-professional and interdependent teamwork with defined roles is essential (Khademian, Sharif, Tabei, Bolandparvaz, Abbaszade, & Abbas 2013:333).

Working twelve hour shifts is physically demanding on ED nurses (Davies 2016:1) and if burnout and fatigue are to be avoided ED nurses need to be physically fit and strong to build resilience to cope with the physical demands of such a pressured environment (Terpeluk, Rogen & Gilliam 2016:424). Consequently, there is a risk that the stress (emotional and physical) of trauma-related experiences of ED nurses could negatively impact on their general wellness, leading to stress, fatigue, low morale, and burnout with possible negative outcomes on nursing quality and patient experience (Chesak, Bhagra, Schroeder, Foy, Cutshall & Sood 2015:38). A further negative consequence of emotional and physical stress is staff attrition resulting in a loss of experienced and skilled ED nurses.

Nurses working in the ED normally experience some level of stress because of high acuity patients and high patient volume, while repeated exposure puts them at risk for developing compassion fatigue (Schmidt & Haglund 2017:317). The overall impact, in the context of professional human resource management of ED nurses and their retention, is considerable. Phiri, Draper, Lambert and Kolbe-Alexander (2014:22-25) advocate worksite health promotion programmes to enhance productivity, employee loyalty and reduce health risks and costs. The clinical role of nurses and the nature of emergency department therefore need to be considered in the context of compassion and require further research.

2.6.2 Physical exercise and compassion

There are several benefits to employers promoting employee fitness interventions in the workplace. These benefits include personal health benefits such as improved body mass index, gripping strength, flexibility, abdominal and back muscle durability and cardiopulmonary durability (Yuan, Chou, Hwu, Chang Hsu & Kuo 2009:19); less absenteeism from work (Sjogaard et al 2016:159); better performance (Terpeluk et al 2014:424), and fostering teamwork in the workplace. Consequently, these benefits would contribute to greater job satisfaction, less stress and related fatigue among ED nurses thereby enhancing job satisfaction and building ED nursing experience by staff retention. Braunschneider (2013:16)

maintains that positive quality nursing care can only be delivered, if nurses have a high level of well-being.

In a study among nurses in Greenville, North Carolina, Bhabhi, Das, Clemmons, Kemble et al (2017:232) found several health benefits associated with physical activity. Bhabhi et al (2017:232) suggest a physical activity intervention among nurses to fully see the effects of physical activity on physical, mental, and occupational health, and ultimately patient health and safety. Nolte, Downing, Temane and Hastings-Tolsma (2017: 4364-4378) found that self-care strategies such as exercise were a way of coping with the negative effects of compassion fatigue. Neville and Cole (2013:1) found that engagement in health promotional behaviours contributed to nurses' well-being in counteracting compassion fatigue and burnout and enhancing compassion satisfaction. In order to avoid compassion fatigue, nurses must develop strategies to prevent the development, or progression, of compassion fatigue and learn to maintain resilience. Self-directed activities, including physical exercise, could help to decrease compassion fatigue levels experienced by individuals (Nolte, Downing, Temane et al 2017:4378).

West, Wantz, Shalongo, Campbell, Berger, Cole, Seroskie and Cellitti (2017:1) used the Professional Quality of Life Scale and the Connor-Davidson Resilience Scale validated survey tools, to measure compassion and resilience before and after the implementation of a staff developed activity plan. West, Wantz, Shalongo et al (2017:5) found that compassion satisfaction and resilience could improve, and burnout and trauma could decrease, when nurses worked on creating the change. The change had to come from within and nurses had to identify the actions that worked for them as individuals. In addition, the activity plans had to be seriously created and worked on daily. Nurses' degree of commitment and readiness to change was important for such a project to be effective. The overall goal was to provide staff with resources that would help to reduce levels of stress, create a better work-life balance, promote resilience and decrease levels of compassion fatigue.

2.7 MOTIVATIONAL INTERVIEWING

The researcher selected motivational interviewing as the most appropriate technique to encourage the sample of ED nurses to participate in the physical exercise intervention. As is pointed out below in 2.7.1 below motivational interviewing as wide recognition as a motivational technique in similar environments and has been proven to be effective as encouraging participants to have "buy-in" based on being able to evaluate choices as opposed

to a more prescriptive type of motivation. As a form of counselling interventions motivational interviewing facilitates lifestyle behavioural changes through the promotion of a positive autonomous and personal motive for change.

The American Congress of Obstetrics and Gynaecologists (ACOG) (2009:1) defines motivational interviewing as a directive, client-centred counselling style for eliciting behaviour change by helping clients explore and resolve ambivalence. In dealing with women's health and patient interactions, the ACOG found motivational interviewing effective in eliciting behaviour change that contributed to better health outcomes and motivational interviewing a catalyst to change. Sensitivity and empathy are key elements of motivational interviewing, which is a collaborative, conversational style of approach for strengthening a person's own motivation and commitment to change (Firth 2016:1).

According to Marsh (2004:1), the consultation style of motivational interviewing should be one of "dancing" rather than "wrestling" with a patient in the context of a doctor-patient relationship. The critical element of a motivational interviewing-based study or approach is to first set the agenda and select the right time to discuss behaviour change and clearly set out the topics that need to be addressed (Marsh 2004:2). It is then necessary to ascertain readiness to change in the context of two key dimensions: importance and confidence as techniques to motivate the subject matter to contemplate and understand the consequences of not changing (Marsh 2004:3). Motivational interviewing focuses on exploring and resolving ambivalence, and centres on motivational processes within a person to facilitate change and differs from a coercive or externally driven method to motivate for change being collaborative as opposed to confrontational.

Miller and Rollnick (2002:1) list four distinct principles that guide motivational interviewing:

- Express *empathy*. The interviewer must see the world through the client's (ED nurse) eyes and share the client's experiences.
- Motivational interviewing is *strengths-based* with the belief that clients have within themselves the capabilities to change successfully and the support must be for *self-efficacy* with a focus on previous successes and highlighting skills and strengths which the client (ED nurse) already has.
- *Rolling with resistance*. The context is where the client experiences a conflict or ambivalence to change and resistance must not be directly challenged. Allow the client to develop own solutions which makes resistance to change less.

- *Developing discrepancy.* The interviewer motivates for change when, for example, the client (ED nurse) perceives a mismatch between *where they are and where they want to be*. In other words, develop this to assist the client (ED nurse) to examine the discrepancies between their current situation/behaviour and their values and future goals. Once the client (ED nurse) recognises that current behaviours can be changed for the better, there is a greater possibility to achieve goals she has recognised for important life changes.

Hall, Gibbie and Lubman (2012:660) state that motivational interviewing is a counselling method that involves enhancing a patient's motivation to change by means of four guiding principles, represented by the acronym RULE: Resist the righting reflex; Understand the patient's own motivations; Listen with empathy, and Empower the patient. According to Hall, Gibbie and Lubman (2012:660), motivational interviewing is effective for decreasing alcohol and drug use in adults and adolescents and other areas of health including smoking cessation, reducing sexual risk behaviours, improving adherence to treatment and medication, and diabetes management.

2.7.1 Motivational interviewing and physical exercise

Motivational interviewing has been used to promote or motivate physical exercise and physical fitness. Gourlan Sarrazin and Troulloud (2013:1265-1286) found motivational interviewing an efficient counselling method as an addition to a weight loss programme to promote physical activity in the context of paediatric obesity.

Lambie (2016:e49) found that physical inactivity is a key future health challenge and lack of exercise is a modifiable risk factor contributing to global mortality and morbidity rates. In addition, motivational interviewing is effective in helping various lifestyle changes including exercise, but the exact mechanism is unclear and therefore its expansion into mainstream healthcare settings has been limited. Lambie (2016:e50) states that identifying the crucial 'active ingredients' of motivational interviewing requires the exploration of the human experience.

Brodie and Inoue (2005:518) state that motivational interviewing, which incorporates established behaviour change principles and a flexible approach to promotion of activity, increases reported physical activity in older patients with heart failure over a short period. In terms of level and type of activity, Brodie and Inoue (2005:527) found that this approach gave

a better outcome than standard care, and nurses should explore alternative strategies to promote health in this population.

In a study using motivational interviewing to increase physical activity in underserved women, Falahee, Benkert, George, Hartlieb and Cederna (2016:1) found that regular physical activity, reduced the risk of chronic illness among low-income women. Twelve low-income women participated in three motivational interviewing sessions oriented toward increasing physical activity and 43% of the women engaged in physical activity for 8 weeks. The women also demonstrated increased confidence in engaging in physical activity and a downward trend in pulse rate. Motivational interviewing offered an effective communication pattern for patients and providers interested in working together toward successful chronic disease management (Falahee et al 2016:1).

In a study using motivational interviewing to promote physical activity in breast cancer survivors, Patel (2013:1) found that behaviour change interventions may be flexibly delivered in a variety of formats and styles. This study suggests that positive change in physical activity is feasible with the implementation of relatively brief interventions, requiring a modest investment of resources and such an intervention to promote physical activity may assist to meet the needs of both patients and healthcare delivery environments (Patel 2013:78).

Gourlan, et al (2013:1) found motivational interviewing an efficient counselling method as an addition to a standard weight loss programme to promote physical activity among obese adolescents.

Physical inactivity is a key health challenge and lack of exercise is a modifiable risk factor contributing to global mortality and morbidity rates (Lambie 2016:49). Lambie (2016:50) states that motivational interviewing is effective in helping various lifestyle changes including exercise.

In a study to document the longer-term effects of adapted motivational interviewing, delivered in the primary care setting, on BMI, physical activity and related cardiovascular disease risk factors, Hardcastle, Taylor, Bailey et al (2013:1) found that a motivational interviewing intervention led to significant improvements in walking and reduced cholesterol, which were maintained. The addition of motivational interviewing-based sessions following an 8-week exercise programme improved the maintenance of physical activity in people with type-2 diabetes (Armstrong, Campbell, Lewin, Khandwala, Culos-Reed & Sigal 2013:3).

2.7.2 Motivational interviewing and change

Hardcastle, Taylor et al (2014:1) state that despite the compelling evidence of the health benefits of being physically active, few people are sufficiently active to benefit their health and there is a need to focus on effective interventions to increase motivation for continued physical activity participation. The said authors found that counselling interventions, such as motivational interviewing, facilitated lifestyle behavioural changes through the promotion of autonomous motives for change. They conclude that motivational interviewing interventions were likely to promote long-lasting, sustained behaviour change as the central emphasis is on eliciting personal motives for change, working through ambivalence, building confidence and promoting more autonomous forms of motivation. (Hardcastle, Taylor et al 2014).

Hall, Gibbie and Lubman (2012:667) state that motivational interviewing is an effective counselling method that enhances motivation through the resolution of ambivalence. Prochaska, Norcross and DiClemente (2013) and Miller and Rollnick (2002, 2013) outline three critical components of motivation:

- the importance of change for the patient (willingness)
- the confidence to change (ability)
- whether change is an immediate priority (readiness).

Using motivational interviewing techniques, the practitioner can tailor motivational strategies to the individual's stage of change according to Prochaska, Norcross and DiClemente's model (see Table 2.1 below).

Table 2.1 Practitioner tasks in the stages of change model

Patient stage	Practitioner tasks
Precontemplation (Not ready)	Raise doubt and increase the patient's perception of the risks and problems with their current behaviour. Provide harm reduction strategies.
Contemplation (Getting ready)	Weigh up the pros and cons of change with the patient and work on helping them tip the balance by: • exploring ambivalence and alternatives • identifying reasons for change/risks of not changing • increasing the patient's confidence in their ability to change

Patient stage	Practitioner tasks
Preparation Action (Ready)	Clear goal setting – help the patient to develop a realistic plan for making a change and to take steps toward change
Maintenance (Sticking to it)	Help the patient to identify and use strategies to prevent relapse.
Relapse (Learning)	Help the patient renew the processes of contemplation and action without becoming stuck or demoralised.

Source: Prochaska, Norcross & DiClemente (2013)

2.7.3 Motivational interviewing and nursing

Motivational interviewing is effective in improving client lifestyle and health outcomes and can therefore be part of a nurse's ability to enhance patient outcomes (Scott 2010:21; Wu & Lin 2014:1). The four guiding principles in conducting motivational interviews, namely expressing empathy, developing discrepancies, backing off when encountering resistance, and supporting self-efficacy, and the five basic therapeutic skills often used in interviewing, namely reflective listening, asking open questions, affirming, weighing the pros and cons, and summarizing, can all assist nurses to better understand the spirit of motivational interviewing and facilitate their further application in clinical practice. This can promote client self-awareness and instil a motivation to change health behaviours (Wu and Lin 2009:1).

Nurses could play a major role in improving health outcomes by incorporating motivational interviewing skills into therapeutic conversations, potentially addressing some of the productivity challenges of modern healthcare systems (Scott 2010: 22).

2.8 SUMMARY

This chapter discussed the literature review conducted for the study. The literature review covered compassion in nursing care, the professional quality of life (ProQOL) scale, compassion satisfaction, compassion fatigue, physical fitness, physical exercise, emergency nursing, and motivational interviewing. The literature confirmed that compassion is core to quality nursing care, nurses' well-being and patient outcomes. In addition the literature emphasized the need for appropriate interventions to enhance ED nurses' well-being and quality of life and the need to build resilience to ED stressors as positive compassion

satisfaction leads to higher job satisfaction, better patient outcomes and enhanced and more efficient inter-dependencies in ED teams. The review validates the relevance of the research problem and its key issues as there is ample evidence of the topic and need for further research to benefit nursing professionalism.

Chapter 3 discusses the research design and methodology used in the study.

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CHAPTER 3

RESEARCH DESIGN AND METHODS

3.1 INTRODUCTION

In Chapter 2, a literature review was offered on the essential elements and meaning of the term compassion in nursing care, patient outcomes, and factors which adversely affect the ability of nurses to maintain compassionate care in ED's. In particular, the review covered research regarding interventions, using motivational interviewing, which could be effective in avoiding the negative consequences of compassion fatigue, such as promoting physical exercise and self-care, so as to build resilience to the stressors of nurses working in the ED.

Chapter 3 describes the details the research design and consequent research methods included to address the research aim and objectives. The research methods are discussed in terms of the research sample of ED nurses, the physical exercise intervention and measurement (pre-test and post-test of compassion levels and physical fitness), data collection and the data analyses. The discussion included aspects of validity and reliability in order to emphasise the rigour of the study.

The sequence of the research design in the context of the research aim is based on firstly the need to measure the ED nurses compassion levels and then their physical fitness levels before and after the intervention based on the aim to ascertain whether a physical exercise intervention will have an effect on compassion satisfaction levels.

3.2 RESEARCH DESIGN

Research designs, as with this study, determine the overall strategy which integrates the different components of the study in a coherent and logical way to ensure that the research problem is effectively addressed, and in essence, constitutes the blueprint for the collection, measurement, and analysis of the data (De Vaus 2006:1).

A one-group pre-test post-test design was carried out (Bell 2012:2) as depicted in the diagram below. (Figure 3.1).

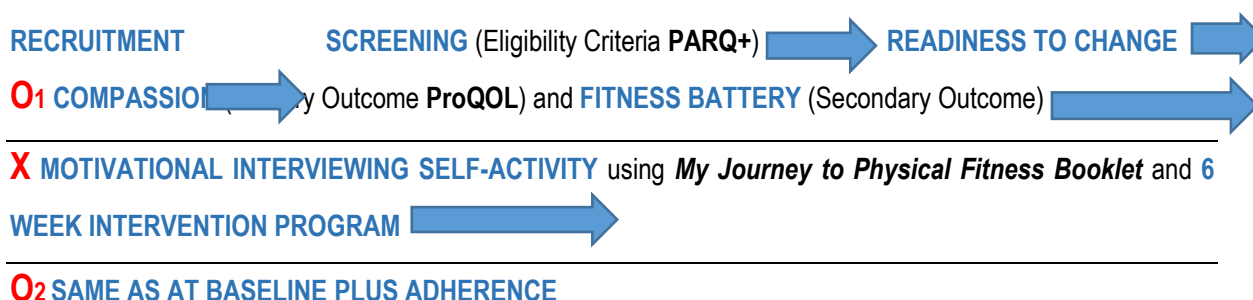


Diagram 3.1 Flow Diagram of the Design

A one-group pre-test post-test design is a type of research design that is most often utilised by behavioural researchers to determine the effect of a treatment or intervention on a given sample. This research design is characterised by two features. The first feature is the use of a single group of participants. This feature denotes that all participants are part of a single condition—meaning all participants are given the same treatment and assessments. The second feature is a linear ordering that requires the assessment of dependent variables before and after a treatment has been implemented (Sage 2017:1). The nature of this study therefore, has the attributes of a quantitative design.

Justification for the design

The design enabled the obtaining of pre-test measures of ED nurses' level of compassion and health-related physical fitness. Their readiness for change was also measured prior to the intervention followed by a six-week personalised self-directed physical exercise intervention, where group members supported each other using WhatsApp (Cellular phone application) discussion groups applying motivational interviewing principles. After the exposure the same base-line measurements were repeated. Adherence to the exercise intervention was quantified by the number of days that participants exercised per week. The research sought to analyse data to determine a possible causal relevance between levels of compassion and physical exercise and whether a higher level of physical fitness contributed to compassion satisfaction among ED nurses.

A limitation of this design is that it lacks a comparison or control group and this type of design has been criticised as there are some threats to its internal validity. (Sage 2017:1) Knapp

(2016:1) Knapp states that some of the threats to the validity of this design were firstly, *history* as there could be some other event occurring whilst the participants were being exposed to X (the physical exercise intervention in this study's design) which could cause the change in O, secondly, *maturation* if there is a long time between the pre-test and the post-test some external factor could effect for example, health either positively or negatively, thirdly, *testing*, if the post-test is cognitive and the same test as the pre-test the questions may be familiar and therefore easier which could improve scoring, fourthly, *instrumentation* is a threat to scoring and rating of the pre-test and post-test measurements if evaluated by different persons or by a mechanical or electrical instruments reduction in precision, from pre-test to post-test. The question arises whether the validity of the design used in this research was threatened by what the factors which Knapp highlights above.

The nature of this research was such that the factors which Knapp has identified are not wholly applicable to it as there is no comparison or control group of ED nurses and this is a unique and novel study. The factors of *history* and *maturation* were diluted due to the short six week intervention. Further risks were not applicable as no cognitive testing was done and the *instrumentation* risks were managed by using outcome measures with good test-retest reliability. See for example in Chapter 4 where a metronome was used for the muscle endurance test and calibrated apparatus for the anthropometric measurements. Statistical regression is not applicable here as ED nurses of varying backgrounds, ages and experience were included in the sample. Generalisation is not an external risk to the design, as the research focused on a particular group with common selection criteria as ED nurses.

This study's design was therefore, based on an intervention, as opposed to an observational design. Thiese (2014:1) states that observational study designs are often retrospective and are used to assess potential causation in exposure-outcome relationships and therefore influence preventive methods. Interventional studies, on the other hand, are often prospective and are specifically tailored to evaluate direct impacts of treatment or preventive measures on disease. In the current prospective study the intervention was based on the impact which a six-week physical exercise programme has on the compassion of ED nurses.

3.3 POPULATION

A population is defined as all the individuals that comply with the inclusion criteria set and outlined by the researcher (Brink, van der Walt and van Rensburg 2006:23; Burns & Grove 2009:42; Polit & Beck 2010: 306-307). These authors point out that it is uncommon for a researcher to have access to the entire population, therefore, a distinction is made between a

target population and a study population (or accessible population). A target population refers to the entire group of people that are of interest to the researcher, whereas a study population is the actual group of people that the researcher can approach (Brink 2006: 123; Polit & Beck 2010: 307).

The target population in this study consisted of nurses working in ED's in Pretoria hospitals in South Africa, which included 6 public and 12 private hospitals, with approximately 631 ED nurses (view Table 3.1 below).

Table 3.1 Summary of target population

Hospitals	Emergency Department	Number of nurses
Public	1	53
	2	38
	3	63
	4	67
	5	65
	6	68
Private	1	46
	2	23
	3	21
	4	17
	5	18
	6	27
	7	28
	8	23
	9	36
	10	38
Total	16	631

3.4 SAMPLING

Brink *et al* (2006:123), Burns and Grove (2009:42), and Polit and Beck (2010:306-307) agree that a sample is a smaller component of the population (see Figure 3.2) and sampling represents the process of selecting a sample.

A key requirement for both the positivist paradigm and quantitative research is that the findings should be generalised to the population; therefore the sample has to represent the population

(Polit & Beck 2010: 307). Sampling, the authors' state, has to be conducted in such a manner to ensure that most of the population's characteristics are present in the sample.

3.4.1 Sampling strategy

In research, it would be ideal to test the entire population, but in most cases, the population is too large and it would be impossible to include every individual. There are a considerable number of sampling strategies, which can be used in research designs and which often contain a combination of several such strategies. Broadly speaking, there are two groups of sampling techniques: probability sampling techniques and non-probability sampling techniques. (Maheshwari 2017:1)

In this study sampling was done in two steps. Firstly, the researcher selected specific large public and private hospitals in the Tshwane metropolitan area. Convenience sampling was used to select the hospitals. Most researchers rely on convenience sampling which is the most common of all sampling techniques. This sampling technique is fast, inexpensive, easy and when the participants are readily available. (Maheshwari 2017:1).

In step two, all the ED nurses in these hospitals were invited via their unit managers to participate in the study. Total population sampling was applied to all the nurses in the target population who were qualified ED nurses and each had an equal chance of being selected as a participant in the research study. Total population sampling was applied (Etikan, Musa, and Alkassim 2015:1) as all the ED nurses in their units were invited to participate via unit managers in the different State and private hospitals by the researcher and each ED nurse had an equal chance of being selected as a participant in the research study.

As only volunteers who responded to the invitation formed the final sample, the sample strategy therefore, shared characteristics of convenience sampling where participants are invited based on their willingness to participate in the study. Most researchers rely on convenience sampling which is the most common of all sampling techniques. This sampling technique is fast, inexpensive, easy and when the subjects are readily available. (Maheshwari 2017:1).

In order to improve the response rate, the researcher also applied non-probability sampling techniques, more often used in qualitative research, by directly inviting nurses known to her

as part of purposive sampling (Etikan, Musa, and Alkassim 2016:1). They in turn, as part of snowball sampling, spread information on the research topic by “word of mouth”.

3.4.2 Eligibility criteria

The target sample of ED nurses were required to meet the following inclusion criteria:

- Work a minimum of 40 hours per week in an ED;
- Willing to take part in the study for a six-week period;
- Could safely participate in exercises as determined by the per current evidence-based consensus panel approved official version of the Physical Activity Readiness Questionnaire for Everyone (2017 ParQ+); (see Annexure F)
- Have medical aid cover in the unlikely event of injury related to the fitness test and/or six-week intervention.

The researcher tested the eligibility criteria with direct questions to those ED nurses who had indicated their willingness to participate in the research and upon completing the ParQ+ Physical Readiness Questionnaire.

3.4.3 Sample size

It is important to select a representative sample in quantitative research in order to be able to generalise the results to the target population and the sample should be of the required sample size and must be selected using an appropriate probability sampling technique as there are many hidden biases which could have an adverse effect on the research outcome. (Omair 2014:1). For this study total population sampling method was applied.

Due to the nature of the study and anticipated participation rate, the aim was to obtain a sample of at least 40 ED nurses to participate, using the central limit theorem that the distribution of the sample means will be approximately normally distributed if the sample is sufficiently large ($n \geq 30$).

Diagram 3.2 gives a representation of the relationship between the target population, the study population of participating ED nurses and the number of ED nurses who attended the pre-test but did not complete the intervention nor the post-test as applicable to this study:

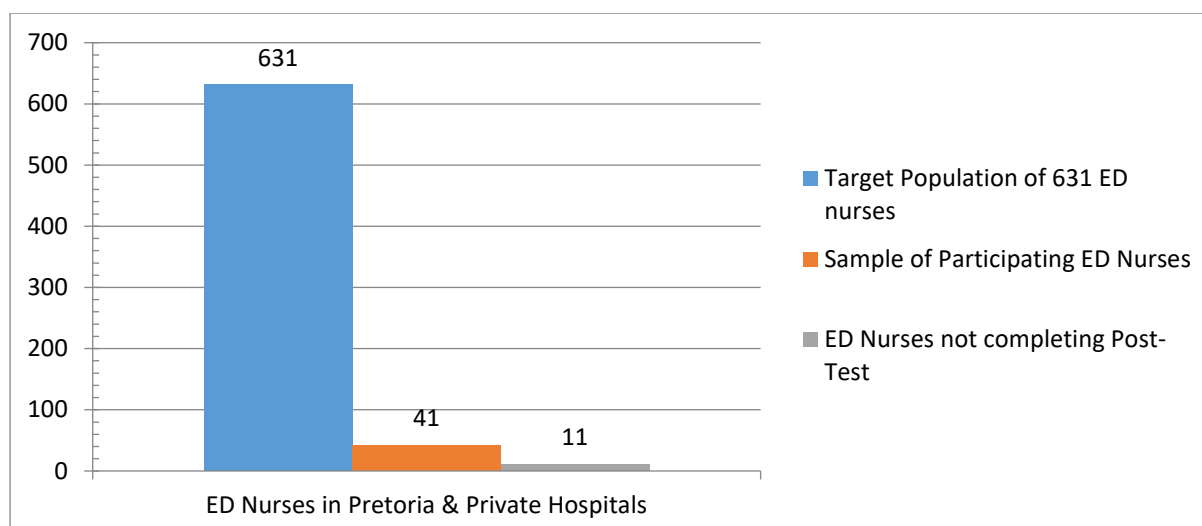


Diagram 3.2 Summary of the target population and participants enrolled for the study

3.4.4 Recruitment of Participants

Once ethics approval was obtained twenty emergency nurses known to the researcher were approached personally, and asked to recruit more participants (“snowball”-technique). The researcher justified the potential benefits for each individual participant in the study during the recruitment process with phone calls.

The researcher emailed and in some cases called hospital managers and unit managers in the various EDs in the hospitals listed above. The hospital managers were emailed and asked to give the unit managers in all the ED departments of the purpose of the study and to explain in detail the date, time, venue and what were expected of each participant. The email communication contained sufficient detail on be precisely how long the process would take and what the participants should wear and bring with them.

The participants were given all the information and the researcher’s email and contact details including those of the supervisor were made available for any potential further questions prior to the date of the pre-test. ED nurses who had been identified as willing to participate were then sent an invitation (Annexure **G**) and consented to participate in the study with its pre-test post-test six week intervention with the Participant’s Information and Informed Consent Document (Annexure **H**).

3.4.5 Screening of participants

The 2017 Physical Activity Readiness Questionnaire for Everyone (PAR-Q+) (Annexure F), available online to the public for self-screening for participation in community exercise programmes (Ontario Society for Health and Fitness (OSHF). 2017), was administered telephonically by the researcher. The purpose was to screen whether persons invited to the study could indeed safely participate in the study and this telephonic contact was made subsequent to the recruitment process.

Warburton, Jamnik, Bredin, Shephard and Gledhill (2017) are the authors of the widely accepted Physical Activity Readiness Questionnaire for Everyone known as “The PAR-Q+” (Annexure F) and is a self-administered questionnaire. It was designed, according to the authors, to assess readiness to participate in physical activity or engage in a fitness appraisal. This form is generally used before starting a new physical activity program or before completing a fitness appraisal.

When a potential participant responds positively to one or more questions on the PAR-Q+, he or she is advised to consult a physician for physical activity participation clearance and follow up PARmed-X was designed in Canada for use by physicians to address medical concerns about physical activity participation for persons answering yes to 1 or more of the 7 questions on the PAR-Q+.

Although the original PAR-Q+ is used extensively in Canada and worldwide, barriers in this physical activity participation clearance process have been identified by physicians, physical activity participants, fitness professionals, and various organizations. For instance, the PAR-Q is purposely conservative, leading to many false positive results and causing considerable unnecessary medical referrals. The age restrictions of the PAR-Q+ (i.e., 15 to 69 years) create an unnecessary barrier to physical activity participation for children and elderly people; and there is often inconsistent or improper use of the clearance forms. In addition, the PAR-Q+ is often a barrier for individuals who need increased physical activity the most (such as those living with chronic medical conditions) (Warburton Bredin *et al* 2013:1)

Forty-one participants were screened by the researcher, and the same number was selected who had no medical conditions which disqualified them from participating in the research based on the PAR-Q+.

3.5 RESEARCH METHODS

The research methods used in this study are the techniques used to apply the intervention and to collect the data. It is in essence, the strategy and planning used to gather the data for analysis in terms of the aims and objectives of the research.

3.5.1 Intervention: Six-week personalised exercise Intervention

This section described the intervention.

3.5.1.1 Six-week exercise programme

The intervention comprised of a personalised exercise intervention over six weeks which included components of health-related fitness (American Association of Sports Medicine 2014). Each participant planned his/her own programme for each week, based on the minimum requirements recommended for health-related fitness (Appendix A and B of the My Journey to Fitness Booklet- Annexure **D**.) Participants had to apply the FITT Principle for an effective exercise programme to plan the exercise for each week, where the acronym FITT stands for Frequency (how often per week), Intensity, Time (duration of each session) and Type of exercise. The booklet (Annexure **D**) was developed with all the information to enable the participants to plan a personalised exercise programme.

3.5.1.2 My Journey to Physical Fitness booklet

The “My Journey to Physical Fitness” booklet (see Annexure **D**) was the core information instrument for the six week physical exercise intervention.

Participating ED nurses were required to follow a six week physical exercise programme whilst supporting and motivating one another on a cellular telephone WhatsApp group. Motivational interviewing principles were applied in preparing the ED nurses for the programme as well as during the programme and interacting on the WhatsApp group. It was important at the outset to describe to the participating ED nurses the meaning of physical exercise, the benefits and risks thereof, its five components and types of physical exercises for each component, how to determine the intensity of exercise and progress from week to week.

It was also important to give the ED nurses the assurance not only of the relevance and importance of the study, but also that they would do exercises within their own limits of fitness, and not too strenuous for each individual. The ED nurses were guided about a balanced

programme for a week and given the option to select what suited them best in the context of their respective personal medical histories and lifestyles. In other words, each one followed a programme that she/he customised for him/herself and circumstances.

3.5.1.3 Content of the My Journey to Physical Fitness Booklet

The My Journey to Physical Fitness Booklet (the Booklet) was structured in such a manner that the participating ED nurses could obtain sufficient information regarding what the six physical exercise components of the intervention entailed.

The Booklet was designed in such a manner that it had two versions. The one version (see Annexure I) with sections highlighted in grey which were a guide to facilitators during the intervention and these grey portions were removed from the Booklet given to the participants. In planning the study a two-hour workshop was planned with the ED nurses for the facilitators to work through the Booklet with them. Due to practical considerations and the time constraints of the ED nurses participating it was not held. The researcher, however, went through the Booklet with the three sessions of ED nurses explaining its content and placed the onus on the ED nurses to write down their thoughts relating to physical exercise in the spaces provided in the Booklet. The researcher emphasised that the participants had to work through Section A of the booklet within the first few days (but definitely within the first week.) before commencing the intervention.

Table 3.2 describes the intent and content of the Booklet

Table 3.2 Content of My Journey to Physical Fitness Booklet: Motivation

Section	Motivational principle/and or aim	Brief description
1.Introduction	Introduce the topic Setting the agenda	This booklet will provide me with an opportunity to 1) think about my current level of fitness, 2) share the importance of physical exercise with my colleagues, 3) change the way I think about incorporating exercise into my everyday life, 4) improve my readiness and confidence to exercise and 5) plan, implement, document and reflect on my six-week journey towards my personal goals relating to increasing my physical activity.

2. Engage	Self-efficacy	Participants to learn about themselves and how they could make changes to increase physical exercise into their daily lives.
2.1 Opening move		As positive cards were not available at the workshop the participants were asked to do an exercise at home to complete the positive cards.
2.2. Set the frame	Establish a safe and productive group environment	This section sought to and facilitate the group to reach consensus on ground rules that should be adhered to by participants throughout the intervention but this aspect was then left to the group to decide on any ground rules they wanted. Procedure: Brief overview on the principles of motivational interviewing, where participant autonomy and self-efficacy was emphasised.
3. Focus	Strengthen the agenda, increase readiness to change, identify facilitators and barriers of physical exercise and emphasise importance of the new behaviour ('what is in it for me')	Participants were reminded that the focus was on increasing physical exercise and that they should not adopt the role of expert. In addition they were encouraged to listen to others and share their determination, commitment and previous successes as this could enable some participants' to change. Participants were further reminded that this task provided them with an opportunity for sharing successes as change talk from members who had experienced success may experience consolidation to commit to change. Participants were asked to consider and answer the following questions: Reflect on how active they currently are? 1) What made them not exercise; 2) What might get in the way for them not to exercise; 3) What is there in it for the participants not to exercise
4. Evoke	Exploring and resolving ambivalence	Once a focus had been identified and was mutually agreed upon by the participants evoking involved discovering the participants' personal interest in and motivation to change.

4.1 Ambivalence	Exploring ambivalence Increase readiness for change	Participants were asked whether they had simultaneous mixed emotions about starting their exercise journey and changing their behaviour. They were asked to write short notes in the text boxes on these emotions (e.g. participants may have felt hopeful on the one side, but doubtful on the other side).
4.2 Explore functions	Increased awareness about the importance of the new behaviour (exercise) Developing discrepancy Identify barriers and facilitators for implementation	Participants were asked to discuss the pros and cons of physical exercise with a split table in the text for pros and cons adjacent to each other. This was not done in a group setting and only a discussion took place with participants encouraged to fill in the pros and cons at home.
4.3 Explore values	Increase readiness to start with the programme. Build readiness. Build confidence	Participants were asked to list in the text boxes three to five of their core values (e.g. honesty, courage, commitment) Then they were asked to reflected on how exercise could positively influence their values in terms of themselves, their relationships with e.g. family/friends/colleagues, and their responsibilities at home or at work.
4.4 Explore confidence	Identify current level of importance of the behaviour. Identify facilities for the exercise programme. Build confidence. Self-efficacy with a focus on previous successes and highlighting skills and strengths.	Picture of a 10 cm ruler. Participants were asked to circle a number to indicate how important it is for them to exercise with 1 being not important at all and 10 being extremely important. Participants were asked to explain why they selected the specific number and not two numbers below

5. Broaden perspective	Self-efficacy Increase importance Build confidence	Participants were asked what strong points they had that could help them succeed in exercising regularly and what support they needed to do so.
5.1 Increase importance	Vision setting Increase importance	Participants were asked to write down what would they like their lives to look like in 5 years if they increased their respective current physical activity level and they were asked to think about the things that they value and the difficulties they had identified; and how would these values be different
5.2 Build confidence	Build on previous successes Identify potential facilitators Identify character strengths that can facilitate the new behaviour Build confidence	Participants were asked to write short notes when they were physically fit and to consider elements such as how they felt when they were physically fit, what were the actions that they took to become fit and what lessons they learnt that assisted them in this journey. They were then asked to write in the text box what strong points they had that could help them succeed in exercising regularly. The next questions posed were what strong points they could write in the text box that could help them succeed in exercising regularly and then what support they have to help them in succeeding to exercise regularly Participants were then questioned when in their lives had they made up their minds to do something, and did it and to write this down in the text box provided Thereafter, they were asked to reflect in the text box provided on characteristics of successful changers that assisted each of them to successfully achieve their goal with no restrictions and a table of characteristics of successful changers was given to guide their discussion.

The second section of the booklet contained information about the type and intensity of possible exercises in the different health-related fitness domains, which are summarised in **Table 3.3**.

Table 3.3 Content of My Journey to Physical Fitness Booklet: Physical Activity Section

6. Moving into action	Aim/Motivational principle	Brief description
6.1 Introduction to physical exercise	Introduce elements of health-related fitness, and refer to detail guidelines	The five components of health-related fitness Participants were advised that it is best to start at a level of doing the exercise that they were comfortable with and to set a goal(s) for the first week of their exercise journey. Participants were advised that they could slowly increase their activity and exercise at a pace that suits them starting at their current level of activity.
6.2 Set my goals	Goal setting Self-efficacy	The Booklet provided a text box for each participant to describe in writing their own goal for their six-week physical exercise journey.
6.3 Specific actions	Planning day of exercise, type and duration for the coming week Self-efficacy	Participants could in the text box provided set and describe their own weekly goal. The Booklet then provided a table below this goal divided into three columns next to each day of the week whether firstly they were going to exercise on that particular day of the week, and if so what will the exercise be and then for how long will the exercise last.
Weekly logs and goal setting	Motivation Goal setting Strategising Strengthening facilitators Problem solving to address barriers	The Booklet was structured in such a way to enable the participants to set their weekly goals and logging actual daily exercise and the duration of such exercise. The table had a space for the total number of days exercised in each of the six weeks as well as the

		number of hours exercised in each week. Reflection on the week's exercises
Appendix A of the Booklet	Provide options of type of exercises and how to progress Self-efficacy	Table with example of types of exercises for different components of health-related fitness and how to progress.
Appendix B of the Booklet	Provide information on the intensity of exercise per week Self-efficacy	A three column table with three levels of intensity, light - less than 40% of desired level of intensity/moderate-40%-60% of desired level of intensity and vigorous – 60% to less than 90% of desired level of intensity and the participants could select their level of intensity. Below the table was a formula on how to calculate exercise heart rate for different levels of intensity (MaxHR)-(Age)-(HR@rest) X(% of desired level of intensity+(HR@rest) = target exercise HR with a table to calculate the desired exercise heart rate and to guide candidates on the various levels of intensity for different days of the week and the time (minutes) spent at either moderate or vigorous levels or a combination of both.
Appendix C of the Booklet	Provide information on recommended frequency, intensity, duration (time) and type of exercise, (FITT) of exercise for health. Self-efficacy	The table in this appendix provided participants with the principles (frequency/duration/intensity/type) and recommendations for cardiorespiratory endurance (aerobic exercise), muscular strength, muscle endurance and flexibility.

The third section in the booklet related to participants supporting each other, applying the motivational interviewing principles. View summary in Table 3.4.

Table 3.4 Content of My Journey to Physical Fitness Booklet: Motivational interviewing principles via WhatsApp support group

	Aim	Brief description
7. Principles when supporting each other	Problem solving/brain storming To enable the participants to mutually support one another and apply motivational interviewing principles in their 6 week physical exercise journey by establishing and maintaining a motivational interviewing-consistent group climate on WhatsApp	The importance of adhering to the principles of motivational interviewing was emphasised during discussions and support on the WhatsApp group. The researcher was part of the group and the point was made that the WhatsApp group was for supporting each other and the data would not be used in the study. The principles were: • To model the spirit of motivational interviewing throughout the intervention through for example openness, acceptance, respect, genuine positive liaison • To be vigilant and respond promptly to violations on the WhatsApp group without being punitive or critical (e.g. group members pushing each other to change, criticising each other's point of view, failing to listen) • Proactively offer affirmations to individuals who chats on WhatsApp using the principles of motivational interviewing The following principles were discussed for the group to adhere to when supporting each other on the WhatsApp:

		• Motivation to change is elicited from each Participant herself/himself and not imposed from others in the group • Nobody should give advice and avoid 'solution talk' • Nobody to judge each other • Only use affirmative language (e.g. I hear, I understand) • Acknowledge and respect each other's feelings Participants were also given the opportunity to state in writing in the Booklet how they intended to support one another and be successful in their six-week exercise journey on the WhatsApp group

The last section of the booklet provided additional resources that the participants could use to plan their physical exercise programme. View Table 3.5.

Table 3.5: Content of My Journey to Physical Fitness Booklet: Additional resources

8. My resources	To provide participants with information on where to read up on the benefits of physical exercise	
8.1 Websites	To provide participants with more information on exercise	Internet addresses of 11 websites relating to the benefits of healthy exercise were described in the Booklet
8.2 Applications (Apps)	To provide participants with information that they could download various apps	Participants were given a reminder that if they use a 7 min workout app then they should repeat some of the exercises or the entire set at

	from the Internet such as 7 minute workout apps	least twice to exercise for a minimum of 10 minutes.

3.5.1.4 Development of the My Journey to Physical Fitness Booklet

The content of the Booklet was derived from literature regarding motivational interviewing (with an emphasis on group settings) and physical exercise (and progression therapy) (Krejci & Neugebauer 2015, the American College of Sports Medicine (2014), Douaihy, Kelly & Gold (2014), Wagner & Ingersoll (2013), Miller (2012), Nieman (2011), McKeag & Moeller (2007), Miller and Rollnick (2002). Quality control strategies were implemented to finalise the format and its content of the workshop and as explained in the next section.

3.5.1.5 Evaluation of the My Journey towards Physical Fitness Booklet by Expert Panel

The My Journey to Physical Fitness Booklet was evaluated by an expert panel. The panel of experts was selected using the inclusion criteria of formal qualifications in physical exercise (physiotherapy) and/or motivational interviewing and the measurement of both.

Two experts were identified at the University of Pretoria in the field of physical exercise one being a senior lecturer in sports physiotherapy with 20 years' experience and the second was also a senior lecturer in physiotherapy with 15 years' experience, both having master's degrees in this field and were enrolled in the same discipline. In addition, an expert with 15 years' experience in motivational interviewing with a doctorate in nursing science and senior lecturer at the University of Pretoria was recruited. Two experts in the field of motivational interviewing also agreed to evaluate the Booklet who have also published in the field of motivational interviewing.

The panel which was invited by email invitation upon the recommendations are summarised in Table 3.6.

Table 3.6 Review Panel of My Journey to Physical Fitness Booklet

Academic position and years' experience	Qualification	Justification
Motivational Interviewing Principles (Sections 1 to 6, and 8)		
Professor	PhD	Published and presented papers at international conferences on motivational interviewing and physical exercise.
Professor	PhD	Published and presented papers at international conferences on motivational interviewing
Physical activity (Section 7 and 9)		
Lecturer	Registered for PhD	Published and lectures in Sports Physiotherapy
Overall		
Professor	PhD	Expert in research methodology and emergency nursing
Senior lecturer	PhD	Published in Public Health and lectures brief motivational interviewing

The above experts were invited and given a document entitled Evaluation of The Booklet (see Annexure **J (a)**) together with the My Journey to Physical Fitness Booklet. The experts' role was to evaluate the My Journey to Physical Fitness Booklet developed to guide the intervention for the study. It was clearly stated that no remuneration was provided for the expert's participation in the research study. The invitation to the experts also contained the fact that ethics approval (Annexure **A**) had been obtained and the evaluation of the My Journey to Physical Fitness booklet would enhance the rigour of the intervention.

The experts were requested to evaluate the My Journey to Physical Fitness Booklet using the following criteria:

- Clarity
- Simplicity
- Consistency
- Logical Flow
- Layout.

The above criteria were evaluated by the following grading:

- Exemplary
- Proficient
- Marginal
- Unsatisfactory

In summary, the evaluators and expert panel found that the Journey towards Physical Fitness Booklet met the adequate grading of mostly “exemplary” and “proficient” with no unsatisfactory commentary confirming that it conformed to the required standard for the intervention.

A summary of the experts’ evaluation is contained in Annexure **J (b)**, which were included in the final Booklet given to the facilitators.

3.5.2 Measurements

Data was collected using a self-reported questionnaire on the demographic information of the participating ED nurses, (Annexure **K** and **L** Pre-test and Post-test respectively) and their compassion levels in terms of the ProQOL tool (Annexure **E**). In addition, a data capturing sheet was used to record the findings of the health-related physical fitness test battery (Annexure **M**) described below.

3.5.2.1 Questionnaires

3.5.2.1.1 Demographic Information

The demographic information questionnaire was aimed at collecting data of the participants’ variables regarding sex, age, marital status, number of children, highest academic qualification, years of ED experience and whether the ED nurses worked day/night time shifts and overtime. (Annexure **K**)

3.5.2.1.2 Compassion (ProQOL)

The ProQOL instrument was used in this study to measure compassion fatigue (Yang & Kim, 2012). Stamm (2010:1) developed this instrument to measure compassion satisfaction and compassion fatigue and is most commonly used to measure the negative and positive effects of helping others who experience suffering and trauma. The instrument consists of three subscales used to measure compassion satisfaction and compassion fatigue, which is sub-

divided into burnout and secondary traumatic stress. The version in the ProQOL Manual (2nd Edition) of November 2010 was used. The ProQOL scale is a 3-item instrument using a 5-point Likert scale from 1 (never) to 5 (very often) that yields composite scores for the three psychometrically unique phenomena.

The instrument has been tested extensively with reliability with a coefficient of 0.88 for compassion satisfaction, 0.75 for burnout, and 0.81 for secondary traumatic stress, and it is a valid measure of each individual phenomenon (Stamm, 2009). The ProQOL instrument has been the subject of research to determine its validity, adequacy of its internal structure and invariance across different countries and cultures. In a study by Galiana, Oliver, Arena, Tomás, Vidal-Blanco and Sansó (2020) using three cross-sectional surveys of Spanish, Argentinian, and Brazilian palliative care professionals the conclusion was that the new *Short ProQOL* scale provided a robust way to measure the quality of life of professionals. Furthermore, the latter authors found in a study of its brevity that the ProQOL scale is not incompatible with improved psychometric properties and, based on relationships with other variables, the results for factorial validity, invariance measurement, reliability, and validity, were also appropriate. (Galiana *et al* 2020)

The reliability and validity of the ProQOL measuring tool is as follows:

Compassion satisfaction $\alpha = .88$ (n=1130)

Burnout $\alpha = .75$ (n=976)

Compassion fatigue $\alpha = .81$ (n=1135)

Interscale correlations show compassion satisfaction has a 5% shared variance ($r = -.23$; $\text{co-}\sigma = 5\%$; n=1187) with burnout and 2% variance with compassion fatigue and with secondary traumatic stress ($r = .14$; $\text{co-}\sigma = 2\%$; n=1187). The shared variance between compassion fatigue and burnout and secondary traumatic stress is higher reflecting a stress that is common to both conditions (Stamm, 2005:10 Figure 3).

Permission has been obtained to use the ProQOL instrument. (Annexure **B**)

3.5.2.1.3 Readiness for Physical Activity

The stage of exercise readiness (readiness for change) was assessed by means of five items proposed by Marcus, Rakowski, and Rossi (1992) with an additional item regarding relapse ('I

exercised in the past, but I do not exercise now') as suggested by Sas-Nowosielski, Hadzik, Górna and Grabara (2016:222). Findings from this test were used to assist with the interpretation of the other study results.

3.5.2.2 Test Battery for Health-Related Physical Fitness

The pre-test five-stage fitness or battery test, followed after the questionnaire relating to the demographics of the participating ED nurses, and after their measurement of compassion and their readiness for physical activity. Faktor (2009: xiv) in his research accepts the US Department of Health and Human Services 1999 definition that physical fitness is measured using a five stage fitness test which also appears in the literature to be generally or universally accepted as covering the five critical elements of fitness: 1) muscular strength 2) flexibility 3) muscular endurance; 4) body composition and 5) cardiovascular or cardiorespiratory fitness;. As supported by the literature in section 2.5 (Chapter 2) health-related physical fitness is comprised of five different components: 1) muscular strength 2) flexibility 3) muscular endurance; 4) body composition and 5) cardiovascular or cardiorespiratory fitness. (Percia, Davis and Dwyer 2016:1).

Table 3.7 summarises the five tests (column 2) of the fitness test battery by fitness component (listed in column 1), the reliability of these tests (column 2) and the source where a description of the test can be found (column 4).

The order in which the participants did the test battery for health related physical fitness was as follows:

- Muscle endurance (Sit-up crunches)
- Flexibility (ROM - hamstring)
- Muscular strength (One repetition leg press)
- Anthropometry (BMI)
- Cardiovascular

Table 3.7 Test battery for physical fitness

Components of Physical Fitness	Testing	Reliability	References
Muscle endurance	Sit-up crunches	Intraclass correlation values ranged from 0.92 to 0.95	Augustsson Bersas, Thomas, Sahlberg,

			Augustsson & Svantesson. (2009)
Flexibility	Active straight leg raise (SLR) Hamstring muscle length	Intra-rater reliability R=.99	Gajdosik and Lusin (1983) Gajdosik, Rieck, Sullivan, and Wightman (1993)
Muscle strength	One repetition maximum (1RM) leg press	R*.95 between predicted and achieved 1RFM	LeSuer, McCormick, Mayhew et al. (1997)
Biometry (Anthropometry)	BMI (Height and weight)	r=.70 when compared with actual measurement of body fat from hydrostatic weighing.	Nieman (2011):96
Cardiorespiratory fitness	Heart rate Blood pressure 6-min walk test (distance covered)	Correlations between walking-test cycle ergometer testing (in cardiac and respiratory patients): P-value <.001	Guyatt,, Sullivan, Thompson et al (1985)

*r means Reliability Coefficient; # ICC means Intra-class correlation

a. Muscular Endurance

Muscular endurance was tested by participants doing sit-up crunches as being high-test-retest reliability, equally as push ups, and are recommended for clinical use (Augustsson, Bersas, Thomas, Sahlberg, Augustsson & Svantesson , 2009:70) The said authors found that sit-ups and push-ups have universally been used to measure muscular endurance and as one of the components for testing physical fitness and examples being the Eurofit test battery, the American College of Sports Medicine guidelines for exercising and the Canadian Physical Activity, Fitness Lifestyle Approach Protocol (Augustsson et al 2009:65). The test in this study for muscular endurance followed the accepted test of a partial curl up with the participant performing as many curl-ups in one minute in time to a metronome set at forty beats per minute Hoffman (2006:194)

b. Flexibility

Flexibility of the participants was tested using the straight leg raise (range of motion of the femero-throchantic joint and hamstring length as measured by a goniometer, which is a reliable instrument in general use. (Hoffman 2006:97) The latter author defines flexibility as the ability to move a muscle or a group of muscles through a complete range of motion (ROM).

Goniometers are devices similar to protractors and measures the angle of the joint at both extreme ranges of motion. (Hoffman 2006:97)

Pate Oria & Pillsbury (2012:1) advise that in the case of flexibility, stretching is a physical activity behaviour or exercise typically performed to increase muscle-tendon unit (MTU) length and to allow improved joint range of motion. The said authors found in their research that flexibility has been defined as the range of motion of muscle and connective tissues at a joint or group of joints. In contrast to other, more general or systemic fitness components, flexibility is highly specific to each of the joints of the body. In contrast to other, more general or systemic fitness components, flexibility is highly specific to each of the joints of the body. For this reason, Pate et al found that although flexibility has been included in national fitness test batteries, linking it to one or more health outcomes is difficult, however, and few data support such an association. According to Acevedo and Starks (2011:1) flexibility is the ability to move the body parts through a wide range of motion without undue strain to the articulations and muscle attachments

Measuring a joint angle with a universal goniometer has moderate to excellent reliability. It can therefore, be used as a repeatable device for accurately measuring the range of motion of the joint for consistent and precise results. (Shamsi, Mirzaei & Khabiri 2019:1)

c. Muscular Strength

Muscular strength was measured using the research of the American College of Sports Medicine (2014) to determine muscular strength on the basis of one maximum repetition using a leg press machine to maximum resistance (1-RM which is the maximal weight an individual can lift for only one repetition with correct technique) within four trials with rests of 3 to 5 minutes between trials. Participants with the help of research assistants were required to select an initial weight within the participant's perceived capacity and then progressively increases until the maximum was attained. Hoffman (2006:34) is authority for this test and the methods to determine muscular strength.

d. Body Mass Index/Composition

Body mass index is the most commonly used measure for body fat and is a key index for relating weight to height of a person and often abbreviated as BMI. BMI is a person's weight in kilograms (kg) divided by his or her height in meters squared (kg/m²). Current guidelines from the U.S. Centres for Disease Control and Prevention, and the World Health Organization

define a normal BMI range as 18.5 to 24.9. Overweight is defined as a BMI of 25.0 to 29.9; obesity is defined as a BMI over 30.0; and severe obesity is defined as BMI 35 or higher. (NIH News Release December 2010:1)

In this study, waist circumference was also used as it has been found by to assist in health assessment. Lean, Han & Morrison (1995:1) is authority that waist circumference can be used in health promotion programmes to identify individuals who should seek and be offered weight management. Men with waist circumference of up to 94 cm and women with waist circumference of up to 80 cm should gain no further weight; men with waist circumference up to 102 cm and women with waist circumference up to 88 cm should reduce their weight.

e. Cardiovascular and Cardiorespiratory Fitness

This test was done in accordance with the American Thoracic Society (ATS) Guidelines for the Six Minute Walk Test (6MWT) (2002). This 6MWT is not the only test that can be used to determine cardiovascular fitness and the ATS point out that the most popular clinical tests are stair climbing, the 6MWT, a shuttle-walk test, a cardiac stress test (Bruce Protocol) and a cardio-pulmonary exercise test. The research by the ATS (2012:112) found that the 6MWT was easy to administer, better tolerated and more reflective of daily activities of daily living than other walk tests ATS (2002:112). The ATS (2002:112) found that the 6MWT evaluates the global and integrated responses of all the systems involved during exercise including pulmonary and cardiovascular systems, systemic circulation, peripheral circulation, blood, neuromuscular units and muscle metabolism. The test does not seek to test maximal exercise capacity as this does not occur in daily physical activities where sub-maximal levels of exertion are performed and the 6MWT thus reflects the functional exercise level for such daily physical activities. (ATS 2002)

3.6 DATA COLLECTION PROCEDURES

The researcher personally together with the research team (supervisor and research assistants) collected the data during both the pre-test and post-test stages of the intervention.

After each data collection session at baseline the documents were collected from the research assistants, whilst supervised by the facilitator, and handed back to the participants when they returned for the post-intervention measurements.

3.6.1 Site

According to Polit and Beck (2010:62), the site within a setting refers to the overall location where the study will be conducted, for example ‘an institution is a community’. For the purpose of this study, the site was the Virgin Active Gymnasium located adjacent to the Loftus rugby stadium area in Pretoria. The same studio within the gym was used for all sessions, with the same sequence of exercises and events, same room temperature and approximately the same time of day. Permission to use the gym was given to the researcher by Virgin Active management (Annexure C)

3.6.2 Research Assistants

Research assistants who assisted in both the pre-test and post-test processes consisted of biokineticists, final-year physiotherapy students, nurses and helpers who were trained by a registered physiotherapist with a PhD in the methods to collect the data at each assigned station. The research assistants were not remunerated.

3.6.3 Data Collection Sessions

The forty-one (41) ED nurses participated in the study in three groups due to practical constraints in the pre- and post-test sessions as well as their availability due to the demands of night duty and duty rosters. Sixteen (16) ED nurses participated in the first pre-test on 29 June 2018 and the post-test for this group was done on 3 August 2018. The second group of 12 ED nurses did the pre-test on 31 July 2018 and the post-test on 18 September 2018 with the last group of 14 ED nurses doing the pre-test on 23 August 2018 and the post test on 4 October 2018. See Table 4.1 under Chapter 4 for Data Collection Timeframe 2018.

The following programme was arranged for all three pre-test sessions and according to the following programme:

Participants arrived at Virgin Active Loftus on the following dates and times: 11h00 29th June, 31st July, and 23rd August 2018, where they were registered at the entrance of the club. Participants were welcomed at Studio 1, where their registration was confirmed on the register of participants and each were given their ‘data collection fitness pack’ and black pens. Participants were made comfortable sitting on steps or exercise balls in Studio 1. The ethics clearance was explained to the participating ED nurses and their consent was obtained for the intervention. The nature and aims of the research topic was described by the researcher to

the participants and then the sequence of events, was presented and what was expected of each participant and how long the pre-test should take.

The researcher explained the content of the 'Participation Pack', which contained the informed consent brochure, the demographic questionnaire, the ProQOL test and the My Journey to Physical Fitness Booklet. Each document was explained to the participants, as well as process for the physical fitness test battery to be carried out, and each of the five stations was discussed and explained. Time was made available to address questions asked by the participants.

Each session was planned to last about an hour to 90 minutes as determined during preliminary pilot test study and in the actual pre-test and post-test phases each session actually took approximately two hours to complete. The research assistants and participants were given refreshments and properly thanked in a professional manner.

Participants were required to complete the demographic questionnaire and the ProQOL test at the start of the session and then proceed for the physical fitness battery tests at the five stations. One assistant consistently collected data at a specific station. All participants moved in the same order from station to station with his/her own data sheet. The researcher personally with her supervisor, collected and collated all the research data securely for submission to the statistician at the University of Pretoria who conducted the data analysis

3.7 PILOT STUDY

A pilot study according to Hassan Schattner and Mazza (2008:1) can be defined as a "small study to test research protocols, data collection instruments, sample recruitment strategies, and other research techniques in preparation for a larger study". The authors also found that a pilot study is one of the important stages in a research project and is conducted to identify potential problem areas and deficiencies in the research instruments and protocol, prior to implementation of a full study.

Crossman (2017:1) defines a pilot study as a preliminary small-scale study that researchers conduct in order to help them decide how best to conduct a large-scale research project. In this study a small sample of five ED nurses was used to in effect test the design as a pilot study and which lay the basis for this study.

The pilot study using the small sample of five ED nurses laid the blueprint for the main study and every step from recruitment to eligibility criteria (ParQ+) to motivational interviewing to the

pre-test for compassion and physical fitness (using the five stage physical fitness test) and post-test was used. The essential purpose of the pilot study was to “test run” the sequence of the design, test the measurement tools and equipment and no data was statistically analysed.

The pilot study indicated that the design was workable and that the ED nurses understood the sequence and content of the intervention and that a motivational interviewing workshop was not in fact necessary.

3.8 DATA CAPTURING

Data from the questionnaire and the data sheet were captured in Microsoft Excel spreadsheets. (Version 7).

3.9 DATA ANALYSIS

For research questions to be answered, data has to be properly analysed.. To assist in this process statistical techniques are applied (Bryman & Cramer 1994:77; Cozby 2005:229; LoBiondo-Wood & Haber 2006:359; Polit & Beck 2010:392). The type of statistical techniques implemented depends on the level of measurement of the variables. According to Polit & Beck (2010:371), four levels of measurement exist, namely, nominal, ordinal, interval and ratio. LoBiondo-Wood and Haber (2006:359) add that the level of measurement depends on the nature of the object being measured.

In this study the following levels of measurement were included which contributed to the type of descriptive statistical techniques implemented:

- Nominal: Numeric values were given for a categorical purpose without mathematical meaning to identify
- Ordinal: Numeric values to show
- Interval: variables

Relationships between variables were investigated using inferential statistics.

The objectives of the study were:

- Objective 1: Determine the level of compassion before the intervention (pre-test)
- Objective 2: Determine the level of compassion after the intervention (post-test)

- Objective 3: Determine the health-related physical fitness before the intervention (pre-test)
- Objective 4: Determine the health-related physical fitness after the intervention (post-test)
- Objective 5: Determine the relationship between the change in compassion with the change in health-related physical fitness from base-line to post-intervention

These were analysed using descriptive statistics such as means, standard deviations, ranges, and proportions.

3.10 RIGOUR

Research design and data collection instruments have to be valid and reliable to ensure that accurate findings and conclusions can be made. Researchers have to implement control measures to improve validity and reliability (Brink *et al* 2006:158); LoBiondo-Wood & Haber 2006:337). The validity and reliability of the research design and study questionnaire are discussed below:

Validity of the research design

According to LoBiondo-Wood and Haber 2006:209; Polit & Beck 2010:246, the research design has to comply with criteria for both internal and external validity

Internal validity determines whether independent variables have an effect on the dependant variable. Threats to internal validity include history, maturation, testing, instrumentation, mortality and selection bias. LoBiondo-Wood and Haber 2006:213 indicate that these threats are common in experimental designs, but should be considered in all quantitative designs. Since there was no experimental manipulation as the intervention consisted of an exercise programme, the researcher had to conclude that selection bias might hold a potential threat. The pros and cons of the pre-test-post-test design is context in this regard as discussed in 3.2 above.

External Validity determines whether findings can be generalised to other populations, and what should be conditions be for the same results to be repeated (LoBiondo-Wood & Haber 2006:213). The factors which affect external validity depend on the extent of generalisation to be made. If this generalisation is to target population, it is important to select a representative sample. As suggested by LoBiondo-Wood and Haber 2006:215, the inclusion criteria used in

this research were incorporated to limit selection effects and increase population characteristics. These authors add that if the generalisation is planned for different types of people or settings, new studies might be necessary.

Polit and Beck (2010:249) mention particularly the importance of replication and maintain that multi-site studies contribute to generalisability, especially when findings are replicated. For this reason the researcher included 12 different hospitals in the Pretoria area, state and private, Level 1 and Level 2 Hospitals and the various ED nurses, of different rank, experience, age and qualification.

Validity of the research instruments

Brink *et al* (2006:158) emphasises that data-collection methods are prone to error. If instruments measure accurately, LoBiondo-Wood and Haber 2006:336 point out that neither systematic nor random errors occur. Systematic errors may be seen when validity has been affected and random errors are indicative of poor reliability.

Factors that may contribute to errors may include (Brink 220:159):

- The participants
- The researcher
- The environment
- The instrument

To limit these effects in this study the following measures were implemented:

- The instrument was pre-tested to avoid any ambiguity and correct and errors before the pre-test
- The supervisors met with the research assistants before the pre-test to ensure that they were given clear instruction with regard to how the data should be collected and managed and to abide by the guidelines
- The research was conducted at the same venue (Virgin Active Gym Loftus), in the same studio, with the same equipment and sequence, the lightening, air-conditioning temperature was the same and the same equipment was used for all three sessions of the pre and post-tests
- The researcher was present for all three pre- and post- tests to ensure sameness and equivalence
- The same questionnaires were used and the instruction to all participants was the same

A research instrument is valid when it measures what it is intended to measure. Polit & Beck (2010:377) mention that instruments should be assessed for face validity, content validity, criterion-related validity and construct validity.

Face validity: If an instrument looks as though it is measuring the planned construct, face validity is present. Litwin (2003:33) points out that this validity may be assessed by any lay person, that is, someone who has no knowledge of the subject.

Content validity: this determines whether or not the sample of items covers the construct sufficiently. A panel of experts ascertains the contents validity of a research instrument (Polit & Beck 2010:378)

Criterion-related validity: this is established to correlate the participants' performance on the instrument with their actual behaviour (LoBiondo-Wood & Haber 2006:339) or criterion (Polit & Beck 2010:378). Criterion validity may be done concurrently (concurrent validity), or at a time in the future (Predictive validity)

Construct validity: this relates to the extent to which a theoretical construct will be measured (LoBiondo-Wood & Haber 2006:339-340) and is usually associated with the theoretical perspective (Polit & Beck 2010:379).

Polit & Beck 2010:380 calls attention to the fact that validity should be supported by evidence. This evidence usually comes from a study conducted by a person that has developed the instrument. In order to increase the validity of the study questionnaire, the researcher must follow the principles described herein. Findings were also compared to the original developers of the questionnaires, therefore conclusions about validity could be made (see Chapter 2 - 2.3 on the ProQOL instrument and Chapter 4 – 4.5).

3.11 RELIABILITY

Research instruments have to be accurate and consistent in measuring the variables. Polit & Beck 2010:337 refer to stability, internal consistency and equivalence as factors that contribute to the reliability of the instrument. When results are the same on two different occasions, high stability is indicated. A coefficient represents more stability (Polit & Beck 2010:374).

Internal consistency is calculated to signal the extent to which the same trait is being measured. To ensure equivalence, independent coders and observers have to agree about

the scoring of the instrument (Polit & Beck 2010:375). In this study generally accepted methods of reliable measurement tools were used such as the ProQOL tool and for the measuring of the components for physical fitness as set out in Chapter 4 below.

3.12 SUMMARY

The design and research method used in this study provided a structure according to which the researcher planned procedures and logistical requirements required for the intervention and within time frames in order to implement the process of data collection for analysis.

Although the intervention was well planned and thorough, it was necessary to make changes from the original plans owing to the ED nurses participants not meeting schedules due to work pressure, personal issues and financial constraints for travelling to the venue.

The empirical data collected was analysed and these findings is discussed in chapter 4.

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CHAPTER 4

DATA ANALYSIS, INTERPRETATION AND RESULTS

4.1 INTRODUCTION

Chapter 3 described the research design and methodology of the study. This chapter discusses the data-collection timeframe, data analysis and interpretation and the results.

4.2 DATA COLLECTION TIMEFRAME

Data was collected from 28 June 2018 to 4 September 2018 (see Table 4.1). Data was collected on three occasions, to accommodate the participants' work schedules and allow them to participate at a convenient time.

Table 4.1 Data-collection timeframe, 2018

Timeframe	Pre-Test ($N_{\text{pre}}=41$)	Post Test ($N_{\text{post}}= 30$)
Group 1	28 June	3 August
Group 2	31 July	4 September
Group 3	23 August	4 October

4.3 PARTICIPANTS' DEMOGRAPHIC PROFILE

Forty-one nurses accepted the invitation and participated in the pre-test. Of the participants, 73.8% (n=30) returned for the post-test and 26.2% (n=11) did not attend the post-test. The participants in both the pre- and post-test worked in the selected public (n=6) and private (n=10) hospitals in the Tshwane Metropolitan area. **Table 4.2** presents the participants' demographic profile.

Table 4.2 Participants' demographic profile

Variable	Pre-test (N _{pre} =41)		Post-test (N _{post} = 30)	
	Count	Percentage (%)	Count	Percentage (%)
Gender				
Male	5	12.2	2	6.7
Female	36	87.8	28	93.3
Marital status				
Single	16	39.0	13	43.3
Married	17	41.5	10	33.3
Divorced	3	7.3	2	6.7
Live-in partner	5	12.2	5	16.7
Number of children				
Nil	13	31.7	11	36.7
1 to 2	14	34.1	3	10.0
3 to 5	4	9.7	1	3.3
Omitted	10	24.4	15	50
Highest qualification				
Matric (Grade 12)	2	4.9	2	6.0
Diploma	27	65.9	18	60.0
Degree	10	24.4	8	26.7
Master's degree	1	2.4	1	3.3
Omitted			1	3.0

Shifts				
Only day duty	9	22		
Only night duty	3	7.3		
Day and night duty	29	70.7		
Number who did overtime shifts	41	100		

The participants' years of nursing experience ranged from 1.5 to 34 years, with a mean working experience of 15 years. The participants' (n=41) mean age was 35.5 ± 7.6 years, ranging from 24 to 55 years. In 2018, the South African Nursing Council (SANC) (SANC 2018 website) reported that 21% of nurses were between 30 and 39 years old; 28% were between 40 and 49 years old, and 16% were between 50 and 59 years old. The researcher found no references on the average age of nurses working in EDs in South Africa.

In a comparison of nursing in Australia and the UK in 2017, Stott (2017:1) found that the average age of registered nurses in the UK was 39 and 44.1 years old in Australia respectively. In 2018, the New Zealand Nurses Organisation (NZNO 2018:1) found that 43% of nurses in New Zealand were over the age of 50. These average ages referred to nurses generally and not specifically to ED nurses. A 2019 survey of the emergency, trauma, and transport nursing workforce (ETT) in the United States (USA) found that the largest proportion (33.5%) the workforce were 30 to 39 years old and 78.8% were female (Schumaker, Taylor & McGonigle 2019:21). Specifically, the data of nurses in the ETT sectors indicated that the average age of nurses was 43.6, the median age was 42, and 31.7% of the nurses were 50+ years old (Schumaker, Taylor & McGonigle, 2019:21).

Of the participants in the current study, 87.8% (n=37) were female and 12.2% (n=5) were male pre-test. In 2017, 89.2% of registered nurses in the UK were female (Stott, 2017) and in 2018, 88.6% of Australian nurses were female (Australian Government Department of Health, 2018). In 2018, 9.1% of nurses in the USA were male (Kaiser Family Foundation, 2018) and 8% of New Zealand nurses were male (New Zealand Nurses Organisation, 2018). In South Africa, the SANC workforce statistics for 2018 indicated that 5.8% of nurses were male. Historically, nursing has been a female-dominated profession and is only gradually beginning to change.

Regarding the participants' marital status, 41.5% (n=17) were married; 39% (n=16) were single; 12.2% (n=5) were in a relationship living with a partner, and 7.3% (n=3) were divorced. Regarding children, of the participants, 34.1% (n=14) had 1 or 2 children; 31.7% (n=13) had no children; 9.7% (n=4) had 3 to 5 children, and 24.5% (n=10) did not indicate.

Regarding the participants' highest educational qualification, 65.9% (n=27) had a diploma; 24.4% (n=10) had a degree; 4.9% (n=2) had matriculation (Grade 12), and 2.4% (n=1) had a master's degree.

The participants were asked to indicate the shifts they worked. Of the participants, 70.7% (n=29) worked day and night duty; 22% (n=9) worked only day duty; 7.3% (n=3) worked only night duty, and 100% (n=41) worked overtime shifts. A mean of 6.43 additional overtime shifts were worked by the participants.

Of the participants, 73.8% (n=30) returned for the post-intervention measurements. Of the participants in the post-test, 93.3% (n=28) were female and 6.7% (n=2) were male; 43.3% (n=13) were single; 33.3% (n=10) were married; 16.7% (n=5) had a live-in partner, and 6.7% (n=2) were divorced.

Marital status showed 39% pre-test being single and 43% post-test, those married were 43.3% pre-test and post-test 33.3%.

The majority of the participating ED nurses did not have a degree (n=27). Only one participant had completed postgraduate studies to master's level. Most of the nurses participating worked both night and day shifts (70.7%; n=29). A mean of 6.43 additional overtime shifts were worked by the participants. Of the participants, 30 returned for the post-intervention measurements. The results of pre-test and post-test show similar results. For example, gender in the pre-test sample was 87.8% female and post-test 93.3%.

Marital status showed 39% pre-test 43.3% post-test being single, those married were 41.5% pre-test and post-test 33.3%.

4.4 OBJECTIVES 1 AND 2: DETERMINING THE PARTICIPANTS' LEVEL OF COMPASSION (PRE- AND POST-TEST)

The outcome of objectives 1 and 2 was the measurement of the participants' levels of compassion satisfaction and compassion fatigue (burnout and secondary traumatic stress) during the pre- and post-test. The participants (n=41) completed the ProQOL, a Self-Reported Questionnaire (see Annexure E), which measured their levels of compassion, burnout, and secondary traumatic stress levels (Stamm, 2009-2012). Of the participants, 100% (n=41) completed the ProQOL questionnaire of the ProQOL tool during the pre-test, and 73.8% (n=30) after the intervention (post-test).

Table 4.3 presents the participants' results of the three ProQOL categories (pre-test and post-test).

Table 4.3 Participants' levels of compassion satisfaction and compassion fatigue (burnout and secondary traumatic stress): pre-test and post-test

Category	Pre-test (N _{pre} =41)		Post-test (N _{post} = 30)	
	Compassion Satisfaction			
	Frequency	Percentage	Frequency	Percentage
Low	0	0	3	10
Average	23	56	14	46.7
High	18	44	13	43.3
Total	41	100	30	100
	Compassion Fatigue			
	Burnout			
Low	11	26.8	30	100
Average	29	70.7	0	0
High	1	2.4	0	0
Total	41	100	30	100
	Secondary Traumatic Stress			
Low	8	19.5	12	40
Average	33	80.5	18	60
High	0	0	0	0

Category	Pre-test (N _{pre} =41)		Post-test (N _{post} = 30)	
Total	41	100	30	100

The participants' results of compassion satisfaction and compassion fatigue are discussed next.

4.4.1 Participants' compassion satisfaction

In this study, it is significant that none of the participants reported low levels of compassion satisfaction pre-test. In the post-test a smaller percentage (10%) (n=3) showed low compassion satisfaction. Of the participants, 56% (n=23) scored average levels of compassion satisfaction and 44% (n=18) scored high levels of compassion satisfaction which, when combined, gives a generally high level of compassion satisfaction pre-test and this was also the result post-test with 90% either having high or average levels of compassion satisfaction.

According to the ProQOL tool, if one scored in the higher range, one probably derived a good deal of professional satisfaction from one's position and helped others through one's work (Stamm 2010:12). Alternatively, if the score is below 40, one may either find problems with one's job, or there may be some other reason, for example, one might derive satisfaction from activities other than one's job (Stamm 2010:12). It should be noted that individuals reporting compassion satisfaction may also at the same time suffer from compassion fatigue, namely burnout and secondary traumatic stress (Stamm 2010:12).

Compassion satisfaction occurs when nurses feel a sense of connection with the patients they care for and feel a sense of achievement in their work (Stamm, 2010). In order to feel compassion satisfaction, it is essential that in caring for others and providing support, such caring outweighs the difficulties that nurses feel when doing their jobs. Establishing and maintaining a high level of professional quality of life is essential for a nurse to feel compassion satisfaction and foster compassion satisfaction (Stamm, 2010). The balance between satisfaction and fatigue and the cumulative experience of both compassion fatigue and compassion satisfaction is described as professional quality of life (ProQOL). A sustainable ProQOL is achieved by maintaining a healthy balance between the positive and negative aspects of caring (Stamm, 2010).

4.4.2 Participants' compassion fatigue (burnout and secondary traumatic stress)

Compassion fatigue has two parts, namely burnout and secondary traumatic stress. Compassion fatigue is stress resulting from exposure to traumatized individuals and has been described as the convergence of secondary traumatic stress and cumulative burnout and is a state of physical and mental exhaustion caused by a depleted ability to cope with one's everyday environment (see Chapter 2 paragraph 2.4).

4.4.2.1 Participants' burnout

In the pre-test, 70.7% (n=29) of the participants scored average levels of burnout; 2.4% (n=1) scored high levels of burnout, and 26.8% (n=11) scored low levels of burnout. This indicated that most of the participants were not unhappy, disconnected, or insensitive to their work environment (Stamm 2010:21). In the post-test, 100% (n=30) of the participants scored low levels of burnout, and none scored high or average levels of burnout (see Table 4.3).

Burnout consists of exhaustion, frustration, anger and depression. Stamm (2010:13) states that most people have an intuitive idea of what burnout is. Burnout is associated with feelings of hopelessness and difficulties in dealing with work effectively. Burnout is often associated with a very high workload or a non-supportive work environment, and characterised by unhappiness, feelings of being overwhelmed, being "out of touch" or disconnectedness (Stamm 2010:13, 21).

4.4.2.2 Participants' secondary traumatic stress

In the pre-test, 19.5% (n=8) of the participants scored low levels of secondary traumatic stress, 80.5% (n=33) scored average secondary traumatic stress, and no participants scored high secondary traumatic stress.

In the post-test, 40% (n=12) of the participants scored low levels of secondary traumatic stress; 60% (n=18) scored average levels of secondary traumatic stress, and none of the participants scored high levels of secondary traumatic stress.

It is significant that there were no high levels of secondary traumatic stress both at pre-test and post-test, although the average levels of secondary traumatic stress as an element of compassion fatigue and in all probability reflects the exposure which ED nurses have to trauma.

Discussion

The study found generally high levels of compassion satisfaction among the participants, with significant levels of burnout and secondary traumatic stress on average among the participants. There have been several studies measuring compassion satisfaction and compassion fatigue in ED nurses although the studies referred to below have in certain cases different parameters of research to the current study.

Secondary traumatic stress is a negative feeling driven by fear and work-related trauma. Secondary traumatic stress is a feeling of despair caused by the transfer of emotional distress from a victim. Although the elements of compassion fatigue are related, Sacco, Ciurzynski, Harvey and Ingersoll (2015:32) state that secondary traumatic stress is an effect of experiences with specific types of patients, whereas burnout is an effect of environmental stressors. Stamm (2010:8) states that it is important to note that trauma at work can be direct (primary) trauma or, in other cases, a combination of both primary and secondary trauma. Furthermore, if working with others' suffering changes one so deeply in negative ways that one's understanding of oneself changes, this is vicarious traumatisation (Stamm 2010:8).

In a study with 86 ED nurses in two hospitals in Victoria, Australia, O'Callaghan, Lam, Cant and Moss (2019:1) found that the majority of the ED nurses reported medium to high compassion satisfaction and average levels of compassion fatigue and burnout, with half reporting secondary traumatic stress.

In their study among Jordanian critical care nurses, Al Barmawi, Salameh, Sayyah Yousef Sayyah, Shohirat and Abdel-Azeez Eid Abu Jebbeh (2019:9) found low to average levels of compassion satisfaction, burnout and secondary traumatic stress and low to average levels of seeking social support. The study also found that the type of critical care unit had a significant impact on the participants' secondary stress syndrome, problem-solving and seeking social support.

A study on levels of burnout and compassion fatigue among nurses in EDs in Ireland found moderate levels of compassion fatigue among the participants (Burgess 2018:37). The participants scored low in compassion satisfaction, and demographic characteristics such as age and the number of night shifts worked per month negatively impacted on compassion fatigue. Moreover, secondary traumatic stress had a negative influence on the development of burnout (Burgess 2018:37).

In her study in North Carolina, USA, to determine compassion satisfaction and compassion fatigue among ED nurses, Petleski (2013:39) found that 87% of the participants reported average to high compassion satisfaction. However, 30% of the participants reported high burnout and 90% reported high secondary trauma stress related to their work as ED nurses.

A cross-sectional survey conducted by Moukarzel, Michelet, Durand, Sebbane, Bourgeois, Markarian, Bompard and Gentile (2019:1) sought to assess the prevalence of burnout among all ED staff in three French university hospitals and to determine associated factors. The study used medical, paramedical, and administrative and technical professionals working in three EDs. Data was collected using a standardised questionnaire, which included sociodemographic and occupational data, general health questions, burnout level (Maslach Burnout Inventory), job strain (Karasek), and quality of life (Medical Outcome Study Short Form). The study found that emotional exhaustion and depersonalisation, the major components of burnout, were reported, respectively, by 15.8% and 29.6% of the participants. Burnout prevalence, defined as a severely abnormal level of either emotional exhaustion or depersonalisation, was 34.6%. Of the participants, the medical category was significantly more affected by burnout compared with their colleagues and nearly one ED physician out of two (50.7%) had burnout.

A study in the West of Scotland measured secondary traumatic stress among ED nurses using a different tool to the ProQOL (Morrison & Joy 2016:2894-2906). Quantitative data was collected by means of a postal questionnaire and qualitative data by means of a focus group. Secondary traumatic stress was found to be a prevalent phenomenon and if not managed appropriately could represent a significant barrier to the mental health of this group and their capacity to provide quality care (Morrison & Joy 2016:2900). Of the participants, 75% reported at least one secondary traumatic stress symptom in the past week and 39% met the full criteria of secondary traumatic stress. Although formal debriefing and social support were beneficial tools to manage secondary traumatic stress, barriers such as time and experience, inhibited their common use. The study

concluded that secondary traumatic stress was a prevalent phenomenon among ED nurses in the West of Scotland and could negatively affect their mental health and capacity to provide quality care (Morrison & Joy 2016:2906).

In their study in western Ireland on secondary traumatic stress among 117 ED nurses, Duffy, Avalos and Dowling (2015:53) found that 64% of the participants met the criteria for secondary traumatic stress. In Iran, a study of the prevalence of post-traumatic stress disorder (PTSD) among a sample of 131 ED nurses found that 82.96% suffered from the condition (Hosseininejad, Jahanian, Elyasi, Mokhtari, Koulaei & Pashaei 2019:19). An exploratory comparative study in Hemet, California, with 67 ED nurses from three general community hospitals found that 85% of the participants reported at least one symptom of secondary traumatic stress in the past week while 33% met all the criteria of secondary traumatic stress (Dominguez-Gomez & Rutledge 2009:200).

Dominguez-Gomez *et al's* (2009) findings that 85% of the ED nurses displayed some symptoms of secondary traumatic stress similarly compares, percentagewise, with the results of the current study where 80.5% of the participants scored average secondary traumatic stress.

A study to determine the prevalence of compassion satisfaction and compassion fatigue, specifically burnout, in ED nurses throughout the United States found low to average levels of compassion fatigue and burnout and generally average to high levels of compassion satisfaction among the 1,000 participant ED nurses (Hunsaker, Chen, Maughan & Heaston 2015:186-194). The results showed that a low level of manager support was a significant predictor of higher levels of burnout and compassion fatigue among emergency department nurses while a high level of manager support contributed to a higher level of compassion satisfaction

The results for compassion satisfaction and compassion fatigue indicate some commonalities to results in other studies relating compassion satisfaction and compassion fatigue in ED nurses.

4.5 OBJECTIVES 3 AND 4: DETERMINE THE PARTICIPANTS' HEALTH-RELATED PHYSICAL FITNESS (PRE- AND POST-TEST)

The study examined the participants' pre- and post-test health-related physical fitness by means of a test battery, which included the measurement of: 1) muscle endurance, 2) flexibility, 3) muscular strength, 4) anthropometry and 5) cardiovascular and cardiorespiratory fitness.

4.5.1 Participants' muscle endurance

The muscle endurance test was the first of the health-related physical fitness test batteries. The muscle endurance test consisted of measuring the number of sit-ups a participant could do in one minute at a cadence of 25 sit-ups per minute. Table 4.4 and 4.5 present the participants' muscle endurance results.

Table 4.4 Participants' muscle endurance: number of sit-ups per minute - ($N_{pre} = 41$; $N_{post} = 30$)

Statistics	Pre-Test ($N_{pre}=41$)	Post-Test ($N_{post}=30$)
Mean $\pm$ SD* 95% CI**	22 $\pm$ 6 (20;24)	25 $\pm$ 2 (24;26)
Minimum	7	18
Maximum	24	30
* Standard deviation		
**Confidence interval		

The pre-test muscle endurance showed a wide range between the weakest participant of only 7 sit-ups per minute and the highest participant of 24 per minute. The average for the participants was 22 $\pm$ 6 sit-ups per minute pre-test and 25 $\pm$ 2 post-test with a small increase despite the limitation of fewer participants post-test. . Table 4.5 shows the results for the participants' by age groups.

Table 4.5 Participants' muscle endurance (cadence of crunches per minute) by age

Age category in years	Pre-test (N _{pre} =41)		Post-test (N _{post} =27)	
	Count	Mean	Mean	Count
20 to 29	7	26.80 Average	28.00 *Average	7
30 to 39	11	29.60 Average	29.40 *Average	11
40 to 49	8	26.00 Average	25.40 *Average	8
50 to 59	1	20.00 Average	25.00 *Above average	1
Valid	27			27
Missing values	14			3

Table 4.6 presents the norms for muscle endurance for females.

Table 4.6 Norms for muscle endurance

* Norm for females for cadence of crunches

WOMEN	Teens	20's	30's	40's	50's	60's
Excellent	42+	37+	30+	26+	21+	20+
Good	32 - 39	28 - 35	22 - 27	18 - 23	14 - 19	13 - 18
Average	29 - 31	25 - 27	19 - 21	15 - 17	11 - 13	10 - 12
Below Avg	20 - 27	17 - 24	12 - 18	8 - 14	5 - 11	4 - 9
Poor	below 20	below 17	below 12	below 8	below 5	below 4

Result tables interpreted from the norms by age group (Golding, et al (1986). The Y's way to physical fitness (3rd ed.)

http://acsf.edu.au/pdf/Endurance_Test_Sit_up.pdf

Source: Golding and Myers (1986)

The 'norm' means how many sit-ups a person should be able to do at a certain age. The results indicate that of the 27 participants, 26 performed at average level in the pre- and post-test while the participant in the 50-59 age group improved to above average in the post-test (see Table 4.5).

The one male who participated was in the 30 to 39 years old age group. Before the test he could manage 26 crunches per minute and 25 after the intervention, additionally he was below average for his age (19 to 30), both at baseline and after the intervention. There was no remarkable change overall between the number of crunches before and after the intervention.

Discussion

The level of muscle endurance before the intervention indicated an average level, in terms of the above norms among the participants and which may be reconcilable with the physical nature of emergency nursing. The sit up test was found to be inexpensive, safe, and appropriate for core muscle endurance measurement for both male and female although the adoption of a single test for the global evaluation of muscle endurance is not the optimal approach. (Bianco, Lupo, Alesi, Spina, Raccuglia, Thomas, Paoli & Palma 2015:1).

There are few studies which measure muscle endurance of nurses. In a cross-sectional study of 80 nurses aged between 20 and 30 with at least two years' nursing experience and a BMI of 18.5 to 24.99 kg/m² using the trunk muscle endurance with a trunk extensor test (one-minute hold test) with the lower body fixed on a test bed and upper body extended in a cantilevered fashion, as well as testing trunk flexors on a bench, it was found that the nurses lacked endurance when compared to normative data (Banthia, Honkalas & Kumar 2018: 2640). Banthia *et al's* study whilst measuring muscle endurance using a different method and the nurses not all being ED nurses, does not equate to the present study and is cited for context only.

ED's in South Africa are burdened with excessive trauma which has been described as a "malignant epidemic" with a ratio of 17 per 1000 of the population seeking hospital care for trauma which places enormous physical and mental pressures on ED nurses. (Lutge, Moodley, Tefera, Sartorius, Hardcastle & Clarke 2015:135-140) South African EDs are not only extremely busy but also resource constrained which requires ED nurses to use more physical endurance in ongoing lifting and moving patients. A review of studies on the incidence of trauma in South Africa, which is seen as a preventable disease, evidences the major burden of trauma on healthcare facilities as significant and aggravated by low staffing levels in ED's, insufficient basic resuscitation and X-ray/CT-scanner facilities and a lack of nurses trained to manage trauma and emergency cases (Hardcastle, Oosthuizen, Clarke & Lutge 2016:2).

The context being that the physical demands of ED's in such a crisis make the level of muscle endurance in ED nurses a factor which could influence their roles.

4.5.2 Flexibility

Flexibility was the second component of health-related fitness tested. Table 4.3 presents the participants' flexibility.

Table 4.7 Participants' hip range of motion (in degrees) (flexibility)

Statistics	Pre-Test (N=41)		Post-Test (N = 28)	
	Left	Right	Left	Right
Mean $\pm$ SD	76 $\pm$ 13	76 $\pm$ 13	76.4195 $\pm$ 14	79.1548 $\pm$ 11
Median	76	79	78.0000	80.
Minimum	41.	50	44.	55.
Maximum	103.	104	98	97.
CI 95% Lower limit	73	76	71	75
CI 95% Upper limit	83	85	81	83

*95% CI were estimated using the bootstrapping method (see Annexure Q Flexibility Protocol)

Flexibility based on the hip range of motion did not significantly change after the intervention from the pre-test measurements.

Discussion

The researcher found scant research on the ideal flexibility requirements, as a component of physical fitness, for nurses or ED nurses, nor data for ED nurses which indicates normative values against which comparisons can be made.

An extensive study (n = 1 000) conducted in Australia where the median for hip flexion was 123° in a large sample they divided the participants into 100 adults (equal sex) for age groups 20-29, 30-39, 40-49, 50-59, 60-69, 70-79, 80+ (for anthropometric factors, isometric strength, joint flexibility). (McKay, Baldwin, Ferreira, Simic, Vanicek & Burns 2017:35). The purpose of McKay et al's study was to generate a reference dataset of normative values across the lifespan for an extensive set of isometric muscle strength and joint flexibility items, stratified for age and sex, and to investigate the influence of demographic and anthropometric factors. McKay *et al's*

comprehensive study, however, cannot be used as a comparative norm to the present study as it had a different purpose and a different demographic profile.

In Sheffield, UK, Elson and Aspinall (2008:4) investigated flexibility of the hamstring (range of motion of the hip joint measured with a straight knee) of 200 swimmers. In the current study the average age was 40.9, which is older than the average age of 29 in Elson and Aspinall's study. The mean of 80 degrees that compares favourably with the flexibility in the results of the participants of this study of left and right means of 76/79 and 78/80 degrees (pre- and post-test). The comparison however is limited by the fact that apart from the age discrepancy between the two studies, Elson and Aspinall were measuring the flexibility of physically fit and healthy swimmers, as opposed to the current study consisting of ED nurses.

4.5.3 Participants' muscular strength

Table 4.8 summarises the participants' results of the muscular strength test which consisted of finding the maximum weight that a participant could lift using a leg press machine (1-RM which is the maximal weight an individual can lift for only one repetition with correct technique) within four trials with rests of 3 to 5 minutes between trials.

Table 4.8 Participants' results of 1-RM in kilograms (muscle strength)

Statistics	Pre-Test (N=41)	Post Test (N = 30)
Mean	135.79 $\pm$ 34.37	144.21 $\pm$ 36.26
95% CI		
Lower	120.53	127.89
Upper	151.58	161.58
Valid	19	19
Missing	11	11

***95% CI were estimated using the bootstrapping method**

One observation was not included in the analysis as the muscle strength of 890 kg was invalid. The results show a slight increase from a mean of 135.79 pre-test to 144.21 post-test with the limitation of the reduced sample post-test to 30 from 41 pre-test.

The one male who participated was in the 30 to 39 years age group. At baseline he could lift 2.40 times his body weight and post-test, 2.71 times his body weight, which means he was well above the average norm for his age and sex (> 2.07) before and after the intervention. The norms for the 1-RM for the leg press are summarised below in **Table 4.9:** (Annexure **R**).

Table 4.9 Norms for assessing muscular strength with one range of movement adopted from Aerobic Research Dallas 1994 using leg strength



Assessing MS – 1-RM

TABLE 5.3. Fitness Categories for Leg Strength by Age and Sex*						
		Age (year)				
Percentile		20-29	30-39	40-49	50-59	60+
Men						
90	Well above average	2.27	2.07	1.92	1.80	1.73
80	Above average	2.13	1.93	1.82	1.71	1.62
70		2.05	1.85	1.74	1.64	1.56
60	Average	1.97	1.77	1.68	1.58	1.49
50		1.91	1.71	1.62	1.52	1.43
40	Below average	1.83	1.65	1.57	1.46	1.38
30		1.74	1.59	1.51	1.39	1.30
20	Well below average	1.63	1.52	1.44	1.32	1.25
10		1.51	1.43	1.35	1.22	1.16
Women						
90	Well above average	1.82	1.61	1.48	1.37	1.32
80	Above average	1.68	1.47	1.37	1.25	1.18
70		1.58	1.39	1.29	1.17	1.13
60	Average	1.50	1.33	1.23	1.10	1.04
50		1.44	1.27	1.18	1.05	0.99
40	Below average	1.37	1.21	1.13	0.99	0.93
30		1.27	1.15	1.08	0.95	0.88
20	Well below average	1.22	1.09	1.02	0.88	0.85
10		1.14	1.00	0.94	0.78	0.72

*One repetition maximum leg press with leg press weight ratio = weight pushed per body weight.
Adapted from Institute for Aerobics Research, Dallas, 1994. Study population for the data set was predominantly white and college educated. A Universal Dynamic Variable Resistance (UDVR) machine was used to measure the 1-repetition maximum (RM).
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Table 4.10 Female participants' muscle strength (1-RM) as a percentage of body weight by age

Age category in years	N _{pre} (N=41)	1RM		N _{post} (N=18)
		Pre-Test	Post-Test	
20 to 29	3	1.45 ±0.60 *Well above average	1.79 ±0.39 *Well above average	3
30 to 39	8	1.67 ±0.37 *Well above average	1.85 ±0.46 *Well above average	8
40 to 49	6	1.60 ±0.31 *Well above average	1.52 ±0.18 *Well above average	6
50 to 59	1	1.40 *Well above average	1.30 *Above average	1

See Annexure **R** and Annexure **S** norms for assessing muscular strength and the protocol.

The results indicated that the female participants were above the norm for strength measured by the leg press by their average age as the maximum weight they could lift with their legs as per body weight per age and sex pre-test and post-test. The muscular strength of the participant in the age group 50 to 59 decreased after the intervention, but still retained a strength of above average of the norm.

Discussion

The finding that all the participants were above the norm for their age and sex (except the one participant above the age of 50) may be because of the physical nature of ED nursing where ED nurses often have to use their muscular strength to lift, assist or turn patients.

As in the case of muscle endurance where the participants were above the norm, the results that the muscle strength was above the norm may have some context to Hardcastle, Oosthuizen, Clarke and Lutge's (2016:179) finding that South African emergency departments are understaffed and under-resourced. Hardcastle et al found that EDs in KwaZulu-Natal were exceptionally busy and pressured with severe trauma cases, mainly due to violence/assault injuries and high number of traffic accidents and this pressure inevitably placed physical demands on ED nurses.

In a study with 148 nursing students (average age 21 and mainly female) who were assessed for their physical activity levels and the relationship with sociodemographic variables, muscle strength tests it was found that those who had higher physical activity levels showed increased muscle strength (Preto, Novo & Mendes 2016:36). Young student nurses obviously cannot be directly compared to the demographic data of the ED nurse participants in the current study, although it does evidence a reasonable possibility that higher physical activity increased muscular strength. Preto, Novo and Mendes tested muscle strength through three tests, namely pinch strength (right and left hand), right and left handgrip strength, and quadriceps muscle strength.

4.5.4 Anthropometry

The fitness battery test on anthropometric measurements included measuring waist circumference and body mass index (BMI).

Table 4.11 presents the participants' waist circumference measurements.

Table 4.11 Participants' waist circumference (in cm) (n = 28)

Waist circumference	Pre-Test (N _{pre} = 28)	Post-Test(N _{pre} = 28)
Mean ± SD	90.25 ± 15.92	90.71 ±13.28
95% CI		
Lower	84.08	85.56
Upper	96.42	95.86
Minimum	65	64
Maximum	130	121
Missing values	13	2
* Standard deviation		

In the analysis of the statistics only 28 of the 41 participants' results were captured in the pre-test and 28 out of the 30 in the post-test and the results show no significant change from pre-test to post test

According to the World Health Organization's guidelines (2008:21), for men, a waist circumference of 94 centimetres or more indicates an increased risk of chronic disease and a measurement of 102 centimetres or more indicates a higher increased risk of chronic disease. For women, a waist circumference of 80 centimetres or more indicates an increased

risk of chronic disease and a measurement of 88 centimetres or more indicates a higher increased risk of chronic disease. These measurements apply only to adults, not to children. They also do not apply to pregnant women or people from certain non-European backgrounds, who may have different body shapes (WHO 2008:21).

Table 4.12 Female participants' results for waist circumference (anthropometry) (in centimetres) as a percentage of body weight by age category (N=28)

Age category in years	1 waist circumference			
	N _{pre} = 28	Pre-Test	Post-Test	N _{post} = 28
20 to 29	8	1.10 ±0.17 *Well above average	1.14 ±0.12 *Well above average	8
30 to 39	10	1.17 ±0.18 *Well above average	1.16 ±0.21 *Well above average	10
40 to 49	8	1.13 ±0.13 *Well above average	1.17 ±0.11 *Well above average	8
50 to 59	2	1.14 ±0.12 *Well above average	1.15 ±0.08 *Above average	2
* Norm for females by age category				

Source: World Health Organization (2008:21) (See Annexure T)

The waist circumference (87 cm) for the one male did not change from pre- to post-test.

In this study, a mean waist circumference for the participants indicated that the females were on average overweight before and after the intervention.

The male (age category 30 to 39) had a waist circumference as percentage of weight of 1.23 (pre) and 1.24 (post) which according to the WHO norms is poor. The participant was not at risk.

Discussion

Waist circumference provides a better estimate of visceral fat deposition, which is related to obesity comorbidities, but cannot differentiate fat distributed to the centre of the abdomen, subcutaneous tissue, or total body fat. However, waist circumference correlates strongly with BMI (Baïoumi 2019:1).

In this study, 70% (n=29) of the participants did night duty and the average of their waist circumference (90.71 cm) was considerably higher than the non-risk norm of 80 cm recommended by the WHO (2008:21). In a study in Cape Town, night shift nurses reported that weight gain and living with NCDs such as hypertension and diabetes were their main personal health concerns (Phiri 2014:89). Nurses from both day and night shifts acknowledged that overweight and obesity were a common health threat. Furthermore, being overweight was perceived to have a negative impact on work performance and the nurses indicated that some of their overweight colleagues found it difficult to cope with their work demands (Phiri 2014:48).

In a study of 307 nurses at 5 hospitals in Beirut, Lebanon, it was found that night shift work led to an unbalanced diet and reduced levels of physical activity among night shift nurses and 84% of the nurses did not practise any physical activity outside their occupation because they did not have enough time or felt too tired after their night shift (Samhat, Attieh & Sacre 2020:4).

In a study of 153 nurses in the Limpopo province to determine levels of abdominal obesity, using the WHO criteria and standard anthropometric methods of the International Society for the Advancement of Kinanthropometry, the results showed a high prevalence of abdominal obesity among the nurses of 68.2% based on waist circumference, 80.5% based on waist to hip ratio and 56.5% based on weight to height ratio (Goon, Maputle, Olukoga, Lebesse, Khoza & Mothiba 2014:570). Goon *et al* (2014) pointed out that the high prevalence of abdominal obesity among nurses in the region was comparable to the general population of South Africa and that the majority of the nurses declined participation in physical activity.

The study found that abdominal obesity peaked between 40 and 49 years of age, indicating that this age group was at higher risk for diseases associated with obesity which, in turn, impacted on their abilities to meet the demands of their profession.

BMI**Table 4.13 Participants' weight results**

Weight	Pre-Test (n = 30)	Post-Test (n = 30)
Mean $\pm$ SD	30 $\pm$ 6.6	29 $\pm$ 6.7
Range	16.1 to 41.2	15.6 to 42.5
Underweight (< 18.5 kg/m ²)	2 (6.7%)	2 (6.7%)
Normal (18.5 to 24.9 kg/m ²)	7 (23.3%)	8 (26.8%)
Overweight (25 to 29.9 kg/m ²)	9 (30%)	8 (26.7%)
Obese ($\geq$ 30 kg/m ²)	12 (40%)	12 (40%)
Missing values	11	11

Table 4.14 presents the participants' distribution of weight by BMI categories.

Table 4.14 Participants' BMI by weight categories

		Pre-test (N=30)		Post –test (N=30)	
		Frequency	Percent	Frequency	Percent
Valid	Underweight	2	6.7	2	6.7
	Normal	7	23.3	8	26.7
	Overweight	9	30.0	8	26.7
	Obese	12	40.0	12	40.0
	Total	30	100.0	30	100.0

Discussion

Tables 4.13 and 4.14 indicate that of the participants, 40% (n=30) were within the obese class of BMI, 26.7% (n=30) were in the pre-obesity class, and 70% (n=30) were in the overweight class measured by the WHO (2014) norms (see Annexure U). In this study, 40% (n=12) of the participants had BMIs in excess of 40>kgm² and there was no trend either positively or negatively pre- and post-test.

The WHO (2014) BMI ranges are based on the effect excessive body fat has on disease and death and are reasonably well related to adiposity. BMI was found to be a risk indicator of disease; as BMI increases so does the risk for some diseases, such as premature death, cardiovascular diseases, high blood pressure, osteoarthritis, some cancers and diabetes (WHO 2014). Consequently, the participants in this study could have a higher risk of these diseases.

Obesity is a global public health concern and the World Health Organisation (WHO) has estimated that it affects 500 million people worldwide with this burden projected to increase to one billion obese globally by 2030 (Sartorius, Veerman, Manyema, Chola & Hofman 2015:1). In South Africa, obesity prevalence increased significantly from 23.5% in 2008 to 27.2% in 2012, with a significantly (p-value<0.001) higher prevalence among females (37.9% in 2012) compared to males (13.3% in 2012 (Sartorius et al 2015:4). The *South African Demographic and Health Survey (SADHS), 2016* found that 68% of women, and 31% of men were either over-weight or obese. The report also found that in South Africa 1 in 5 women (20%) were severely obese with a BMI in excess of 35>kgm² (NDOH, Stats SA, SAMRC & ICF, 2019)

In their survey in Las Vegas, Nevada, on overweight and obesity in nurses, advanced practice nurses and nurse educators, Miller, Alpert and Cross (2008:259) found that the grand mean BMI of the 760 participants was 27.2 and 54% were overweight or obese. Of these, 53% reported that they were overweight but lacked the motivation to make lifestyle changes; 40% were unable to lose weight despite healthy diet and exercise habits, and 26% used BMI to make clinical judgments of overweight and obesity. Although 93% of the participants acknowledged that overweight and obesity were a diagnosis requiring intervention, 76% did not pursue the topic with overweight and obese patients (Miller, Alpert & Cross 2008:259). Miller *et al's* (2008) study indicated a lower results for obesity than the current study (70%) although the grand mean body

mass index of 27.2 was high and comparable to this study. It is not clear how many of the nurses in this much larger sample of Miller et al's study were ED nurses and is of informative value only.

In South Africa, Skaal and Pengpid (2014:563) conducted a study to determine the prevalence of obesity and obesity-related health problems among healthcare workers and compare these variables between medical and nonmedical staff at one selected public hospital. The study focused on health care workers because they are considered role models for health in the eyes of their patients and their communities. A questionnaire was distributed to 200 respondents (100 medical staff and 100 non-medical staff) to assess self-reported body mass index (BMI), obesity-related health problems and perceptions about body weight. Of the participants, 73% were overweight or obese, and 50% had never tried to lose weight. Females and older healthcare workers were more obese than males and younger counterparts. There was no difference in BMI distribution between medical and non-medical staff. Of the participants, 34% reported that they suffered from obesity-related non-communicable diseases (hypertension 20% and diabetes 10%) and stress (32.5%). The study concluded that South African healthcare workers had a high prevalence of obesity-related non-communicable diseases and that a health promotion programme targeting healthcare workers was urgently needed to encourage weight control, urge the prevention of obesity-related NCDs and change self-perceptions of body weight, in order to improve their own health and make them better role models for the general public (Skaal & Pengpid 2014:563) This finding of 73% of Skaal and Pengpip's (2014) study equates broadly to the 70% finding of over-weight and obesity in this study although ED nurses were not specifically categorised.

In their study in three public hospitals in Pietermaritzburg, KwaZulu-Natal, Simfukwe, Van Wyk and Swart (2017:1276) explored the perceptions and attitudes about obesity among 18 healthcare workers and identify the barriers to adopting a healthy lifestyle. The study found that the participants were aware of the negative consequences of being obese or overweight, but only a few chose to adopt a healthy lifestyle.

In a study to determine the health concerns, health priorities and barriers to living a healthy lifestyle among nurses and hospital management staff in the Western Cape Metropole, Phiri, Draper, Lambert and Kolbe-Alexander (2014:1276) found that night shift nurses frequently identified weight gain and living with NCDs such as hypertension as their main health concerns. Being overweight was perceived to have a negative impact on work performance, and all the nurses (night and day shift) identified backache and exposure to TB as occupation-related health

concerns. The hospital environment was perceived as stressful and as having a negative influence on the nurses' lifestyle behaviours, including food service that offered mainly unhealthy foods. In addition, the nurses identified a need and preference for work health promoting programmes (WHPPs) that provided access to fitness facilities or support groups. Phiri, Draper, Lambert and Kolbe-Alexander (2014:1276) highlighted the need for programmes to support nurses in managing stress and transforming the work environment to facilitate healthy lifestyles.

Healthcare workers and shift workers have an increased risk for NCDs. Nurses particularly have a high prevalence of obesity, poor eating habits and insufficient physical activity and are at an increased risk for NCDs. In her study, Phiri (2015) described the health concerns, health priorities and determinants of healthy lifestyle behaviours among nurses and compared the objectively measured and self-reported physical activity and sedentary behaviour in day and night shift nurses. The results indicated that the night shift nurses identified weight gain and living with NCDs such as hypertension as their main health concerns. The results from the 64 nurses measured their physical activity levels by wearing an accelerometer showed that they met the recommendations of 150 minutes or more of moderate to vigorous physical activity per week. The nurses in the study were concerned about NCDs and being overweight; expressed an interest and willingness to participate in future hospital-based intervention programmes, and indicated a preference for work health-promoting programmes that provided access to fitness facilities or support groups (Phiri, 2015).

A meta-analysis of 26 studies quantitatively synthesized the available epidemiological evidence on the association between shift work and the risk of overweight and obesity (Liu, Shi, Duan, Liu, Li, Wang, Li, Yang, Gan, Wang, Cao & Lu 2018:1956). Liu, Shi, Duan, Liu, Li, Wang et al (2018:1971) concluded that individuals involved in shift work were more likely to become overweight or obese and appropriate interventions in the organisation of shift work schedules according to ergonomic criteria would allow shift workers to avoid potential health impairment. A cross-sectional study from April, 2013 to December, 2014 evaluated the association between shift work, quality of life and obesity among 200 healthcare workers of a Brazilian university hospital (Brum, Dantas Filho, Schnorr, Bertolotti, Bottega & da Costa Rodrigues 2020:5). The night shift workers were older, slept less hours, had higher weight, BMI and abdominal circumference than the day shift workers. The night shift workers had almost three times higher association with abdominal obesity independent of age and gender than the day shift workers. There was no

difference for quality of life between the shifts. Brum, Dantas Filho, et al (2020:5) found that night work was a risk factor for abdominal obesity, social jetlag was higher in the night shift workers and it was associated with the presence of obesity.

A study in Nicosia compared physical, psychological, and physiological adaptations between 40 rotating shift (RS) and morning shift (MS) nurses (Vlahoyiannis, Karali, Giannaki, Karioti, Pappas, Lavdas, Karatzaferi & Sakkas 2021:1). The RS nurses showed increased body mass and total and abdominal fat as well as decreased quality of life and sleep quality compared to the MS group. A strong relationship was found between physical, psychological, and physiological domains. Vlahoyiannis, Karali, Giannaki, Karioti, Pappas et al (2021:) concluded that further studies should consider workplace interventions to prevent obesity, promote physical activity, and manage poor sleeping patterns in nurses.

4.5.5 Participants' cardiovascular and cardio-respiratory fitness

The participants' cardiovascular and cardio-respiratory fitness was determined by the 'six-minute walk test'. **Table 4.15** presents the results.

Table 4.15 Participants' results of the 6-minute walk distance (in meters) (respiratory fitness) (N = 30)

Distance covered	n _{pre} = 30	n _{post} = 30
Mean ± SD	541.52 ± 61.72 *Normal	545.6 ± 49.4 *Normal
*95% CI		
Lower	518.37 ±37.64	526.45 ±31.98
Upper	560.93 ±83.95	561.82 ±63.82
Missing values	11	11
*95% CI were estimated using the bootstrapping method		

Source: American Thoracic Society (2002:115)

The norm is approximately 500m for healthy women and 580m for healthy men (American Thoracic Society 2002:115) (see Annexure V).

Discussion

The participants met the norm at both pre-test and post-test levels with no remarkable change following the intervention. The fact that the participants met the normal levels of cardiovascular fitness may be because of the physical nature and demands of ED nursing which requires nurses to be able to respond and physically move in and about the emergency department often under pressured circumstances including doing resuscitations and moving patients and equipment. The researcher has more than thirty years' nursing experience of which half was in emergency nursing and EDs are often under-staffed, placing physical demands on ED nurses.

One participant who walked the shortest distance pre-test improved by 60 meters in the post-test which is of significance.

The researcher found no studies using the 6-minute walk test to measure cardiovascular fitness of ED nurses.

4.5.6 Relationships between compassion and compassion fatigue and the fitness battery

Table **4.16** combines the statistics between the finding on levels of change of compassion and the results of the physical fitness tests in order to determine correlations.

Table 4.16 Summary of the relationships (P-values, Two-tailed T-Test) between the change in participants' levels of compassion and health-related physical fitness from pre- to post-intervention

Variables	Correlation	Compassion satisfaction	Compassion fatigue	Burnout	Secondary traumatic stress	Endurance	Flexibility left	Flexibility right	Muscle strength	Waist circumference	BMI	Cardio-vascular fitness
Compassion satisfaction (Na=29)	Pearson Correlation	1	-.468	-.379	-.441	-0.034	0.083	0.052	0.013	0.019	-0.317	0.23
	Sig. (2-tailed)		0.011*	0.043	0.017	0.868	0.676	0.795	0.959	0.922	0.094	0.229
Compassion fatigue (N=29)	Pearson Correlation	-.468	1	.809	.865	-0.064	0.201	0.315	0.062	0.356	0.03	-0.333
	Sig. (2-tailed)	0.011*		0.000**	0.000**	0.751	0.305	0.109	0.807	0.058	0.877	0.078
Burnout (N=29)	Pearson Correlation	-.379*	.809	1	.440	0.266	0.161	0.284	-0.064	.491	-0.156	-0.252
	Sig. (2-tailed)	0.043	0.000**		0.017*	0.18	0.412	0.151	0.8	0.007**	0.42	0.187
Secondary traumatic stress (N=29)	Pearson Correlation	-.441*	.865**	.440	1	-0.313	0.147	0.254	0.135	0.185	0.152	-0.362
	Sig. (2-tailed)	0.017	0.000**	0.017*		0.112	0.454	0.202	0.594	0.337	0.433	0.054
Endurance (N=27)	Pearson Correlation	-0.034	-0.064	0.266	-0.313	1	0.021	0.017	-0.155	0.11	-0.063	0.119
	Sig. (2-tailed)	0.868	0.751	0.18	0.112		0.917	0.936	0.522	0.577	0.751	0.548
Flexibility left (n=28)	Pearson Correlation	0.083	0.201	0.161	0.147	0.021	1	-0.177	0.391	-0.068	-0.111	-0.111
	Sig. (2-tailed)	0.676	0.305	0.412	0.454	0.917		0.367	0.098	0.726	0.568	0.565

Variables	Correlation	Compassion satisfaction	Compassion fatigue	Burnout	Secondary traumatic stress	Endurance	Flexibility left	Flexibility right	Muscle strength	Waist circumference	BMI	Cardio-vascular fitness
right Flexibility (N=27)	Pearson Correlation	0.052	0.315	0.284	0.254	0.017	-0.177	1	0.074	0.002	0.091	0.112
	Sig. (2-tailed)	0.795	0.109	0.151	0.202	0.936	0.367		0.772	0.994	0.644	0.572
strength Muscle (N=18)	Pearson Correlation	0.013	0.062	-0.064	0.135	-0.155	0.391	0.074	1	-0.099	0.45	0.269
	Sig. (2-tailed)	0.959	0.807	0.8	0.594	0.522	0.098	0.772		0.686	0.053	0.266
Waist circumference (N=29)	Pearson Correlation	0.019	0.356	.491	0.185	0.11	-0.068	0.002	-0.099	1	-0.218	-0.074
	Sig. (2-tailed)	0.922	0.058	0.007**	0.337	0.577	0.726	0.994	0.686		0.248	0.696
Weight (N=29)	Pearson Correlation	-0.317	0.03	-0.156	0.152	-0.063	-0.111	0.091	0.45	-0.218	1	-0.098
	Sig. (2-tailed)	0.094	0.877	0.42	0.433	0.751	0.568	0.644	0.053	0.248		0.607
Cardio-vascular fitness (N=29)	Pearson Correlation	0.23	-0.333	-0.252	-0.362	0.119	-0.111	0.112	0.269	-0.074	-0.098	1
	Sig. (2-tailed)	0.299	0.078	0.187	0.054	0.548	0.565	0.572	0.266	0.696	0.607	

Table 4.16 indicated the correlations between the participants' pre- and post-test measurements; that is, their levels of compassion satisfaction, compassion fatigue (burnout and secondary traumatic stress) and the six components of the physical fitness test (muscular strength, muscular endurance, flexibility, BMI and waist circumference) and cardiovascular fitness.

The following relationships between the components of the ProQOL tool were statistically significant:

- Compassion fatigue positively correlated with burnout
- Compassion fatigue positively correlated with secondary traumatic stress
- Burnout positively correlated with secondary traumatic stress

In terms of the fitness battery, as participants' burnout decreased, waist circumference (0.007) also decreased, also a positive significant relationship.

No further significant correlations between the elements of compassion (compassion satisfaction, compassion fatigue, burnout and secondary traumatic stress) and the various physical fitness elements of the test battery were found.

Discussion

The ProQOL tool is generally accepted to be conceptually sound and the results of the current study reconciled with the overall principle of a negative relationship between compassion satisfaction and compassion fatigue. The two components of compassion fatigue are burnout, where there is exhaustion, frustration, anger and depression, and secondary traumatic stress, which is a negative feeling driven by fear and work-related trauma (Stamm 2010:7; Zhang, Zhang, Han, Li & Wang 2018:5).

The results of this study are roughly comparable to a study using a sample of 83 trauma nurses which found that 55% of the participants had high compassion satisfaction, 61% had average burnout and 75% had average compassion fatigue (Wentzel & Brysiewicz (2014:95-97). In the current study 44% of the ED nurses had high compassion satisfaction with 70% average burnout pre-test although with a decrease post-test and the comparison is for context only.

In their study of 93 oncology nurses, Wells-English, Giese and Price (2019:490) found that participants who reported higher scores on the burnout ProQOL-V subscale also had higher secondary traumatic stress. and that nurses who experience greater satisfaction in their care

giving role, will less likely experience feelings of burnout and stress, and have less desire to leave their place of employment (Wells-English, Giese & Price 2019:491).

Although Mathieu (2007:4) indicated that physical exercise was a component of compassion fatigue resilience programmes, the current study only found a relationship between burnout and waist circumference. Nurses with bigger waist circumferences were more likely to suffer from back pain and other musculoskeletal conditions, potentially affecting their ability to meet the physical demands of their jobs, and these factors may possibly lead to burnout (Ross, Bevans, Brooks, Gibbons & Wallen 2017:267).

Melamed, Shirom, Toker and Berliner (2006:328) reviewed evidence that high levels of burnout and vital exhaustion posed significant risks to health, including cardiovascular disease and diabetes which is aggravated by obesity (Melamed, Shirom, *et al* 2006:328). In addition, burnout and high levels of stress led to poor health behaviours, including lack of physical exercise, which heightens risks of mental and physical health complications (Melamed *et al* 2006:328).

The results of the fitness battery components did not indicate whether the six-week physical exercise intervention was long enough to influence compassion satisfaction or counter compassion fatigue. In addition, physical exercise alone may not be sufficient.

In Spain, Ortega-Campos, Vargas-Román, Velando-Soriano, Suleiman-Martos, Guillermo, Fuente, Albendín-García and Gómez-Urquiza (2019:72) found that professionals working in cancer care were exposed to strong sources of stress. Their review and meta-analysis of 15 studies, with 900 nurses, found high burnout and compassion fatigue among nursing professionals, affecting more women and nurses with more years of experience, and one of the highest levels of burnout and compassion fatigue among nurses in oncology units. Ortega-Campos, Vargas-Román, Velando-Soriano, Suleiman-Martos *et al* (2019:72) state that burnout and compassion fatigue in nursing staff can be prevented and minimised with a correct evaluation and development of intervention programmes.

Ross, Bevans, Brooks, *et al* (2017:267) point out that although nurses are knowledgeable about health-promoting activities, such as healthy eating, physical activity, and stress management, they may not follow recommended guidelines for physical activity and healthy nutrition. Long hours, work overload, and shift work can be stressful and contribute to job satisfaction, burnout and health consequences such as obesity and sleep disturbances. Chronic stress is associated with weight gain, abdominal adiposity, and obesity and

inadequate sleep can affect immune system function and memory processing (Ross, Bevans, *et al*, 2019: 275). Moreover, intrinsic barriers, such as age, fatigue, depression and anxiety, and extrinsic barriers, such as lack of time and money, institutional and social support, lessen motivation and participation (Ross *et al* 2019:270). Ross Bevans *et al* (2017:274-275) give examples and recommend workplace interventions that target physical activity, stress reduction and diet, and emphasise that health-promoting interventions should be ongoing, permanent components in the workplace and not just limited-time events.

In a study with a 12-week programme of physical activity, as an incentive for nurses called “Nurses Living Fit”, that involved 12 weekly exercise classes and information on healthy lifestyle, nutrition, and adequate sleep was found to be effective in reducing the prevalence of overweight in the participating nurses (Ross, Bevans *et al* 2017:267-275). Ross Bevan *et al*’s study raises the question whether an intervention, which is a more structured and more comprehensive, than the current study should be considered and emphasised that health-promoting interventions should be ongoing, permanent components in the nursing workplace and not just limited-time events (Ross, Bevans *et al* 2017:275).

Boyle (2011) suggests three categories of appropriate interventions for the management of compassion fatigue. These interventions must be multifaceted and include prevention, assessment, and consequence minimisation. The three categories are firstly “work/life” balance to enable nurses to invest time and energy into nurturing the self, in order to nurture others (Boyle 2011:5). Boyle (2012) further stated that the use of exercise and attention to diet are central to work/life balance, as is focusing attention on pleasurable, non-work-related activities that promote pacing and personal planning. Journaling and meditation are other self-care strategies. The second of Boyle’s categories is education which is not directly relevant to this study Boyle’s third category deals with work setting interventions to manage compassion fatigue and include on-site counselling, support groups for staff, de-briefing, art therapy, massage sessions, bereavement interventions and attending to spiritual needs.

In a recent study of the literature on the issue of compassion levels in oncology nurses, it was found that the increase in cases of burnout and compassion fatigue in nursing can be prevented and minimized with a correct evaluation and development of intervention programs, considering that there are more women than men and that they seem to be more vulnerable. The study endorses research findings that mindfulness and meditation programmes reduces stress and emotional tension from exposure to patients with severe health conditions. In addition to group support sessions, an innovative suggestion proposed was the use of technology mobile phone applications, (“apps”) which have been used with mindfulness, as a

very effective approach in reducing burnout. It is a flexible introduction to the practice of mindfulness and can also increase work commitment, job satisfaction, innovation and creativity, and self-efficacy. (Ortega-Campos, Vargas-Román, Velando-Soriano, Suleiman-Martos, Guillermo, Fuente, Albendín-García, Gómez-Urquiza 2019:12).

In Minneapolis, USA, Lawrence (2019) in her doctoral dissertation addressed the problem of ED nurses' lack of knowledge related to compassion fatigue in the work setting which negatively impacted their ability to provide quality care to patients. One of Lawrence's categories of dealing with compassion fatigue is

self-care and revitalization which is to refuel one's self to continue to be able to provide care to others and to develop a program of self-care that incorporates all areas of life: relational, physical, spiritual, professional, as well as to engage in behaviours that revitalizes one's self.

Self-care was found to be the most significant preventive measure healthcare professionals can take to protect themselves from developing compassion fatigue. (Lawrence 2019:27)

4.6 SUMMARY

This chapter discussed the data analysis and interpretation and findings, with reference to the literature reviewed. The relationship between exercise and compassion is more complex than a simple linear relationship and to improve compassion satisfaction requires combining exercise with other interventions to combat compassion fatigue.

Chapter 5 briefly discusses the conclusions and makes recommendations for practice, nursing education and management, and further research.

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CHAPTER 5

CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

Chapter 4 discussed the data analysis and results. This chapter briefly presents the findings and limitations of the study, and makes recommendations for practice, education and further research.

5.2 AIM AND OBJECTIVES OF THE STUDY

The aim of the study was to determine the effects of health-related physical fitness on compassion satisfaction in ED nurses, using motivational interviewing as a technique and a six-week physical exercise intervention. In this context, the secondary aim was assessing the levels of compassion of the participating ED nurses using the ProQOL tool, to determine their professional quality of life.

In order to achieve the aim, the primary objectives of the study were to:

- Objective 1: Determine the level of compassion before the intervention (pre-test).
- Objective 2: Determine the level of compassion after the intervention (post-test).
- Objective 3: Determine the health-related physical fitness before the intervention (pre-test).
- Objective 4: Determine the health-related physical fitness after the intervention (post test).
- Objective 5: Determine the relationship between the change in compassion with the change in health-related physical fitness from baseline to post-intervention.

5.3 CONCLUSIONS

The conclusions and summary of the results are presented in terms of the objectives.

5.3.1 Objectives 1 and 2: Determining Level of Compassion

The participants completed the ProQOL test, which measured their levels of compassion satisfaction pre-test and post-test. The ProQOL test also measured compassion fatigue, comprising of levels of burnout and secondary traumatic stress.

Pre-Test

Compassion satisfaction

Of the participants in the pre-test (N=41), 44% (n=18) had high, 56% (n=23) had average levels of compassion satisfaction, and none (0%) had low levels of compassion satisfaction;

Burnout

70.7% of the participants (n=29) had average, 26.8% (n=11) had low, and 2.4% (n=1) had high levels of burnout;

Secondary traumatic stress

80.5% of the participants (n=33) had average, 19.5% (n=8) had low, and none (0%) had high levels of secondary traumatic stress. (see Table 4.3)

Post-Test

Compassion satisfaction

10% of the participants showed low levels of compassion satisfaction with 46.7% average levels and 43.3% had high levels of compassion satisfaction.

Burnout

Of the participants in the post-test (N=30), 100% (n=30) had low levels of burnout, and none (0%) had average or high levels of burnout;

Secondary traumatic stress

40% (n=12) had low, 60% (n=18) had average and none (0%) had high levels of secondary traumatic stress (see chapter 4, Table 4.3).

5.3.2 Objectives 3 and 4: Health-related physical fitness

The study examined the participants' pre- and post-test health-related physical fitness by means of a test battery, which consisted of five elements measuring: muscle endurance, flexibility, muscular strength, anthropometry and cardiovascular and cardiorespiratory fitness.

The results indicated that the participants in both the pre- and post-test performed at average level and maintained a solid normative level Muscular strength, however, measured by the leg press, indicated that the participants were above the norm.

Regarding anthropometry, the World Health Organization (2008:21) states that for men, a waist circumference of 94 centimetres or more indicates an increased risk of chronic disease and a measurement of 102 centimetres or more indicates a higher increased risk of chronic disease. For women, a waist circumference of 80 centimetres or more indicates an increased risk of chronic disease and a measurement of 88 centimetres or more indicates a higher increased risk of chronic disease.

In this study, a mean waist circumference for the participants indicated that the females were on average overweight before and after the intervention. Waist circumference provides a better estimate of visceral fat deposition, which is related to obesity comorbidities, but cannot differentiate fat distributed to the centre of the abdomen, subcutaneous tissue, or total body fat. However, waist circumference correlates strongly with BMI (Baïoumi 2019:1).

Of the participants 70% (n=29) did night duty and the average of their waist circumference (90.71 cm) was higher than the recommended non-risk norm.

Regarding BMI, 40% (n=30) were within the obese class of BMI, pre- and post-test. 30% (n=9) and 23.3% (n=7) were in the normal class pre-test and 26.7% (n=8) were post-test measured by the WHO (2014) norms.

Regarding waist circumference, the participants' mean was 90.25 cm pre-test and 90.71 cm post-test which was higher than the WHO norms and indicated a high risk of chronic disease.

The participants' cardiovascular and cardio-respiratory fitness was determined by the 'six-minute walk test'. The findings revealed that the participants met the normal level of cardiovascular fitness at both pre-test and post-test levels with no remarkable change

following the intervention. One participant, who walked the shortest distance pre-test, improved significantly by 60 meters in the post-test.

Overall there was no remarkable increase in the six physical fitness component levels before and after the intervention.

5.3.3 Objective 5: Relationship between Compassion and Physical Fitness

The combined results indicated some correlations between the participants' pre- and post-test measurements of compassion; that is, their levels of compassion satisfaction, compassion fatigue (burnout and secondary traumatic stress) with the following relationships between the components of the ProQOL tool were statistically significant:

- Compassion fatigue positively correlated with burnout
- Compassion fatigue positively correlated with secondary traumatic stress
- Burnout positively correlated with secondary traumatic stress

Compassion levels before and after the intervention generally did not show any - correlations with the six components of the physical fitness test (muscular strength, muscular endurance, flexibility, BMI and waist circumference and cardiovascular fitness). The only exception being that waist circumference was found to be the only variable that correlated positively and significantly ($p = .007$) with one of the components of compassion, namely compassion fatigue, and specifically burnout where that as participants' burnout decreased, waist circumference also decreased.

No further significant correlations between the elements of compassion (compassion satisfaction, compassion fatigue, burnout and secondary traumatic stress) and the various physical fitness elements of the test battery were found.

5.4 EVALUATION OF THE STUDY

The *My Journey to Physical Fitness Booklet* was developed according to the principles of brief motivational interviewing and a health-related fitness programme, and was found valid by experts. Generally the Booklet was well received and understood by the participants with no criticism being received from the participants. Valid and reliable instruments and tests were used to measure compassion and the six components of health-related physical fitness which

ensured credible results. The data analysis of the results provided challenges with data capture which impacted the results.

On reflection the researcher experienced a positive confirmation, not only from the participating ED nurses and the literary review, but also from medical colleagues that the research topic and method was very relevant and appropriate, but the frustrations of available time to over-worked ED nurses made the research difficult to conduct as the smaller post-test sample showed.

The objective to measure compassion and quality of life with the ProQOL tool proved insightful as did the results of the physical fitness tests which indicated that the sample of ED nurses, however small, required more healthy lifestyles and some interventions to assist them.

The ED nurses generally had high levels of compassion satisfaction although the question of whether higher levels of physical fitness would positively influence compassion satisfaction levels was not clearly evident mostly due to the limitations set out below.

5.5 LIMITATIONS

The researcher identified the following limitations of the study. A major limitation of the study was that the planned motivational interviewing workshop did not take place. The participants were expected to work through the *My Journey to Physical Fitness* workbook, which included the motivational interviewing principles, individually and the researcher could not monitor whether they completed this task before commencing the exercise programme. The researcher asked the participants to do an exercise at home to identify the pros and cons for doing physical exercise. However, the section in the booklet did not provide a place for the participants to write out their pros and cons for exercising. In addition, a further question could have been asked on how their core values could assist in performing the exercise programme. In addition, the researcher did not let the participants post the ground rules for the intervention on the WhatsApp group during the intervention, but allowed them to develop their own etiquette for communicating with one another.

The study centred on the role of physical exercise as related to the compassion of ED nurses; tested whether physical exercise, including cardiovascular fitness, muscular strength and flexibility, built resilience in ED nurses in maintaining compassion, and further, investigated the effectiveness of a six-week physical fitness intervention programme, based on the motivational interviewing method, appropriate for ED nurses, to assess whether physical

fitness plays a positive role in compassion as an essential element of quality nursing care. The study did not, however, examine lifestyle and personal factors that might influence compassion, including individual eating habits, use of alcohol or smoking, sleep patterns, reflection and meditation.

The researcher used convenience sampling, and the participants did not, therefore, represent all ED nurses and the findings cannot be generalised to all ED nurses outside of the greater Tshwane Metropolitan region in Gauteng province, other provinces or countries. Owing to the small sample size, the design may have been underpowered to detect differences in responses between compassion satisfaction and compassion fatigue, as well as the fitness variables. O'Callaghan et al (2019) state that it is possible that the respondents who self-select to participate because they were nurses who have manageable burnout and low stress levels. These respondents may have other intrinsic physical or mental strengths to better manage their stress levels compared to those non-respondents. In addition, the participants may have had more intrinsic motivation to participate in a physical activity programme.

The drop-out rate was 27% between pre-test and post-test. Therefore, all the findings need to be interpreted with utmost caution. The external validity of the study is weak, and findings cannot be generalised. The test- and re-test design is not optimal to determine the effect of an intervention, as indicated in Chapter 3. Owing to the small sample size, the design may have been underpowered to detect differences in responses between compassion satisfaction and compassion fatigue, as well as the fitness variables.

5.6 RECOMMENDATIONS

Based on the findings, the researcher makes the following recommendations for management, education and further research.

5.6.1 Management

Hospital and ED unit managers should:

- Evaluate and introduce appropriately resourced on-site workplace interventions and facilitate strategies that address ED nurses' clinical welfare to reduce and manage risks of emotional strain and compassion fatigue. This could include counselling, support groups, de-briefing, and spiritual support.
- Continuously monitor the compassion levels of nurses working in EDs, using the ProQOL tool. Implement activities to promote compassion satisfaction, such as co-

constructing collaborative values clarification and goals with nurses in a non-judgmental way.

- Establish organizational and cultural values of teamwork, nurturing and mutual support in ED teams through use of professional human resource management techniques.
- Promote and design fitness programs, including health lifestyle behaviour programs to encourage weight control, prevent obesity related NCDs and change self-perceptions of body weight in order to improve nurses' health.
- Provide and promote affordable healthy food options.
- Make physical activity and exercise facilities available to enable nursing staff to access them at times convenient to their work schedule. (Simfukwe et al 2017:13).

5.6.2 Education

The Department of Education, the SANC and nurse educators should ensure that knowledge and an understanding of compassion satisfaction and compassion fatigue, especially burnout and secondary traumatic stress, are included in nursing curricula. This would not only make students aware of the challenges in stressful settings, such as the ED environment, but will enable them to monitor their own levels of compassion in order to take timely action and use self-care strategies to build resilience against compassion fatigue.

Human resource departments in both the private and public sector hospitals should, on a continuous basis, provide relevant informative communications to ED nurses on the risks of compassion fatigue and the benefits of compassionate nursing care to ensure better patient outcomes. In addition, ED nurses should be provided with relevant information on self-care strategies to assist them in maintaining a healthy work/life balance and professional quality of life.

5.6.3 Further research

Further research should be conducted on the following topics:

- An investigation of the relationship between levels of compassion on the one hand and shift work, family life, healthy lifestyle and job satisfaction on the other.
- Professional ED nurses' perceptions of the challenges to compassion satisfaction which may include work, family life and lifestyle factors.
- An examination of lifestyle factors that might influence compassion, such as individual eating habits, use of alcohol or smoking, sleep patterns, mindfulness and meditation.

- Evaluating compassion satisfaction and compassion fatigue by measuring the negative and positive effects of helping others who experience suffering and trauma, using the ProQOL-21.
- Investigating the link between stress, burnout and being overweight among ED nurses.
- Facilitators of, and barriers to, strategies to improve compassion satisfaction among ED nurses.
- Excessive workloads, organisational inattentiveness to nurses' needs, lack of role models for compassionate care, and focus on routines and protocols, instead of patients, as barriers to compassionate care
- Improving ED nurses' working lives and mental health to prevent burnout and secondary traumatic stress.
- Determining effective, sustainable interventions to build resilience and manage unavoidable stressors in the ED to improve quality professional nursing care
- Assessing and analysing patients' perceptions and experience of compassionate nursing care in the ED.
- Investigating the concept of compassion in nursing education and assessing the content of programs, which include ethics and compassionate nursing care.
- Assessing the impact and negative effects of compassion fatigue, including burnout and secondary traumatic stress, on ED nurses and ED's.

5.7 CONCLUSION

Compassion plays a critical role in professional nursing care to ensure quality patient outcomes and experiences. The findings of this study highlight the critical role compassion plays in professional nursing care to ensure quality patient outcomes and experiences as well as the need for renewed awareness of the negative risks to both ED nurses and the healthcare system of compassion fatigue.

In conclusion:

Compassion is the human and moral part of care, and according to many nursing literatures, compassion is the philosophical foundation and centrepiece of the nursing profession. Being compassionately responsive to the care needs of patients is one of the professional standards of nursing. (Dalvandi, Vaisi-Raygani, Nourozi, Edabi & Rahgozar 2019:1047).

The expectation that we can immerse ourselves in suffering and loss daily and not be touched by it, is as unrealistic as expecting to be able to walk through water without getting wet. (Dr Naomi Rachel Remen, 1996).

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ANNEXURE A

**ETHICS APPROVAL:
UNIVERSITY OF PRETORIA**





UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Health Sciences

Institution: The Research Ethics Committee, Faculty Health Sciences, University of Pretoria complies with ICH-GCP guidelines and has US Federal wide Assurance.

- FWA 00002567, Approved dd 22 May 2002 and Expires 03/20/2022.
- IORG #: IORG0001762 OMB No. 0990-0279 Approved for use through February 28, 2022 and Expires: 03/04/2023.

Faculty of Health Sciences Research Ethics Committee

11 November 2021

Approval Certificate Annual Renewal

Dear Mrs M Smith

Ethics Reference No.: 156/2018

Title: Motivational interviewing for increasing physical exercise to influence compassion and fitness of nurses in emergency departments

The **Annual Renewal** as supported by documents received between 2021-11-09 and 2021-11-10 for your research, was approved by the Faculty of Health Sciences Research Ethics Committee on 2021-11-10 as resolved by its quorate meeting.

Please note the following about your ethics approval:

- Renewal of ethics approval is valid for 1 year, subsequent annual renewal will become due on 2022-11-11.
- Please remember to use your protocol number (156/2018) on any documents or correspondence with the Research Ethics Committee regarding your research.
- Please note that the Research Ethics Committee may ask further questions, seek additional information, require further modification, monitor the conduct of your research, or suspend or withdraw ethics approval.

Ethics approval is subject to the following:

- The ethics approval is conditional on the research being conducted as stipulated by the details of all documents submitted to the Committee. In the event that a further need arises to change who the investigators are, the methods or any other aspect, such changes must be submitted as an Amendment for approval by the Committee.

We wish you the best with your research.

Yours sincerely

On behalf of the FHS REC, Dr R Sommers

MBChB, MMed (Int), MPharmMed, PhD

Deputy Chairperson of the Faculty of Health Sciences Research Ethics Committee, University of Pretoria

The Faculty of Health Sciences Research Ethics Committee complies with the SA National Act 61 of 2003 as it pertains to health research and the United States Code of Federal Regulations Title 45 and 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, Second Edition 2015 (Department of Health)

ANNEXURE B

**PERMISSION TO USE THE
PROFESSIONAL QUALITY OF
LIFE SCALE**



Annexure B

Permission to use the Professional Quality of Life Scale (ProQOL instrument Version 5:2009)

Permission for Use of the ProQOL (Professional Quality of Life Scale:

Compassion Satisfaction and Compassion Fatigue)

www.proqol.org

Accompanied by the email to you, this document grants you permission to use for your study or project

The ProQOL (Professional Quality of Life Scale: Compassion Satisfaction and Compassion Fatigue) www.ProQOL.org

Prior to beginning your project and at the time of any publications, please verify that you are using the latest version by checking the website. All revisions are posted there. If you began project with an earlier version, please reference both to avoid confusion for readers of your work.

This permission covers non-profit, non-commercial uses and includes permission to reformat the questions into a version that is appropriate for your use. This may include computerizing the measure.

Please print the following reference or credit line in all documents that include results gathered from the use of the ProQOL.

Stamm, B. H. (2010). The ProQOL (*Professional Quality of Life Scale: Compassion Satisfaction and Compassion Fatigue*). Pocatello, ID: ProQOL.org. retrieved [date] www.proqol.org

Permission granted by

Beth Hudnall Stamm, PhD

Author, ProQOL

ProQOL.org

info@proqol.org

Help us help all of us. Please consider donating a copy of your raw data to the data bank.

You

can find more about the data bank and how you can donate at www.proqol.org and

www.proqol.org/Donate_Data.html. Data donated to the ProQOL Data Bank allow us to

advance the theory of compassion satisfaction and compassion fatigue and to improve and norm the measure itself

ANNEXURE C

**PERMISSION LETTER FROM
VIRGIN ACTIVE**



Mary-Ann Smith

Permission Letter from Virgin Active



To whom it may concern

I, Tessa Groenewald, Club General Manager at Loftus Virgin Active, hereby give Mary Ann Smith, (University student number # 10666703), permission to do fitness tests on nurses for her M.Cur degree.

Regards

A handwritten signature in black ink, appearing to read "Tessa Groenewald", written over a horizontal line.

Tessa Groenewald
Club General Manager
Loftus Virgin Active
tessa.groenewald@virginactive.co.za
012-4925830

ANNEXURE D

**MY JOURNEY TO PHYSICAL
FITNESS BOOKLET**



Annexure D: My Journey to Physical Fitness Booklet



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denkielers • Leading Minds • Dikgopolo tša Dihlalefi

My journey towards physical fitness



*'Physical fitness is not only one of the most important keys to a healthy body,
it is the basis of dynamic and creative intellectual activity'*

John F Kennedy

My unique number

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Note

All the grey highlighted areas in the booklet guide the facilitators during the intervention. The grey highlighted text will be removed before the booklet is handed out to the participants.

1 INTRODUCTION

Congratulations on taking my first step to increase my physical exercise quest.

This booklet will provide me with an opportunity to

- 1) think about my current level of fitness,
- 2) share the importance of physical exercise with my colleagues,
- 3) change the way I think about incorporating exercise into my everyday life,
- 4) improve my readiness and confidence to exercise and
- 5) plan, implement, document and reflect on my six-week journey towards my personal goals relating to increasing my physical activity.



Facilitators

Throughout the intervention motivational interview, the facilitators will adhere to the:

- a) spirit of motivational interviewing throughout the process, which include four key elements: 1) partnership, 2) acceptance, 3) compassion and 4) evocation
- b) core motivational interviewing skills namely: open-ended questions, affirmations, reflections and summaries (OARS)
- c) critically reflect on the way in which the motivational interview intervention was implemented

Douailhy et al (2014:21; 38)

Krejci and Neugebauer (2015:23-24)

2 ENGAGE

Facilitators

Give a brief overview of study. Ensure that all the participants have been telephonically pre-screened using the 2017 Par-Q+. Participants will sign the document and receive an electronic version. Circulate a name list with contact details (cell number and e-mail) and unique name of each participant. The supervisor will keep the list and the names of the participants will remain confidential throughout the study. The participant information leaflet will be discussed, participants will be given an opportunity to ask questions and informed consent will be obtained from volunteers. Facilitators will emphasize that they are there to facilitate learning and support the participants to learn about themselves and how they can make changes to increase physical exercise into their daily lives.

2.1 OPENING MOVE

Facilitators

Ask the participants to: select one of the positive thinking cards on the table and then introduce themselves to the group and give a reason for selecting the specific card.

Wagner and Ingersoll (2013:334)

2.2 SET THE FRAME

Facilitator

Set the frame to establish a safe and productive group environment. Facilitate the group to reach consensus on ground rules that will be adhered to by the facilitators as well as participants throughout the intervention (e.g. psychological safe environment, everybody's voice will count, no cell phones).

Wagner and Ingersoll (2013:335)

Provide a brief overview on the principles of motivational interviewing, where participant autonomy and self-efficacy will be emphasized.

Krejci and Neugebauer (2015: 30)

My own notes on the set ground rules for the group

3 FOCUS

Facilitators

Remind the participants that the focus on **increasing physical exercise** and

- do not adopt the role of expert
- allow participants to listen to others and share their determination, commitment and previous successes as this may shift some participants' to change
- provide opportunity for sharing successes as change talk from members who have experienced success may experience consolidation to commit to change

Ask the participants to sit in small groups (3 to 5).

Reflect on how active I currently am?

Braudi 2005

What makes me not to exercise?

What might get into the way for me not to exercise?

What is there in it for me not to exercise?

4 EVOKE

Facilitators

Pair and share (2 members per group)

4.1 AMBIVALENCE

Do you have some mixed emotions about starting your exercise journey? Write short notes on these emotions and share these feelings with the person next to you (e.g. you may feel hopeful on the one side, but feel doubtful on the other side).

Wagner and Ingersoll (2013:336)

4.2 EXPLORE FUNCTIONS

Facilitators

Ask the participants to sit in small groups (3 to 5)

Wagner and Ingersoll 2013:337

Discuss the potential pros and cons of physical exercise.

Pros	Cons

4.3 EXPLORE VALUES

Facilitator

Form small group (3 to 5 members).

Wagner and Ingersoll (2013:337)

List three to five of your core values (e.g. honesty, courage, commitment)

Now, in your group, reflect on how exercise may positively influence your values in terms of:

a) Self

b) Relationships (family/friends/colleagues)

c) Responsibility (home/work)

4.4 EXPLORE IMPORTANCE AND CONFIDENCE

Wagner and Ingersoll 2013:338

Facilitators

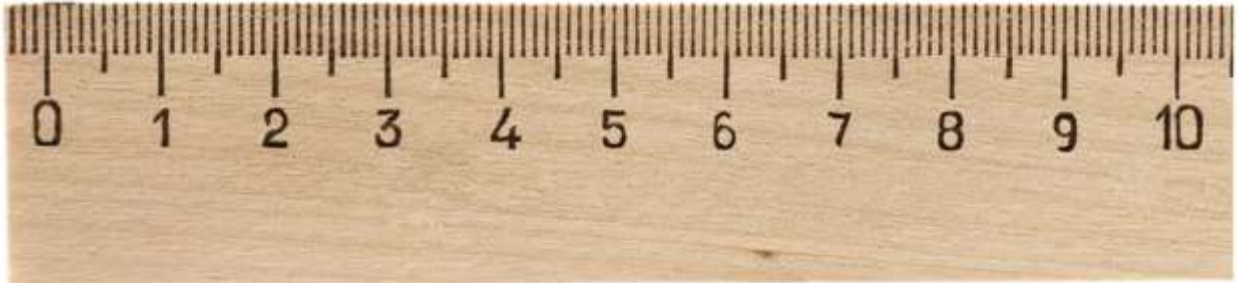
Self-activity

Using the ruler below, circle a number to indicate how IMPORTANT it is for me to exercise?

Not IMPORTANT at all

extremely

IMPORTANT



I selected number _____ Explain why I selected the specific number and not two numbers below?

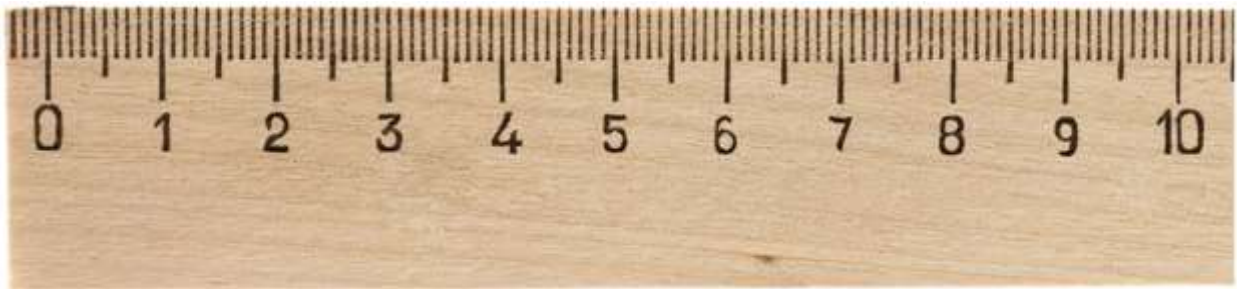
(E.g. I selected number **3**. Explain why I did not select numbers **1 or 2**?)

What would it take to move up two or more points to change my view of the importance of exercise?

Using the ruler provided below, circle a number to indicate how **CONFIDENT** you are to exercise?

Not **CONFIDENT** at all

Extremely **CONFIDENT**



I selected number _____ Explain why I selected the specific number and not two numbers below?

(E.g. I selected number **3**. Explain why I did not select numbers **1 or 2**?)

What would it take for me to move up two or more points to become more confident to exercise?

5 BROADEN PERSPECTIVES

Facilitators

First reflect as individual and then pair and share

5.1 INCREASE IMPORTANCE

What would I like my life to look like in five (5) years if I have increased my current physical activity level? Think about the things that I value and the difficulties I have identified; how would these be different?

5.2 BUILD CONFIDENCE

Write short notes on and then share a story when I was physically fit. Consider elements such as how I felt when I was physically fit, what were the actions that I took to become fit and what lessons have I learnt that will assist me in this journey.

What strong points do I have that could help me succeed in exercising regularly?

What support do I have that could help me succeed in exercising regularly?

When in my life have I made up my mind to do something, and did it?

Brainstorm with a person next to me when in my life I made up my mind to do something and did it. Reflect on your characteristics of successful changers that assisted me to successfully achieve my goal. All ideas are acceptable, no matter how silly or unrealistic they might seem. I can use the table below to guide my discussion.

You the following examples of characteristics of successful changers (Select by circling from the following)

Accepting	Committed	Flexible	Persevering	Stubborn
Active	Competent	Focused	Persistent	Thankful
Adaptable	Concerned	Forgiving	Positive	Thorough
Adventuresome	Confident	Forward-looking	Powerful	Thoughtful
Affectionate	Considerate	Free	Prayerful	Tough
Affirmative	Courageous	Happy	Quick	Trusting
Alert	Creative	Healthy	Reasonable	Trustworthy
Alive	Decisive	Hopeful	Receptive	Truthful
Ambitious	Dedicated	Imaginative	Relaxed	Understanding
Anchored	Determined	Ingenious	Reliable	Unique
Assertive	Die-hard	Intelligent	Resourceful	Unstoppable
Assured	Diligent	Knowledgeable	Responsive	Vigorous
Attentive	Doer	Loving	Skilful	Visionary
Bold	Eager	Mature	Solid	Whole
Brave	Earnest	Open	Spiritual	Willing
Bright	Effective	Optimistic	Stable	Winning
Capable	Energetic	Orderly	Steady	Wise
Careful	Experienced	Organised	Straight	Worthy
Cheerful	Faithful	Patient	Strong	Zealous
Clever	Fearless	Perceptive	Sensible	Zestful

The purpose of this table is to prompt you to find and identify approximately three (3) positive attributes and personal strengths to help you make a change to adopt more physical exercise into your lifestyle.

6 MOVING INTO ACTION

6.1 INTRODUCTION TO PHYSICAL EXERCISE

Health-related fitness consists of five components: 1) cardio respiratory endurance, 2) muscular strength, 3) muscular endurance, 4) flexibility and 5) body composition. It is best if I start at a level doing the exercise that I am comfortable with. Today I will set a goal(s) for myself for the first week of my exercise journey. In Appendix A is a table with the optimum amount of exercise generally prescribed for me to be healthy. I can slowly increase my activity and exercise at a pace that suits me, starting at my CURRENT level of activity. This is not a competition with others. Any activity of at least 10 minutes is better than none.

6.2 SET MY GOALS

My main goal(s) for the six-week physical exercise journey is to:

6.3 SPECIFIC ACTIONS TO BECOME MORE ACTIVE



Week 1

From Sunday the ____ of _____ 2018 to Saturday the ____ of ____ 2018

My goal is to:

I **plan** to do the following actions during **Week 1** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 1**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 2

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 2** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 2**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 3

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 3** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 3**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 4

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 4** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 4**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 5

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 5** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 5**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ <i>days</i>			Total time I exercised this week _____ <i>hours</i> and _____ <i>minutes</i>

What worked well during this week? What could I do better next week?

Week 6

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 6** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 6**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

7 PRINCIPLES WHEN SUPPORTING EACH OTHER

Facilitator

Emphasize the importance of adhering to the principles of motivational interviewing during discussions and support on the WhatsApp group.

Establish and maintain a motivational interviewing-consistent group climate on the WhatsApp, where the researcher will be part of the group. The WhatsApp group is for supporting each other and the data will not be used in the study

- Model the spirit of motivational interviewing throughout the intervention through for example openness, acceptance, respect, genuine positive regards
- Be vigilant and respond promptly to violations on the WhatsApp group without being punitive or critical (e.g. group members pushing each other to change, criticizing each other's point of view, failing to listen)
- Proactively offer affirmations to individuals who chats on WhatsApp using the principles of motivational interviewing

The following principles will be discussed in the group that should adhere to when supporting each other on the WhatsApp:

- Motivation to change is elicited from myself and not imposed from others in the group
- We should not give advice and by all means avoid 'solution talk'
- We should not judge each other
- We should use affirmative language (e.g. I hear, I understand)
- Acknowledge and respect each other's feelings

Krejci and Neugebauer (2015:29; 31; 32)

Miller (2012:6)

How will we support each other via a WhatsApp group to enhance the chances of us being successful in our six-week exercise journey?



8 RESOURCES

For additional information, I may find the following websites or applications (Apps) valuable.

8.1 WEBSITES

Allinah Health Patient Education Department. 2009. Exercise and physical activity, viewed 29 November 2017, <https://www.allinahealth.org/Health-Conditions-and-Treatments/Health-library/Patient-education/Prediabetes/Benefits-of-exercise-and-physical-activity/>

Government of Canada. 2011. Physical activity, viewed 30 November 2017, <https://www.canada.ca/en/public-health/services/health-promotion/healthy-living/physical-activity.html>

Medline Plus: Trusted Health Information for You. 2017. Indoor fitness routine, viewed 29 November 2017 <https://medlineplus.gov/ency/patientinstructions/000890.htm>

Medline Plus: Trusted Health Information for You. 2017. Outdoor fitness routine, viewed 29 November 2017 <https://medlineplus.gov/ency/patientinstructions/000891.htm>

Medline Plus: Trusted Health Information for You. 2017. Make time to move, viewed 29 November 2017 <https://medlineplus.gov/ency/patientinstructions/000765.htm>

United States Department of Health & Human Services: National Institute on Aging. 2009. Your everyday guide: Exercise & physical activity, viewed 29 November 2017 https://go4life.nia.nih.gov/sites/default/files/nia_exercise_and_physical_activity.pdf

United States Department of Health & Human Services: National Institute on Aging. Exercise and physical activity, viewed 29 November 2017, <https://www.nia.nih.gov/health/exercise-physical-activity>

United States Department of Health & Human Services. 2017. Be active your way, viewed 29 November 2017 <https://health.gov/paguidelines/pdf/adultguide.pdf>

United States Department of Health Promotion. 2017. Physical activity for Americans, viewed 29 November 2017 <https://health.gov/paguidelines/guidelines/>

Western Cape Government. 2017. WerternCape on Wellness, viewed 29 November 2017, <https://www.westerncape.gov.za/westerncape-on-wellness/doing-enough-physical-activity>

World Health Organization (WHO). 2017. Global strategy on diet, physical activity and health, viewed 30 November 2017, <http://www.who.int/dietphysicalactivity/pa/en/>

8.2 APPLICATIONS (APPS)

I can also consult and/or use one of the many exercise applications (apps) available such as the 7-minute workout apps. Reminder: If I use a 7-minute workout app, then I should repeat some of the exercises (or the entire set) at least twice to exercise for a minimum of 10 minutes.

9 REFERENCE LIST

The following list of references were used to compile my booklet:

American College of Sports Medicine (ACSM). 2014. ACSM's guidelines for exercise testing and prescription. 9th edition. Philadelphia: Lippincott Williams & Wilkins.

Douaihy, A, Kelly, KM & Gold, MA. 2014. Motivational interviewing: a guide for medical trainees. New York: Oxford University Press.

Krejci, J & Neugebauer, Q. 2015. Motivational interviewing in groups: group process considerations. *Journal of Groups in Addiction & Recovery*, 10:23-40.

McKeag, DB & Moeller, JL. 2007. ACSM's Primary Care Sports Medicine. 2nd edition. Philadelphia: Lippincott Williams & Wilkins.

Miller, A. 2012. Instructor's manual for resolving ambivalence in motivational interviewing with Cathy Cole, LCSW, viewed 29 November 2017 <http://www.psychotherapy.net/data/uploads/5113e32091979.pdf>

Nieman, D. 2011. Exercise testing and prescription: A health-related approach. 7th edition. New York: McGraw-Hill.

Rollnick, M. 2002. Motivational interviewing. 2nd edition. New York: The Guildford Press.

Wagner, CC & Ingersoll, KS. 2013. Motivational interviewing in groups. New York: The Guildford Press.

Appendix A

How do I progress?

Type of exercise	How to progress
Cardio respiratory endurance	Increase the time of the exercise (minutes per session): 5-10 minutes every 1-2 weeks Gradually increase the intensity of the exercise (without becoming excessively short of breath, tired or experience muscle soreness)
Muscle strength	Increase the weight or resistance Increase to 12 repetitions in the first set. Increase to four sets. Maintenance: Even as less as one day per week
Flexibility	Not known.

Appendix B

How to determine the intensity of the exercise that you are doing?

Option 1

My age ____ years

My heart rate at rest _____beats/minute

Level of intensity	Percentage of desired level of intensity	My desired level of intensity
Light	Less than 40%	
Moderate	40% to less than 60%	
Vigorous	60% to less than 90%	

My target exercise heart rate should be calculated as follows:

$(\text{MaxHR}) - (\text{Age}) - (\text{HR @ rest}) \times (\% \text{ of desired level of intensity}) + (\text{HR @ rest}) = \text{target exercise HR}$

E.g. $220 - 35 - 65 \times 40\% + 65 = 113 \text{ bpm}$

Now, work out your target exercise heart rate:

Maximum heart rate is: $220 - \text{my age in years}$

MINUS _____ my heart rate at rest (in beats per minute)

TIMES my _____ % desired level of intensity (from table above)

PLUS _____ heart rate at rest (in beats per minute)

Equals: _____ is the heart rate at which I must exercise

Nieman (2011:176)

Option 2

Guideline	Moderate	Vigorous	Combination
Frequency (days/week)	≥ 5	> 3	≥ 3 to 5
Intensity Percentage heart rate reserve (see calculation in option 1)	40 to 59 %	≥ 60%	40 to 85%
Time Minutes per day or	30 to 60	20 to 60	20 to 60
Minutes per week	≥ 150 minutes per week	≥ 150	≥ 150

Nieman 2011:176

Appendix C

When I feel ready I can look at the table which summarizes the optimal level of exercises I should do to be healthy.

Physical fitness component	Principles	Recommendations
Cardio respiratory endurance (aerobic exercise)*	How often?	Moderate intensity of 150 minutes per week (up to 300 minutes) OR Vigorous intensity of 75 minutes of (up to 150 minutes) OR A combination of both
	For how long?	Moderate intensity of 30 to 60 minutes per day OR Vigorous intensity of 20 to 60 minutes of per day OR

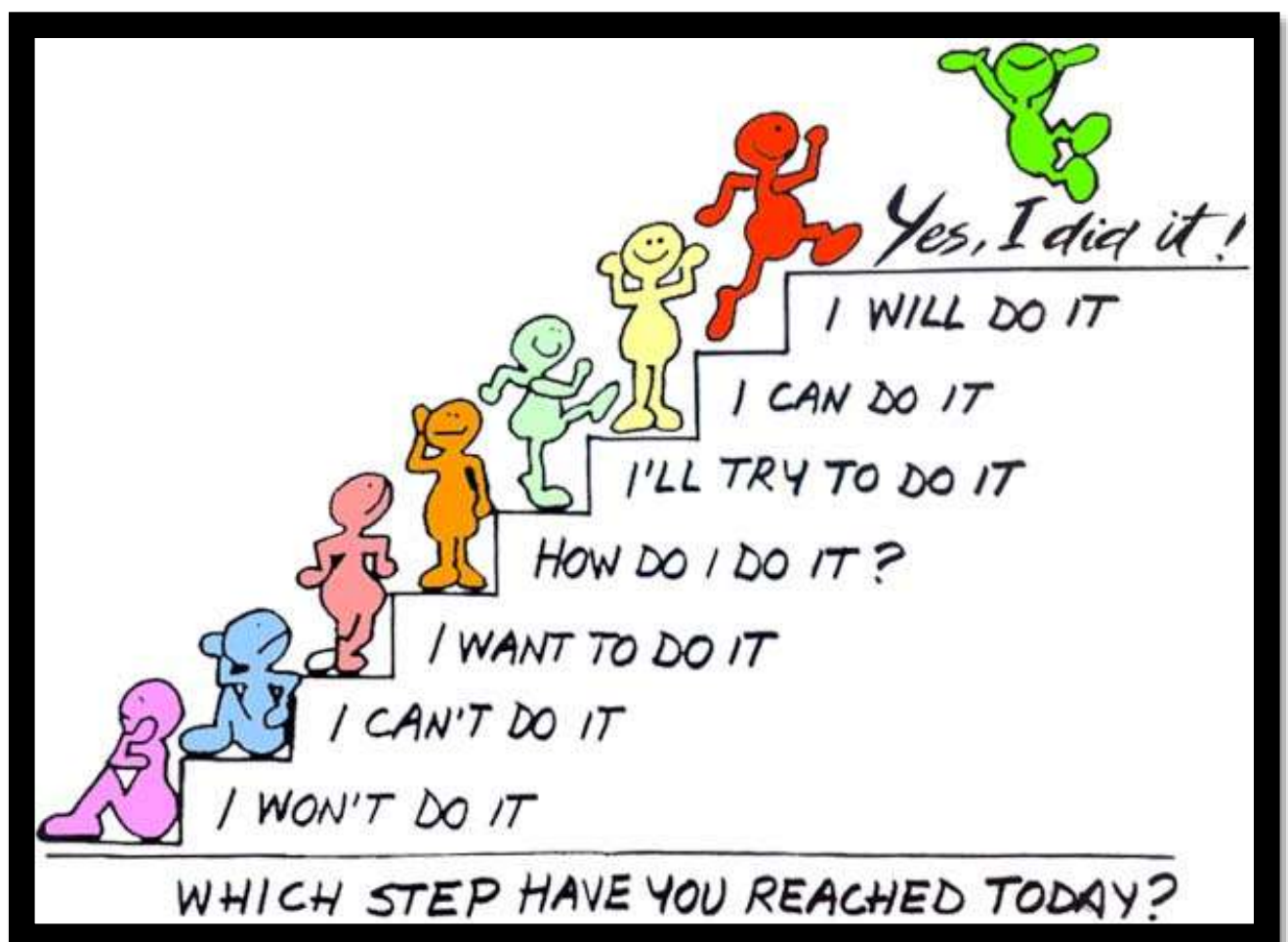
		A combination of both <i>I can do multiple sessions of at least 10 minutes at a time to reach the recommended duration</i> <i>If you have been very inactive even less than 20 minutes can be beneficial</i>
	How intense?	Moderate to vigorous (view Appendix D) Light if you have not exercised for at least 3 time per week for the past 3 months
	What type?	Regular, purposeful exercise that involves major muscle groups and is continuous and rhythmic in nature, like walking, leisurely cycling, aqua-aerobics, slow dancing
Muscular strength	How often?	All the major muscle groups (e.g. shoulders, legs, abdomen, back) 2 to 3 days per week with at least 48 hours rest between exercise sessions of the same group of muscles All can be done in one session or split over different days
	What type?	Use body weight, free weights (e.g. dumbbells, bottles filled with sand) or weights (e.g. apparatus in a gymnasium)
	How much?	2-3 sets per muscle group with 2-3 min rest in between In one set: weight/resistance exercise that you can repeat 8 - 10 times per set up to point of fatigue (e.g. 10 during first set, and 8 during the last set)
	How?	Controlled through the full range of motion

Physical fitness component	Principles	Recommendations
Muscle endurance§	Similar to muscle strengthening	One to two sets at a time Less weight than with strengthening, but with more repetitions (15 to 25) and a shorter rest periods in between.

Flexibility	When?	Best when the muscle is warmed through light-to-moderate aerobic exercises or after a hot bath.
	How often?	2 to 3 times per week, up to daily (best) Can also add balance exercises like yoga or Thai-chi
	Type	One type is static: prolonged stretch of each of the major muscle-tendon groups†
	Intensity?	Stretch to the point of tightness or slight discomfort
	For how long?	Hold a prolonged (static) stretch for 10 to 30 seconds. Repeat to reach 60 seconds for each flexibility exercise.
	How?	After a warm-up, e.g. after other training or after 10 min of jogging on the spot

Source: ACSM 2014

Enjoy each step of your six-week exercise journey!



ANNEXURE E

**PARTICIPANT'S MEASURE OF
COMPASSION – PROQOL
(PROFESSIONAL QUALITY OF
LIFE SCALE)**



Annexure E

Participant's Measure of Compassion – ProQOL (Professional Quality of Life Scale) Test (Version 5:2009)

PARTICIPANT'S MEASURE OF COMPASSION – PROQOL (Professional Quality of Life Scale) TEST (Version 5 2009)

(Permission granted for use in this pilot study)

Compassion Satisfaction and Compassion Fatigue

When you nurse people you have direct contact with their lives. As you may have found, your compassion for those you nurse can affect you in a positive and negative ways. Below are some questions about your experiences both positive and negative as an emergency department nurse. Consider each of the following questions about you and your current work situation in the Emergency Department. Select the number with a tick in the appropriate column that honestly reflects how frequently you experience these things in the last 30 days.

	1=Never	2=Rarely	3=Sometimes	4=Often	5=Very Often
I am happy					
I am preoccupied with more than I person I nurse					
I get satisfaction from nursing people					
I feel connected to others					
I jump or am startled by unexpected sounds					
I feel invigorated after working with those I nurse					

I find it difficult to separate my personal life from my life as a nurse					
I am not as productive at work because I am losing sleep over traumatic experiences at work					
I think that I might have been affected by the traumatic stress of those I nurse					
I feel trapped by my job as a nurse					
Because of my nursing I have felt "on edge" about various things					
I like my work as a nurse					
I feel depressed because of the traumatic experiences of people I nurse					
I feel as though I am experiencing the trauma of someone I have nursed					
I have beliefs that sustain me					

I am pleased with how I am able to keep up with nursing techniques and protocols					
I am the person I always wanted to be					
My work makes me feel satisfied					
I feel worn out because of my work as a nurse					
I have happy thoughts and feelings about those I nurse and how I could help them					
I feel overwhelmed because my nursing workload seems endless					
I feel I can make a difference through my work					
I avoid certain activities or situations because they remind me of frightening experiences of people I nurse					
I am proud of what I can do as a nurse					

As a result of my nursing I have intrusive, frightening thoughts					
I feel “bogged down” by the system					
I have thoughts that I am a “success” as a nurse					
I can’t recall important parts of my work with trauma victims					
I am a very caring person					
I am happy that I chose to do this work					

ANNEXURE F

**INVITATION TO PARTICIPATE
LETTER**



Annexure F

Physical Activity Readiness Questionnaire for Everyone (2017 ParQ+)

2017 PAR-Q+

The Physical Activity Readiness Questionnaire for Everyone

The health benefits of regular physical activity are clear; more people should engage in physical activity every day of the week. Participating in physical activity is very safe for MOST people. This questionnaire will tell you whether it is necessary for you to seek further advice from your doctor OR a qualified exercise professional before becoming more physically active.

GENERAL HEALTH QUESTIONS

Please read the 7 questions below carefully and answer each one honestly: check YES or NO.	YES	NO
1) Has your doctor ever said that you have a heart condition ☒ OR high blood pressure ☐	☐	☐
2) Do you feel pain in your chest at rest, during your daily activities of living, OR when you do physical activity?	☐	☐
3) Do you lose balance because of dizziness OR have you lost consciousness in the last 12 months? Please answer NO if your dizziness was associated with over-breathing (including during vigorous exercise).	☐	☐
4) Have you ever been diagnosed with another chronic medical condition (other than heart disease or high blood pressure)? PLEASE LIST CONDITION(S) HERE: _____	☐	☐
5) Are you currently taking prescribed medications for a chronic medical condition? PLEASE LIST CONDITION(S) AND MEDICATIONS HERE: _____	☐	☐
6) Do you currently have (or have had within the past 12 months) a bone, joint, or soft tissue (muscle, ligament, or tendon) problem that could be made worse by becoming more physically active? Please answer NO if you had a problem in the past, but it does not limit your current ability to be physically active. PLEASE LIST CONDITION(S) HERE: _____	☐	☐
7) Has your doctor ever said that you should only do medically supervised physical activity?	☐	☐

-  **If you answered NO to all of the questions above, you are cleared for physical activity.**
Go to Page 4 to sign the PARTICIPANT DECLARATION. You do not need to complete Pages 2 and 3.
-  Start becoming much more physically active – start slowly and build up gradually.
 -  Follow International Physical Activity Guidelines for your age (www.who.int/dietphysicalactivity/en/).
 -  You may take part in a health and fitness appraisal.
 -  If you are over the age of 45 yrs. and **NOT** accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise. If you have any
 -  further questions, contact a qualified exercise professional.



If you answered YES to one or more of the questions above, COMPLETE PAGES 2 AND 3.

Delay becoming more active if:

You have a temporary illness such as a cold or fever; it is best to wait until you feel better.

You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at www.eparmedx.com before becoming more physically active.

Your health changes - answer the questions on Pages 2 and 3 of this document and/or talk to your doctor or a qualified exercise professional before continuing with any physical activity program.

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1 FOLLOW-UP QUESTIONS ABOUT YOUR MEDICAL CONDITION(S)

1. Do you have Arthritis, Osteoporosis, or Back Problems?

If the above condition(s) is/are present, answer questions 1a-1c

If **NO** ☐ go to question 2

- 1a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES ☐ NO ☐
-
- 1b. Do you have joint problems causing pain, a recent fracture or fracture caused by osteoporosis or cancer, displaced vertebra (e.g., spondylolisthesis), and/or spondylolysis/pars defect (a crack in the bony ring on the back of the spinal column)? YES ☐ NO ☐
-
- 1c. Have you had steroid injections or taken steroid tablets regularly for more than 3 months? YES ☐ NO ☐
-

2. Do you currently have Cancer of any kind?

If the above condition(s) is/are present, answer questions 2a-2b

If **NO** ☐ go to question 3

- 2a. Does your cancer diagnosis include any of the following types: lung/bronchogenic, multiple myeloma (cancer of plasma cells), head, and/or neck? YES ☐ NO ☐
-
- 2b. Are you currently receiving cancer therapy (such as chemotherapy or radiotherapy)? YES ☐ NO ☐
-

3. Do you have a Heart or Cardiovascular Condition? This includes Coronary Artery Disease, Heart Failure, Diagnosed Abnormality of Heart Rhythm

If the above condition(s) is/are present, answer questions 3a-3d

If **NO** ☐ go to question 4

- 3a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? (Answer **NO** if you are not currently taking medications or other treatments) YES ☐ NO ☐
-
- 3b. Do you have an irregular heart beat that requires medical management? (e.g., atrial fibrillation, premature ventricular contraction) YES ☐ NO ☐
-
- 3c. Do you have chronic heart failure? YES ☐ NO ☐
-
- 3 d. Activity in the last 2 months? Do you have diagnosed coronary artery (cardiovascular) disease and have not participated in regular physical activity? YES ☐ NO ☐
-

4. Do you have High Blood Pressure?

If the above condition(s) is/are present, answer questions 4a-4b

If **NO** ☐ go to question 5

- 4a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? YES NO
(Answer **NO** if you are not currently taking medications or other treatments)
- 4b. Do you have a resting blood pressure equal to or greater than 160/90 mmHg with or without medication? YES if you do not know your resting blood pressure) YES NO
(Answer ☐ ☐

5. Do you have any Metabolic Conditions? This includes Type 1 Diabetes, Type 2 Diabetes, Pre-Diabetes

If the above condition(s) is/are present, answer questions 5a-5e If **NO** go to question ☐ 6

- 5a. Do you often have difficulty controlling your blood sugar levels with foods, medications, or other physician-prescribed therapies? YES NO
☐ ☐
- 5b. Do you often suffer from signs and symptoms of low blood sugar (hypoglycemia) following exercise and/or during activities of daily living? Signs of hypoglycemia may include shakiness, nervousness, unusual irritability, abnormal sweating, dizziness or light-headedness, mental confusion, difficulty speaking, weakness, or sleepiness. YES NO
☐ ☐
- 5c. Do you have any signs or symptoms of diabetes complications such as heart or vascular disease and/or complications affecting your eyes, kidneys, **OR** the sensation in your toes and feet? YES NO
☐ ☐
- 5d. Do you have other metabolic conditions (such as current pregnancy-related diabetes, chronic kidney disease, or liver problems)? YES NO
☐ ☐
- 5e. Are you planning to engage in what for you is unusually high (or vigorous) intensity exercise in the near future? YES ☐ NO ☐



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6. Do you have any Mental Health Problems or Learning Difficulties? This includes Alzheimer's, Dementia, Depression, Anxiety Disorder, Eating Disorder, Psychotic Disorder, Intellectual Disability, Down Syndrome

If the above condition(s) is/are present, answer questions 6a-6b If **NO** go to ☐ question 7

- 6a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? YES ☐ NO ☐
(Answer **NO** if you are not currently taking medications or other treatments)
- 6b. Do you have Down Syndrome **AND** back problems affecting nerves or muscles? YES ☐ NO ☐

7. Do you have a Respiratory Disease? This includes Chronic Obstructive Pulmonary Disease, Asthma, Pulmonary High Blood Pressure

If the above condition(s) is/are present, answer questions 7a-7d If **NO** go to ☐ question 8

- 7a. if you are not currently taking medications or other treatments) difficulty controlling your condition with medications or other physician-prescribed therapies? YES NO
(Answer ☐ ☐
- 7b. Has your doctor ever said your blood oxygen level is low at rest or during exercise and/or that you require supplemental oxygen therapy? YES ☐ NO ☐
- 7c. If asthmatic, do you currently have symptoms of chest tightness, wheezing, laboured breathing, consistent cough (more than 2 days/week), or have you used your rescue medication more than twice in the last week? YES ☐ NO ☐
- 7d. Has your doctor ever said you have high blood pressure in the blood vessels of your lungs? YES NO
☐

8. Do you have a Spinal Cord Injury? This includes Tetraplegia and Paraplegia

If the above condition(s) is/are present, answer questions 8a-8c

If **NO** go to question 9

8a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? **YES** **NO**
(Answer **NO** if you are not currently taking medications or other treatments)

8 b. Do you commonly exhibit low resting blood pressure signs/or fainting? Significant enough to cause dizziness, light-headedness,
YES **NO**

8c. Has your physician indicated that you exhibit sudden bouts of high blood pressure (known as Autonomic Dysreflexia)? **YES** **NO**

9. Have you had a Stroke? This includes Transient Ischemic Attack (TIA) or Cerebrovascular Event

If the above condition(s) is/are present, answer questions 9a-9c If **NO** go to question 10

9a. Do you have difficulty controlling your condition with medications or other physician-prescribed therapies? **YES** **NO**
(Answer **NO** if you are not currently taking medications or other treatments)

9b. Do you have any impairment in walking or mobility? **YES** **NO**

9c. Have you experienced a stroke or impairment in nerves or muscles in the past 6 months? **YES** **NO**

10. Do you have any other medical condition not listed above or do you have two or more medical conditions?

If you have other medical conditions, answer questions 10a-10c

If **NO** read the Page 4 recommendations

10a. Have you experienced a blackout, fainted, or lost consciousness as a result of a head injury within the last 12 months **OR** have you had a diagnosed concussion within the last 12 months? **YES** **NO**

10b. Do you have a medical condition that is not listed (such as epilepsy, neurological conditions, kidney problems)? **YES** **NO**

10c. Do you currently live with two or more medical conditions? **YES** **NO**

PLEASE LIST YOUR MEDICAL CONDITION(S) AND ANY RELATED MEDICATIONS HERE:

GO to Page 4 for recommendations about your current medical condition(s) and sign the PARTICIPANT DECLARATION.



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If you answered NO to all of the follow-up questions about your medical condition, you are ready to become more physically active - sign the PARTICIPANT DECLARATION below:

It is advised that you consult a qualified exercise professional to help you develop a safe and effective physical activity plan to meet your health needs.

You are encouraged to start slowly and build up gradually - 20 to 60 minutes of low to moderate intensity exercise, 3-5 days per week including aerobic and muscle strengthening exercises.



As you progress, you should aim to accumulate 150 minutes or more of moderate intensity physical activity per week. If you are over the age of 45 yrs. and **NOT** accustomed to regular vigorous to maximal effort exercise, consult a qualified exercise professional before engaging in this intensity of exercise.

If you answered YES to one or more of the follow-up questions about your medical condition:



You should seek further information before becoming more physically active or engaging in a fitness



appraisal. You should complete the specially designed online screening and exercise recommendations program - the **ePARmed-X+** at **www.eparmedx.com** and/or visit a qualified exercise professional to work through the ePARmed-X+ and for further information.

Delay becoming more active if:



You have a temporary illness such as a cold or fever; it is best to wait until you feel better.



You are pregnant - talk to your health care practitioner, your physician, a qualified exercise professional, and/or complete the ePARmed-X+ at **www.eparmedx.com** before becoming more physically active.



Your health changes - talk to your doctor or qualified exercise professional before continuing with any physical activity program.

- You are encouraged to photocopy the PAR-Q+. You must use the entire questionnaire and NO changes are permitted. The authors, the PAR-Q+ Collaboration, partner organizations, and their agents assume no liability for persons who undertake physical activity and/or make use of the PAR-Q+ or ePARmed-X+. If in doubt after completing the questionnaire, consult your doctor prior to physical activity.

2 PARTICIPANT DECLARATION

- All persons who have completed the PAR-Q+ please read and sign the declaration below.

If you are less than the legal age required for consent or require the assent of a care provider, your parent, guardian or care provider must also sign this form.

I, the undersigned, have read, understood to my full satisfaction and completed this questionnaire. I acknowledge that this physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if my condition changes. I also acknowledge that a Trustee (such as my employer, community/fitness center, health care provider, or other designate) may retain a copy of this form for their records. In these instances, the Trustee will be required to adhere to local, national, and international guidelines regarding the storage of personal health information ensuring that the Trustee maintains the privacy of the information and does not misuse or wrongfully disclose such information.

NAME _____

DATE _____



SIGNATURE _____

WITNESS

SIGNATURE OF PARENT/GUARDIAN/CARE PROVIDER

_____ **For more information, please contact**

PAR-Q+

www.eparmedx.com

Email: eparmedx@gmail.com

possible

Citation for PAR-Q+

Warburton DER, Jamnik VK, Bredin SSD, and Gledhill N on behalf of the PAR-Q+ Collaboration. through financial contributions from the Public Health Agency of Canada and the BC Ministry

Readiness Medical Examination (ePARmed-X+). Health & Fitness Journal of Canada 4(2):3-23, 2011. The Physical Activity Readiness Questionnaire for Everyone (PAR-Q+) and Electronic Physical Activity of Health Services. The views expressed herein do not necessarily represent the views of the

Key References

Public Health Agency of Canada or the BC Ministry of Health Services.

1. Jamnik VK, Warburton DER, Makarski J, McKenzie DC, Shephard RJ, Stone J, and Gledhill N. Enhancing the effectiveness of clearance for physical activity participation; background and overall process. APNM 36(S1):S3-S13, 2011.
2. Warburton DER, Gledhill N, Jamnik VK, Bredin SSD, McKenzie DC, Stone J, Charlesworth S, and Shephard RJ. Evidence-based risk assessment and recommendations for physical activity clearance; Consensus Document. APNM36(S1):S266-s298, 2011.
3. Chisholm DM, Collis ML, Kulak LL, Davenport W, and Gruber N. Physical activity readiness. British Columbia Medical Journal. 1975;17:375-378.
4. Thomas S, Reading J, and Shephard RJ. Revision of the Physical Activity Readiness Questionnaire (PAR-Q). Canadian Journal of Sport Science 1992;17:4 338-345.

ANNEXURE G

**PHYSICAL ACTIVITY READINESS
QUESTIONNAIRE FOR
EVERYONE**



Annexure G

Invitation to Participate Letter



UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA
Denklelers • Leading Minds • Dikgopolo tša Dihlalefi

Navrae / Enquiries:

☎ : 0823211189
📠 : (012) 346 3187
💻 : mary-nns@telkomsa.net

Date

Dear Colleague,

As nurses you are invited to participate in a research project focusing on the effect of physical exercise on compassion of nurses working in emergency departments. If you are thinking about participating, please contact me, Mary-Ann Smith for further information to participate in this exiting project. The planned date for the start of the project is 2018.

Please contact me before the 2018 if you are interested in joining us in this project.

Your participation will be fun and highly appreciated.

Regards

Mary-Ann Smith

0823211189 (you can phone me or leave me a message via WhatsApp and I will call you back)

mary-sanns@telkomsa.net

ANNEXURE H

**PARTICIPANTS INFORMATION
AND INFORMED CONSENT
DOCUMENT**



Annexure H

Participants Information and Informed Consent Document



PARTICIPANT'S INFORMATION & INFORMED CONSENT DOCUMENT

**STUDY TITLE: MOTIVATIONAL INTERVIEWING FOR INCREASING
PHYSICAL EXERCISE TO INFLUENCE COMPASSION AND FITNESS
OF NURSES IN EMERGENCY DEPARTMENTS**

Principal Investigators: Mary-Ann Smith

Institution: University of Pretoria

DAYTIME AND AFTER HOURS TELEPHONE NUMBER(S):

Daytime numbers 083 338 8683

After hours: 083 338 8683

DATE AND TIME OF FIRST INFORMED CONSENT DISCUSSION:

Day	Mth	year

Time

Dear Colleague,

Date of consent procedure ____./____./____

1) INTRODUCTION

I would like to invite you as an expert in motivational interviewing and/or physical exercise to take part in this study. Your role will be to evaluate the booklet that was developed to guide the intervention for the study. The intervention includes a personalised six-week physical exercise programme which are based on the motivational interviewing principles. The information leaflet will help you decide if you would like to participate. Before you agree you should

fully understand what is involved. Please note that no remuneration will be provided for participation in this research study.

2) THE NATURE AND PURPOSE OF THIS STUDY

Compassion and compassion fatigue relating to nurses working in various settings is a topic that have been studied worldwide due to its negative impact on the nursing profession. It has been shown that nurses working in an extremely demanding and stressful environment, such as the emergency department, are at risk of developing compassion fatigue.

3) EXPLANATION OF PROCEDURES TO BE FOLLOWED

Once you have decided to participate, we will e-mail you a copy of the intervention was compiled in the format of a booklet referred to as the '*Journey toward physical fitness*'. You will be expected to evaluate the booklet using the evaluation instrument attached as well as (if appropriate) write comments with suggestions for improvement on the document. The evaluation will take approximately one and a half hour of your time.

4) RISK AND DISCOMFORT INVOLVED.

There are no risks involved.

5) POSSIBLE BENEFITS OF THIS STUDY

Evaluating the booklet will increase the rigour of the intervention.

6) VOLUNTARY PARTICIPATION IN AND WITHDRAWAL FROM THE STUDY

Your participation is completely voluntary. You may refuse to participate or stop at any time during the study without giving any reason. Your withdrawal will not affect you in any way.

7) HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This Protocol was submitted to the Faculty of Health Sciences Research Ethics Committee, University of Pretoria, 012 3541677 / 012 3541330 and written approval has been granted by that committee. The study has been structured in accordance with the Declaration of Helsinki (last update: October 2013), which deals with the recommendations guiding doctors in biomedical research involving human/subjects. A copy of the Declaration may be obtained from the investigator should you wish to review it.

Please feel free to contact Mrs Deepika Behari, Departmental Administrator, Student Research Ethics Committee, if you need any clarification pertaining to ethical approval.

Inquiries can be forwarded to:

Ms Deepeka Behari

Level 2, Room 2-33

31 Bophelo Road, Gezina

Private Bag X323, Arcadia, 0007



012 3541677



086 6516047



deepeka.behari@up.ac.za

8) INFORMATION

If you have any questions about your participation in the research process, you should contact the researcher Mary-Ann Smith at the daytime and night-time numbers supplied at the beginning of this document.

9) CONFIDENTIALITY

All data collected during this study will be regarded as confidential. Your name as well as the names of other participants will not be reported on. Results will be published or presented in such a fashion that all participants remain unidentifiable.

10) COMPENSATION

This study is completely voluntary and there are not compensation for your participation.

STUDY TITLE: THE EFFECT OF PHYSICAL EXERCISE ON COMPASSION OF NURSES IN EMERGENCY DEPARTMENTS: A PILOT STUDY

Thank you for your participation. Your expertise and insights relating motivational interviewing and/or physical exercise are truly valued.

Section A: Demographic information

Please tell us about yourself by answering the following questions by indicating your chosen option with a (X) in the appropriate box or fill in the information asked for in the space provided.

1. Indicate your expertise (you may indicate one or both options provided)	Yes	No
Motivational interviewing		
Physical exercise		
2. How many years of experience do you have relating to:		
Motivational interviewing	_____years and/or	
Physical exercise	_____years	
3. Briefly describe your expertise relating to motivational interviewing and/or physical exercise		

4. State your professional qualification (e.g. lecturer Department of Nursing Science)	
5. Indicate your highest qualification	
	Diploma
	Degree
	Master's
	Doctorate
	Other
If other, please indicate _____	

Section B: Evaluation of the booklet

Please read through the booklet 'Journey toward physical fitness'. Feel free to comment on the document by using track changes. Then indicate with an (X) that best describes your impression of the booklet to the set criteria. If you select '*marginal*' or '*unsatisfactory*', please comment with suggestions for improvement.

Criteria	Exemplary	Proficient	Marginal	Unsatisfactory	Comments
Clarity					
Simplicity					
Consistency					
Logical flow					
Layout					
Applicable in developing a personalised exercise program					
Adhere to principles of motivational interviewing					

Comments

Thank you for your inputs. We appreciate your time and contributions. Please feel free to indicate if you wish to collaborate on similar projects (e.g. using the booklet) in future.

**STUDY TITLE: THE EFFECT OF PHYSICAL EXERCISE ON COMPASSION OF NURSES
IN EMERGENCY**

DEPARTMENTS: A PILOT STUDY

Principal Investigators: Mary-Ann Smith

Institution: University of Pretoria

DAYTIME AND AFTER HOURS TELEPHONE NUMBER(S):

Daytime numbers 083 338 8683

After hours: 083 338 8683

DATE AND TIME OF FIRST INFORMED CONSENT DISCUSSION:

Day Mth year Time

Dear Colleague,

Date of consent procedure _____. / _____. / _____

1) INTRODUCTION

I would like to invite you as an expert in motivational interviewing and/or physical exercise to take part in this study.

Your role will be to evaluate the booklet that was developed to guide the intervention for the study. The intervention includes a personalised six-week physical exercise programme which are based on the motivational interviewing principles. The information leaflet will help you decide if you would like to participate. Before you agree you should fully understand what is involved. Please note that no remuneration will be provided for participation in this research study.

2) THE NATURE AND PURPOSE OF THIS STUDY

Compassion and compassion fatigue relating to nurses working in various settings is a topic that have been studied worldwide due to its negative impact on the nursing profession. It has been shown that nurses working in an extremely demanding and stressful environment, such as the emergency department, are at risk of developing compassion fatigue.

20 07 2018 17h00

20 07 2018

Research question: What is the effect of a six-week personalised physical exercise intervention based on motivational interviewing on compassion, health-related fitness and the stage of behavioural change in emergency nurses?

3) EXPLANATION OF PROCEDURES TO BE FOLLOWED

Once you have decided to participate, we will e-mail you a copy of the intervention was compiled in the format of a booklet referred to as the '*Journey toward physical fitness*'. You will be expected to evaluate the booklet using the evaluation instrument attached as well as (if appropriate) write comments with suggestions for improvement on the document. The evaluation will take approximately one and a half hour of your time.

4) RISK AND DISCOMFORT INVOLVED.

There are no risks involved.

5) POSSIBLE BENEFITS OF THIS STUDY

Evaluating the booklet will increase the rigour of the intervention.

6) VOLUNTARY PARTICIPATION IN AND WITHDRAWAL FROM THE STUDY

Your participation is completely voluntary. You may refuse to participate or stop at any time during the study without giving any reason. Your withdrawal will not affect you in any way.

7) HAS THE STUDY RECEIVED ETHICAL APPROVAL?

This Protocol was submitted to the Faculty of Health Sciences Research Ethics Committee, University of Pretoria, 012 3541677 / 012 3541330 and written approval has been granted by that committee. The study has been structured in accordance with the Declaration of Helsinki (last update: October 2013), which deals with the recommendations guiding doctors in biomedical research involving human/subjects. A copy of the Declaration may be obtained from the investigator should you wish to review it.

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012 3541677 086 6516047

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8) INFORMATION

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9) CONFIDENTIALITY

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10) COMPENSATION

This study is completely voluntary and there are not compensation for your participation

ANNEXURE I

VERSION OF THE BOOKLET FOR EVALUATION



Annexure I

Evaluation of the Booklet

Version of the My Journey to Physical Fitness given to the evaluators with portions greyed out

My journey towards physical fitness



*‘Physical fitness is not only one of the most important keys to a healthy body,
it is the basis of dynamic and creative intellectual activity’*

John F Kennedy

My unique number

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Note

All the grey highlighted areas in the booklet guide the facilitators during the intervention. The grey highlighted text will be removed before the booklet is handed out to the participants.

1 INTRODUCTION

Congratulations on taking my first step to increase my physical exercise quest.

This booklet will provide me with an opportunity to

- 1) think about my current level of fitness,
- 2) share the importance of physical exercise with my colleagues,
- 3) change the way I think about incorporating exercise into my everyday life,
- 4) improve my readiness and confidence to exercise and
- 5) plan, implement, document and reflect on my six-week journey towards my personal goals relating to increasing my physical activity.



Facilitators

Throughout the intervention motivational interview, the facilitators will adhere to the:

- a) spirit of motivational interviewing throughout the process, which include four key elements: 1) partnership, 2) acceptance, 3) compassion and 4) evocation
- b) core motivational interviewing skills namely: open-ended questions, affirmations, reflections and summaries (OARS)
- c) critically reflect on the way in which the motivational interview intervention was implemented

Douailhy et al (2014:21; 38)

Krejci and Neugebauer (2015:23-24)

2 ENGAGE

Facilitators

Give a brief overview of study. Ensure that all the participants have been telephonically pre-screened using the 2017 Par-Q+. Participants will sign the document and receive an electronic version. Circulate a name list with contact details (cell number and e-mail) and unique name of each participant. The supervisor will keep the list and the names of the participants will remain confidential throughout the study. The participant information leaflet will be discussed, participants will be given an opportunity to ask questions and informed consent will be obtained from volunteers. Facilitators will emphasize that they are there to facilitate learning and support the participants to learn about themselves and how they can make changes to increase physical exercise into their daily lives.

2.1 OPENING MOVE

Facilitators

Ask the participants to: select one of the positive thinking cards on the table and then introduce themselves to the group and give a reason for selecting the specific card.

Wagner and Ingersoll (2013:334)

2.2 SET THE FRAME

Facilitator

Set the frame to establish a safe and productive group environment. Facilitate the group to reach consensus on ground rules that will be adhered to by the facilitators as well as participants throughout the intervention (e.g. psychological safe environment, everybody's voice will count, no cell phones).

Wagner and Ingersoll (2013:335)

Provide a brief overview on the principles of motivational interviewing, where participant autonomy and self-efficacy will be emphasized.

Krejci and Neugebauer (2015: 30)

My own notes on the set ground rules for the group

3 FOCUS

Facilitators

Remind the participants that the focus on **increasing physical exercise** and

- do not adopt the role of expert
- allow participants to listen to others and share their determination, commitment and previous successes as this may shift some participants' to change
- provide opportunity for sharing successes as change talk from members who have experienced success may experience consolidation to commit to change

Ask the participants to sit in small groups (3 to 5).

Reflect on how active I currently am?

Braudi 2005

What makes me not to exercise?

What might get into the way for me not to exercise?

What is there in it for me not to exercise?

4 EVOKE

Facilitators

Pair and share (2 members per group)

4.1 AMBIVALENCE

Do you have some mixed emotions about starting your exercise journey? Write short notes on these emotions and share these feelings with the person next to you (e.g. you may feel hopeful on the one side, but feel doubtful on the other side).

Wagner and Ingersoll (2013:336)

4.2 EXPLORE FUNCTIONS

Facilitators

Ask the participants to sit in small groups (3 to 5)

Wagner and Ingersoll 2013:337

Discuss the potential pros and cons of physical exercise.

Pros	Cons

4.3 EXPLORE VALUES

Facilitator

Form small group (3 to 5 members).

Wagner and Ingersoll (2013:337)

List three to five of your core values (e.g. honesty, courage, commitment)

Now, in your group, reflect on how exercise may positively influence your values in terms of:

a) Self

b) Relationships (family/friends/colleagues)

c) Responsibility (home/work)

4.4 EXPLORE IMPORTANCE AND CONFIDENCE

Wagner and Ingersoll 2013:338

Facilitators

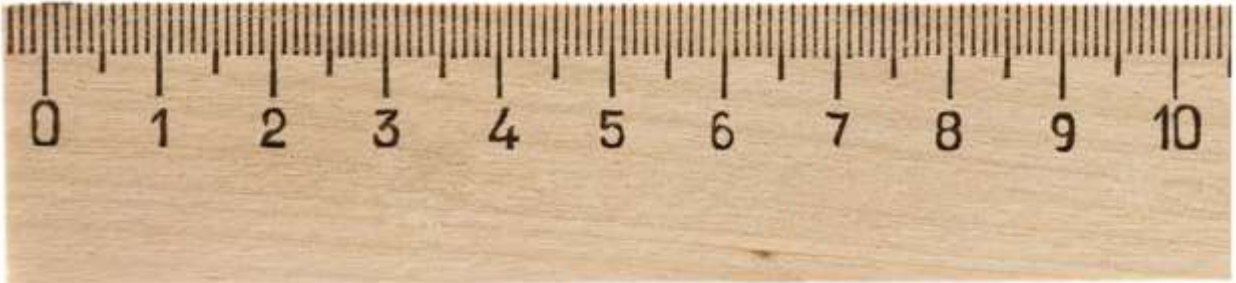
Self-activity

Using the ruler below, circle a number to indicate how IMPORTANT it is for me to exercise?

Not IMPORTANT at all

extremely

IMPORTANT



I selected number _____ Explain why I selected the specific number and not two numbers below?

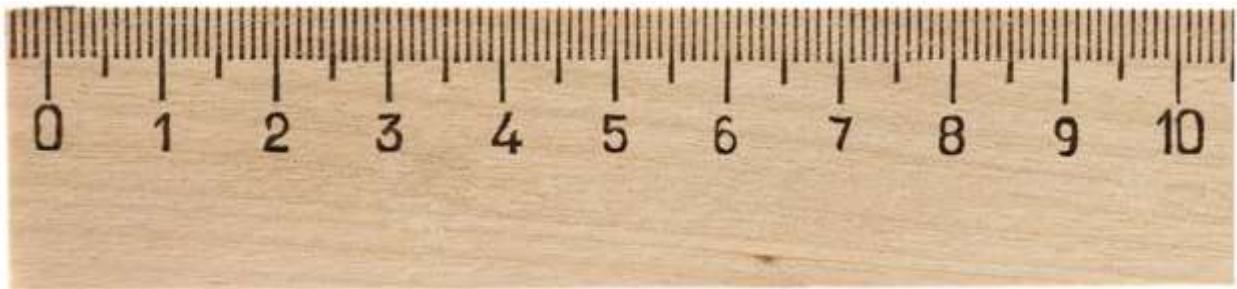
(E.g. I selected number **3**. Explain why I did not select numbers **1 or 2**?)

What would it take to move up two or more points to change my view of the importance of exercise?

Using the ruler provided below, circle a number to indicate how **CONFIDENT** you are to exercise?

Not **CONFIDENT** at all

Extremely **CONFIDENT**



I selected number _____ Explain why I selected the specific number and not two numbers below?

(E.g. I selected number **3**. Explain why I did not select numbers **1 or 2**?)

What would it take for me to move up two or more points to become more confident to exercise?

5 BRAODEN PERSPECTIVES

Facilitators

First reflect as individual and then pair and share

5.1 INCREASE IMPORTANCE

What would I like my life to look like in five (5) years if I have increased my current physical activity level? Think about the things that I value and the difficulties I have identified; how would these be different?

5.2 BUILD CONFIDENCE

Write short notes on and then share a story when I was physically fit. Consider elements such as how I felt when I was physically fit, what were the actions that I took to become fit and what lessons have I learnt that will assist me in this journey.

What strong points do I have that could help me succeed in exercising regularly?

What support do I have that could help me succeed in exercising regularly?

When in my life have I made up my mind to do something, and did it?

Brainstorm with a person next to me when in my life I made up my mind to do something and did it. Reflect on your characteristics of successful changers that assisted me to successfully achieve my goal. All ideas are acceptable, no matter how silly or unrealistic they might seem. I can use the table below to guide my discussion.

You the following examples of characteristics of successful changers (Select by circling from the following)

Accepting	Committed	Flexible	Persevering	Stubborn
Active	Competent	Focused	Persistent	Thankful
Adaptable	Concerned	Forgiving	Positive	Thorough
Adventuresome	Confident	Forward-looking	Powerful	Thoughtful
Affectionate	Considerate	Free	Prayerful	Tough
Affirmative	Courageous	Happy	Quick	Trusting
Alert	Creative	Healthy	Reasonable	Trustworthy
Alive	Decisive	Hopeful	Receptive	Truthful
Ambitious	Dedicated	Imaginative	Relaxed	Understanding
Anchored	Determined	Ingenious	Reliable	Unique
Assertive	Die-hard	Intelligent	Resourceful	Unstoppable
Assured	Diligent	Knowledgeable	Responsive	Vigorous
Attentive	Doer	Loving	Skilful	Visionary
Bold	Eager	Mature	Solid	Whole
Brave	Earnest	Open	Spiritual	Willing
Bright	Effective	Optimistic	Stable	Winning
Capable	Energetic	Orderly	Steady	Wise
Careful	Experienced	Organised	Straight	Worthy
Cheerful	Faithful	Patient	Strong	Zealous
Clever	Fearless	Perceptive	Sensible	Zestful

The purpose of this table is to prompt you to find and identify approximately three (3) positive attributes and personal strengths to help you make a change to adopt more physical exercise into your lifestyle.

6 MOVING INTO ACTION

6.1 INTRODUCTION TO PHYSICAL EXERCISE

Health-related fitness consists of five components: 1) cardio respiratory endurance, 2) muscular strength, 3) muscular endurance, 4) flexibility and 5) body composition. It is best if I start at a level doing the exercise that I am comfortable with. Today I will set a goal(s) for myself for the first week of my exercise journey. In Appendix A is a table with the optimum amount of exercise generally prescribed for me to be healthy. I can slowly increase my activity and exercise at a pace that suits me, starting at my CURRENT level of activity. This is not a competition with others. Any activity of at least 10 minutes is better than none.

6.2 SET MY GOALS

My main goal(s) for the six-week physical exercise journey is to:

6.3 SPECIFIC ACTIONS TO BECOME MORE ACTIVE



Week 1

From Sunday the ____ of _____ 2018 to Saturday the ____ of ____ 2018

My goal is to:

I **plan** to do the following actions during **Week 1** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 1**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 2

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 2** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 2**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 3

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 3** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 3**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 4

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 4** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 4**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

Week 5

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 5** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 5**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ <i>days</i>			Total time I exercised this week _____ <i>hours</i> and _____ <i>minutes</i>

What worked well during this week? What could I do better next week?

Week 6

From Sunday the ____ of _____ 2018 to Saturday the ____ of _____ 2018

My goal is to:

I **plan** to do the following actions during **Week 6** to accomplish my goals

I plan to exercise (✓)		What will I do?	How long will I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I will exercise this week _____ days			Total time I will exercise this week _____ hours and _____ minutes

How much did I exercise during **Week 6**

When did I exercise? (✓)		What did I do?	How long did I exercise? (<i>minutes</i>)
Sunday			
Monday			
Tuesday			
Wednesday			
Thursday			
Friday			
Saturday			
Total number of days I exercised this week _____ days			Total time I exercised this week _____ hours and _____ minutes

What worked well during this week? What could I do better next week?

7 PRINCIPLES WHEN SUPPORTING EACH OTHER

Facilitator

Emphasize the importance of adhering to the principles of motivational interviewing during discussions and support on the WhatsApp group.

Establish and maintain a motivational interviewing-consistent group climate on the WhatsApp, where the researcher will be part of the group. The WhatsApp group is for supporting each other and the data will not be used in the study

- Model the spirit of motivational interviewing throughout the intervention through for example openness, acceptance, respect, genuine positive regards
- Be vigilant and respond promptly to violations on the WhatsApp group without being punitive or critical (e.g. group members pushing each other to change, criticizing each other's point of view, failing to listen)
- Proactively offer affirmations to individuals who chats on WhatsApp using the principles of motivational interviewing

The following principles will be discussed in the group that should adhere to when supporting each other on the WhatsApp:

- Motivation to change is elicited from myself and not imposed from others in the group
- We should not give advice and by all means avoid 'solution talk'
- We should not judge each other
- We should use affirmative language (e.g. I hear, I understand)
- Acknowledge and respect each other's feelings

Krejci and Neugebauer (2015:29; 31; 32)

Miller (2012:6)

How will we support each other via a WhatsApp group to enhance the chances of us being successful in our six-week exercise journey?



8 RESOURCES

For additional information, I may find the following websites or applications (Apps) valuable.

8.1 WEBSITES

Allina Health Patient Education Department. 2009. Exercise and physical activity, viewed 29 November 2017, <https://www.allinahealth.org/Health-Conditions-and-Treatments/Health-library/Patient-education/Prediabetes/Benefits-of-exercise-and-physical-activity/>

Government of Canada. 2011. Physical activity, viewed 30 November 2017, <https://www.canada.ca/en/public-health/services/health-promotion/healthy-living/physical-activity.html>

Medline Plus: Trusted Health Information for You. 2017. Indoor fitness routine, viewed 29 November 2017 <https://medlineplus.gov/ency/patientinstructions/000890.htm>

Medline Plus: Trusted Health Information for You. 2017. Outdoor fitness routine, viewed 29 November 2017 <https://medlineplus.gov/ency/patientinstructions/000891.htm>

Medline Plus: Trusted Health Information for You. 2017. Make time to move, viewed 29 November 2017 <https://medlineplus.gov/ency/patientinstructions/000765.htm>

United States Department of Health & Human Services: National Institute on Aging. 2009. Your everyday guide: Exercise & physical activity, viewed 29 November 2017 https://go4life.nia.nih.gov/sites/default/files/nia_exercise_and_physical_activity.pdf

United States Department of Health & Human Services: National Institute on Aging. Exercise and physical activity, viewed 29 November 2017, <https://www.nia.nih.gov/health/exercise-physical-activity>

United States Department of Health & Human Services. 2017. Be active your way, viewed 29 November 2017 <https://health.gov/paguidelines/pdf/adultguide.pdf>

United States Department of Health Promotion. 2017. Physical activity for Americans, viewed 29 November 2017 <https://health.gov/paguidelines/guidelines/>

Western Cape Government. 2017. WesternCape on Wellness, viewed 29 November 2017, <https://www.westerncape.gov.za/westerncape-on-wellness/doing-enough-physical-activity>

World Health Organization (WHO). 2017. Global strategy on diet, physical activity and health, viewed 30 November 2017, <http://www.who.int/dietphysicalactivity/pa/en/>

8.2 APPLICATIONS (APPS)

I can also consult and/or use one of the many exercise applications (apps) available such as the 7-minute workout apps. Reminder: If I use a 7-minute workout app, then I should repeat some of the exercises (or the entire set) at least twice to exercise for a minimum of 10 minutes.

9 REFERENCE LIST

The following list of references were used to compile my booklet:

American College of Sports Medicine (ACSM). 2014. ACSM's guidelines for exercise testing and prescription. 9th edition. Philadelphia: Lippincott Williams & Wilkins.

Douaihy, A, Kelly, KM & Gold, MA. 2014. Motivational interviewing: a guide for medical trainees. New York: Oxford University Press.

Krejci, J & Neugebauer, Q. 2015. Motivational interviewing in groups: group process considerations. *Journal of Groups in Addiction & Recovery*, 10:23-40.

McKeag, DB & Moeller, JL. 2007. ACSM's Primary Care Sports Medicine. 2nd edition. Philadelphia: Lippincott Williams & Wilkins.

Miller, A. 2012. Instructor's manual for resolving ambivalence in motivational interviewing with Cathy Cole, LCSW, viewed 29 November 2017 <http://www.psychotherapy.net/data/uploads/5113e32091979.pdf>

Nieman, D. 2011. Exercise testing and prescription: A health-related approach. 7th edition. New York: McGraw-Hill.

Rollnick, M. 2002. Motivational interviewing. 2nd edition. New York: The Guildford Press.

Wagner, CC & Ingersoll, KS. 2013. Motivational interviewing in groups. New York: The Guildford Press.

Appendix A

How do I progress?

Type of exercise	How to progress
Cardio respiratory endurance	Increase the time of the exercise (minutes per session): 5-10 minutes every 1 -2 weeks Gradually increase the intensity of the exercise (without becoming excessively short of breath, tired or experience muscle soreness)
Muscle strength	Increase the weight or resistance Increase to 12 repetitions in the first set. Increase to four sets. Maintenance: Even as less as one day per week
Flexibility	Not known.

Appendix B

How to determine the intensity of the exercise that you are doing?

Option 1

My age ____ years

My heart rate at rest _____beats/minute

Level of intensity	Percentage of desired level of intensity	My desired level of intensity
Light	Less than 40%	
Moderate	40% to less than 60%	
Vigorous	60% to less than 90%	

My target exercise heart rate should be calculated as follows:

$(\text{MaxHR}) - (\text{Age}) - (\text{HR @ rest}) \times (\% \text{ of desired level of intensity}) + (\text{HR @ rest}) = \text{target exercise HR}$

E.g. $220 - 35 - 65 \times 40\% + 65 = 113 \text{ bpm}$

Now, work out your target exercise heart rate:

Maximum heart rate is: $220 - \text{my age in years}$

MINUS _____ my heart rate at rest (in beats per minute)

TIMES my _____ % desired level of intensity (from table above)

PLUS _____ heart rate at rest (in beats per minute)

Equals: _____ is the heart rate at which I must exercise

Nieman (2011:176)

Option 2

Guideline	Moderate	Vigorous	Combination
Frequency (days/week)	≥ 5	> 3	≥ 3 to 5
Intensity Percentage heart rate reserve (<i>see calculation in option 1</i>)	40 to 59 %	≥ 60%	40 to 85%
Time Minutes per day or	30 to 60	20 to 60	20 to 60
Minutes per week	≥ 150 minutes per week	≥ 150	≥ 150

Nieman 2011:176

Appendix C

When I feel ready I can look at the table which summarizes the optimal level of exercises I should do to be healthy.

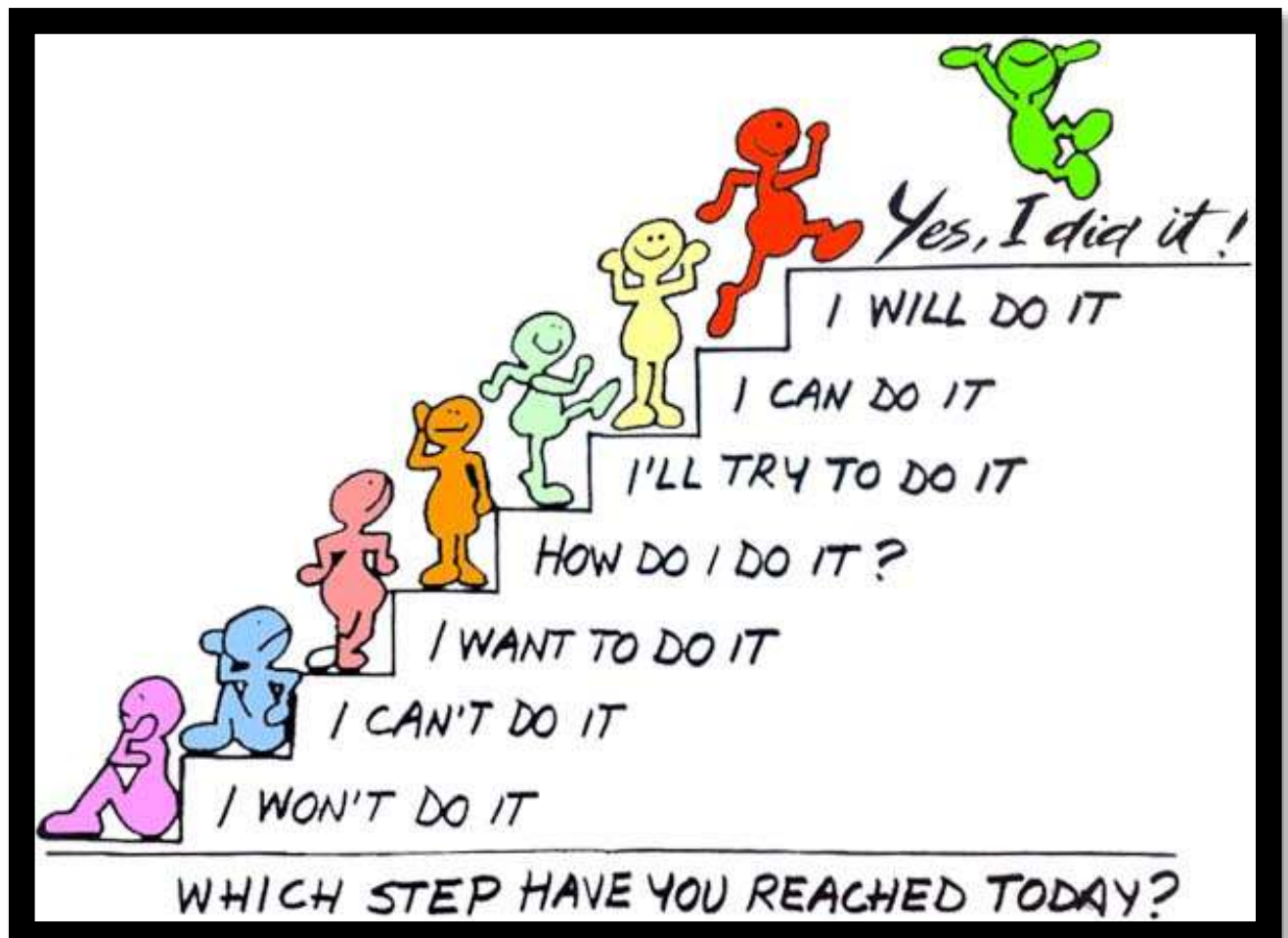
Physical fitness component	Principles	Recommendations
Cardio respiratory endurance (aerobic exercise)*	How often?	Moderate intensity of 150 minutes per week (up to 300 minutes) OR Vigorous intensity of 75 minutes of (up to 150 minutes) OR A combination of both
	For how long?	Moderate intensity of 30 to 60 minutes per day OR Vigorous intensity of 20 to 60 minutes of per day OR A combination of both <i>I can do multiple sessions of at least 10 minutes at a time to reach the recommended duration</i> <i>If you have been very inactive even less than 20 minutes can be beneficial</i>
	How intense?	Moderate to vigorous (view Appendix D) Light if you have not exercised for at least 3 time per week for the past 3 months
	What type?	Regular, purposeful exercise that involves major muscle groups and is continuous and rhythmic in nature, like walking, leisurely cycling, aqua-aerobics, slow dancing
Muscular strength	How often?	All the major muscle groups (e.g. shoulders, legs, abdomen, back) 2 to 3 days per week with at least 48 hours rest between exercise sessions of the same group of muscles All can be done in one session or split over different days
	What type?	Use body weight, free weights (e.g. dumbbells, bottles filled with sand) or weights (e.g. apparatus in a gymnasium)
	How much?	2-3 sets per muscle group with 2-3 min rest in between In one set: weight/resistance exercise that you can repeat 8 - 10 times per set up to point of fatigue (e.g. 10 during first set, and 8 during the last set)
	How?	Controlled through the full range of motion

Physical fitness component	Principles	Recommendations
Muscle endurance§	Similar to muscle strengthening	One to two sets at a time Less weight than with strengthening, but with more repetitions (15 to 25) and a shorter rest periods in between.

Flexibility	When?	Best when the muscle is warmed through light-to-moderate aerobic exercises or after a hot bath.
	How often?	2 to 3 times per week, up to daily (best) Can also add balance exercises like yoga or Thai-chi
	Type	One type is static: prolonged stretch of each of the major muscle-tendon groups†
	Intensity?	Stretch to the point of tightness or slight discomfort
	For how long?	Hold a prolonged (static) stretch for 10 to 30 seconds. Repeat to reach 60 seconds for each flexibility exercise.
	How?	After a warm-up, e.g. after other training or after 10 min of jogging on the spot

Source: ACSM 2014

Enjoy each step of your six-week exercise journey!



ANNEXURE J (A)

TEMPLATE FOR EVALUATION



Annexure J (a)

Evaluation of the Booklet Template



EVALUATION OF THE BOOKLET

STUDY TITLE: THE EFFECT OF PHYSICAL EXERCISE ON COMPASSION OF NURSES IN EMERGENCY DEPARTMENTS: A PILOT STUDY

Thank you for your participation. Your expertise and insights relating motivational interviewing and/or physical exercise are truly valued.

Section A: Demographic information

Please tell us about yourself by answering the following questions by indicating your chosen option with a (X) in the appropriate box or fill in the information asked for in the space provided.

1. Indicate your expertise (<i>you may indicate one or both options provided</i>)	Yes	No
Motivational interviewing		
Physical exercise		
2. How many years of experience do you have relating to:		
Motivational interviewing _____ years and/or		
Physical exercise _____ years		
3. Briefly describe your expertise relating to motivational interviewing and/or physical exercise		
4. State your professional qualification (e.g. lecturer Department of Nursing Science)		
5. Indicate your highest qualification		
Diploma		
Degree		

Master's	
Doctorate	
Other	
If other, please indicate _____	

Section B: Evaluation of the booklet

Please read through the booklet 'Journey toward physical fitness'. Feel free to comment on the document by using track changes. Then indicate with an (X) that best describes your impression of the booklet to the set criteria. If you select '*marginal*' or '*unsatisfactory*', please comment with suggestions for improvement.

Criteria	Exemplary	Proficient	Marginal	Unsatisfactory	Comments
Clarity					
Simplicity					
Consistency					
Logical flow					
Layout					
Applicable in developing a personalised exercise program					
Adhere to principles of motivational interviewing					

Comments

Thank you for your inputs. We appreciate your time and contributions. Please feel free to indicate if you wish to collaborate on similar projects (e.g. using the booklet) in future.

ANNEXURE J (B)

**SUMMARY OF EXPERTS
EVALUATION**



Annexure J (b)
Summary of Experts' Evaluation of Booklet

ANNEXURE K

**DEMOGRAPHIC INFORMATION
QUESTIONNAIRE (PRE-TEST)**



Annexure K

Self-Reported Questionnaire by Participants: Pre-Test

Guidelines for completing the structured, self-reported questionnaire: Pre-test

The structured, self-reported questionnaire consist of the following **three (3) sections** and you are requested to complete **all the sections**:

- **Section A:** Demographical information
- **Section B:** Compassion
- **Section C:** Exercise readiness

Please follow the instructions indicated at each section and answer ALL the questions.

Unique number

Section A: Demographic information

Answer each question by indicating your chosen option with a **(x)** in the appropriate block.

Sex	Male		Female		Other	
Age in years	_____years					
Marital status	Single					
	Married					
	Divorced					
	Live-in partner					
Number of children						
Highest academic qualifications	Matric					
	Diploma					
	Degree					
	Master's degree					

	Other	
	<i>If other, please specify</i> _____	
Indicate the number of years of experience you have in the emergency department		
_____ years		
Do you work	Day duty only	
	Night duty only	
	Day and night duty	
How many shifts on average do you work overtime per month ?		
_____ shifts		

Section B: Compassion

When you *[help]* people you have direct contact with their lives. As you may have found, your compassion for those you *[help]* can affect you in positive and negative ways. Below are some questions about your experiences, both positive and negative, as a *[helper]*. Consider each of the following questions about you and your current work situation. **Select the number that honestly reflects how frequently you experienced these things in the last 30 days.**

1=Never 2=Rarely 3=Sometimes 4=Often 5=Very often

Questions	Number
I am happy	
I am preoccupied with more than one person I <i>[help]</i>	
I get satisfaction from being able to <i>[help]</i> people	
I feel connected to others	
I jump or am startled by unexpected sounds	
I feel invigorated after working with those I <i>[help]</i>	
I find it difficult to separate my personal life from my life as a <i>[helper]</i>	
I am not as productive at work because I am losing sleep over traumatic experiences of a person I <i>[help]</i>	

I think that I might have been affected by the traumatic stress of those I <i>[help]</i>	
I feel trapped by my job as a <i>[helper]</i>	
Because of my <i>[helping]</i> , I have felt “on edge” about various things	
I like my work as a <i>[helper]</i>	
I feel depressed because of the traumatic experiences of people I <i>[help]</i>	
I feel as though I am experiencing the trauma of someone I have <i>[helped]</i>	
I have beliefs that sustain me	
I am pleased with how I am able to keep up with <i>[helping]</i> techniques and protocols	
I am the person I always wanted to be	
My work makes me feel satisfied	
I feel worn out because of my work as a <i>[helper]</i>	
I have happy thoughts and feelings about those I <i>[help]</i> and how I could help them	
1=Never 2=Rarely 3=Sometimes 4=Often 5=Very often	

Questions	Number
I feel overwhelmed because my <i>[case]</i> workload seems endless	
I believe I can make a difference through my work	
I avoid certain activities or situations because they remind me of frightening experiences of people I <i>[help]</i>	
I am proud of what I can do to <i>[help]</i>	
As a result of my <i>[helping]</i> I have intrusive, frightening thoughts	
I feel “bogged down” by the system	
I have thoughts that I am a “success” as a <i>[helper]</i>	
I can’t recall important parts of my work with trauma victims	
I am a very strong person	
I am happy that I chose to do this work	

Section C: Exercise readiness

Read the following statements and indicate with a **cross (x)** where you are at present relating exercise

I exercised in the past, but I do not exercise now	
I currently do not exercise, and I do not intend to start exercising in the next six months	
I currently do not exercise but am thinking about starting to exercise within the next six months	
I currently exercise a little but not regularly	
I currently exercise regularly but have only begun doing so within the past six months	
I currently exercise regularly and have done so for longer than six months	

Thank you for completing the questionnaire!

ANNEXURE L

**DEMOGRAPHIC INFORMATION
QUESTIONNAIRE (POST –TEST)**



Annexure L

Self-Reported Questionnaire by Participants: Post-Test

Guidelines for completing the structured, self-reported questionnaire: Post-test

The structured, self-reported questionnaire consist of the following **three (3) sections** and you are requested to complete **all the sections**:

- **Section A:** Compassion
- **Section B:** Exercise readiness
- **Section C:** Adherence

Please follow the instructions indicated at each section and answer ALL the questions.

Unique number

Section A: Compassion

When you *[help]* people you have direct contact with their lives. As you may have found, your compassion for those you *[help]* can affect you in positive and negative ways. Below are some questions about your experiences, both positive and negative, as a *[helper]*. Consider each of the following questions about you and your current work situation. **Select the number that honestly reflects how frequently you experienced these things in the last 30 days.**

1=Never

2=Rarely

3=Sometimes

4=Often

5=Very
often

Questions	Number
I am happy	
I am preoccupied with more than one person I <i>[help]</i>	
I get satisfaction from being able to <i>[help]</i> people	
I feel connected to others	

I jump or am startled by unexpected sounds	
I feel invigorated after working with those I <i>[help]</i>	
I find it difficult to separate my personal life from my life as a <i>[helper]</i>	
I am not as productive at work because I am losing sleep over traumatic experiences of a person I <i>[help]</i>	
I think that I might have been affected by the traumatic stress of those I <i>[help]</i>	
I feel trapped by my job as a <i>[helper]</i>	
Because of my <i>[helping]</i> , I have felt “on edge” about various things	
I like my work as a <i>[helper]</i>	
I feel depressed because of the traumatic experiences of people I <i>[help]</i>	
I feel as though I am experiencing the trauma of someone I have <i>[helped]</i>	
I have beliefs that sustain me	
I am pleased with how I am able to keep up with <i>[helping]</i> techniques and protocols	
I am the person I always wanted to be	
My work makes me feel satisfied	
I feel worn out because of my work as a <i>[helper]</i>	
I have happy thoughts and feelings about those I <i>[help]</i> and how I could help them	
1=Never 2=Rarely 3=Sometimes 4=Often 5=Very often	

Questions	Number
I feel overwhelmed because my <i>[case]</i> workload seems endless	
I believe I can make a difference through my work	
I avoid certain activities or situations because they remind me of frightening experiences of people I <i>[help]</i>	
I am proud of what I can do to <i>[help]</i>	
As a result of my <i>[helping]</i> I have intrusive, frightening thoughts	
I feel “bogged down” by the system	
I have thoughts that I am a “success” as a <i>[helper]</i>	
I can’t recall important parts of my work with trauma victims	
I am a very strong person	
I am happy that I chose to do this work	

Section B: Exercise readiness

Read the following statements and indicate with a **cross (x)** where you are at present relating exercise

I exercised in the past, but I do not exercise now	
I currently do not exercise, and I do not intend to start exercising in the next six months	
I currently do not exercise but am thinking about starting to exercise within the next six months	
I currently exercise a little but not regularly	
I currently exercise regularly but have only begun doing so within the past six months	
I currently exercise regularly and have done so for longer than six months	

Section C: Adherence

Week	Number of days exercised	Time exercised
Week 1		
Week 2		
Week 3		
Week 4		
Week 5		
Week 6		
Total		

Thank you for completing the questionnaire!

ANNEXURE M

DATA CAPTURING SHEET



Annexure M

Data Capturing Sheet

Participant unique number _____

Components	Tests	Pre-test	Post-test (6 weeks)
Cardiovascular fitness	Heart rate (before walk)	beats/min	beats/min
	Blood pressure (before walk)	mmHg	mmHg
	6-min walk test (distance covered)	m	m
	Heart rate (after walk)	beats/min	beats/min
	Blood pressure (after walk walk)	mmHg	mmHg
Muscle strength	One repetition maximum (1RM) functional squad		
Muscle endurance	Trunk muscle endurance (side trunk flexion of the dominant hand side)		
Flexibility	Active straight leg raise (SLR)		
	Hamstring length		
Biometry (Anthropometry)	Waist circumference	cm	cm
	Height	cm	cm
	Weight	kg	kg
	Body Mass Index (BMI)		

ANNEXURE N

DATA ANALYSIS PLAN



Annexure N

Data Analysis Plan

Data Analysis Plan

Research Objectives	Variable of each Objective (Age, Hospital)	Nature of Variables Compound-Age Categorical- Male/Female	Aim of Stats	Statistical Test	Test Statistics (Variables)
1. Level of Compassion	ProQol Scale	Nominal	Description		
	Readiness for PA				
	Heart Rate	Nominal	Description		
	BP	Nominal	Description		
	6 min walk test	Nominal	Description		
	Muscle Endurance	Nominal	Description		
	Flexibility	Nominal	Description		
	Neck Circumference	Nominal	Description		
2. Level of P.A.					
3. Same as 1					
4. Same Variables			Compare pre + post-test values		
5. Relationship between compliance and the above			Investigate the relationship		

Pre-test level establish a profile in terms of compassion, physical fitness and readiness for change (descriptive).

Post test-paired T-test
Rank Test (Wilcoxin)
Correlation between burnout and compassion compliance

ANNEXURE O

**MUSCULAR ENDURANCE
NORMS: ASSESSING ME – CURL-
UP TEST**



Annexure O

Muscular Endurance Norms: Assessing ME – Curl-Up Test

Adopted from 2014 American College of Sports Medicine norms for muscular endurance testing

Norms for Muscle Endurance

* Norm for females for cadence of crunches

WOMEN	teens	20's	30's	40's	50's	60's
Excellent	42+	37+	30+	26+	21+	20+
Good	32 - 39	28 - 35	22 - 27	18 - 23	14 - 19	13 - 18
Average	29 - 31	25 - 27	19 - 21	15 - 17	11 - 13	10 - 12
Below Avg	20 - 27	17 - 24	12 - 18	8 - 14	5 - 11	4 - 9
Poor	below 20	below 17	below 12	below 8	below 5	below 4

Result tables interpreted from the norms by age group (Golding, et al. (1986). The Y's way to physical fitness (3rd ed.)

http://acsf.edu.au/pdf/Endurance_Test_Sit_up.pdf

ANNEXURE P

**MUSCULAR ENDURANCE
PROTOCOL**



Annexure P

Muscular Endurance Protocol

Norms for muscle endurance

* Norm for females for cadence of crunches

WOMEN	teens	20's	30's	40's	50's	60's
Excellent	42+	37+	30+	26+	21+	20+
Good	32 - 39	28 - 35	22 - 27	18 - 23	14 - 19	13 - 18
Average	29 - 31	25 - 27	19 - 21	15 - 17	11 - 13	10 - 12
Below Avg	20 - 27	17 - 24	12 - 18	8 - 14	5 - 11	4 - 9
Poor	below 20	below 17	below 12	below 8	below 5	below 4

Result tables interpreted from the norms by age group (Golding, et al (1986). The Y's way to physical fitness (3rd ed.)

http://acsf.edu.au/pdf/Endurance_Test_Sit_up.pdf

ANNEXURE Q

FLEXIBILITY PROTOCOL



Annexure Q

Flexibility Protocol

Passive knee extension test to examine joint range and quality of movement

Passive Knee Extension Test (Flexibility)

https://www.physio-pedia.com/Passive_Knee_Extension_Test

The purpose of the Passive Knee Extension Test is to examine the joint range and its quality of movement; in particular, the 'end feel' of the joint. The test can also measure tightness of the hamstring muscles.^[1]

Technique

The patient is positioned in supine with the hip of the tested leg in 90 degrees of flexion. The contralateral leg stays flat on the examination table. The clinician extends the knee until reaching the maximal tolerable stretch of the hamstring muscle as indicated by the patient with the ipsilateral hip remaining in 90 of flexion. The knee angle is then measured.^[2]

Goniometer Placement

The Axis of the goniometer should be places at the lateral epicondyle of the femur. The moving arm should point towards the lateral malleolus and the stationary should point towards the greater trochanter.^[3]



^[4]

Normal Test Values

Davis et al^[5] found the normal values (in degrees) of the popliteal angle (180 degrees - knee extension angle) in a population of healthy college student to be as follows:

Men	Women
71.6	77.7

Reliability

The Passive Knee Extension Test has good intra-tester reliability [ICC: 0.97-0.98].^[6]

Related articles

Goniometry: Knee Extension - Physiopedia Anatomical Movement Knee extension Testing position Patient is in prone with test-side ankle off plinth. Goniometer Placement AXIS LOCATION STATIONARY ARM MOVEMENT ARM lateral epicondyle of the femur along the femur to the greater trochanter along the fibula to lateral malleolus Expected Findings Expected range of motion in prone is 0 degrees and -5 degrees in females (hyper mobility)[1]**Knee Extension Lag - Physiopedia** Purpose The term 'muscle lag' or 'extensor lag' or 'quadriceps lag' is a clinical sign with often profound functional relevance for patients during knee rehabilitation. Technique [1] Muscle lag is an inability to actively move a joint to its passive limit. In more detail, the passive limit should be the passive limit that can be achieved without producing significant discomfort, and without exerting more than mild force against resistance from joint stiffness or other soft tissue tightness. The active limit should be determined with the patient positioned so that the moving segment is resisted by gravity but no other external load. Active Lag Test An active lag is determined by the inability of the erectly seated subject to actively extend the involved knee in maximal dorsiflexion of the ankle to the same level as the normal knee held in maximal extension and ankle in maximal dorsiflexion, as seen by the levels of the toes. Passive Lag Test A passive lag is determined by placing the subject prone with the knees just past the edge of the table and determining the high position of the heel in a fully resting extension position compared to the heel on the normal side. It appears there is a widespread belief that lag is always abnormal. Physiological Quadriceps Lag [2] A study done on physiological quadriceps lag has shown that most healthy young adults, when assessed in the manner

described, manifest a quadriceps lag. [1] At the instant of maximum voluntary active extension, 48% of the 64 subjects had a quadriceps lag of between 2.0 and 10.5 degrees. Since these subjects had no pain, and further passive extension was possible without substantial passive resistance, this lag at 0 sec can only be readily explained as a manifestation of normal quadriceps femoris active insufficiency, perhaps augmented in some subjects by a less than maximum voluntary effort. The apparent absence of any reference in the literature to quadriceps lag in normal knees is most likely because quadriceps lag does not appear to have been examined systematically in healthy subjects. Evidence For the sitting active lag test, the inter-rater reliability was 'good' (Kappa 0.792, SE of kappa 0.115, 95% confidence interval). For the prone passive lag test, the inter-rater reliability was 'good' (Kappa 0.636, SE of kappa 0.136, 95% confidence interval).

[1][Goniometry: Hip Extension - Physiopedia](#)Anatomical Movement Hip extension Testing position Patient is prone with test side knee extended Goniometer Placement AXIS LOCATION STATIONARY ARM MOVEMENT ARM greater trochanter parallel to trunk parallel to longitudinal axis of femur in line with lateral femoral condyle Expected Findings Expected range of motion is 0- 30 degrees[1][Active Knee Extension Test - Physiopedia](#)Purpose The Active Knee Extension Test is used to assess hamstring muscle length and the range of active knee extension in the position of hip flexion (Dennis et al 2008) Technique Evidence Provide the evidence for this technique here Resources add any relevant resources here[Goniometry: Elbow Extension - Physiopedia](#)Anatomical Movement Elbow extension Testing position Patient is supine with the hand supinated. You may need a pillow under the upper arm in cases of hyperextension (>0) Goniometer Placement AXIS LOCATION STATIONARY ARM MOVEMENT ARM lateral epicondyle of the elbow parallel with the humerus parallel with the radius Expected Findings Expected range of motion is 0 degrees in males and 10-15 degrees in females (hyperextension)[1]

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ANNEXURE R

ASSESSING MUSCULAR STRENGTH



Annexure R

Assessing Muscular Strength Norms

Norms for assessing muscular strength with one range of movement adopted from Aerobic Research Dallas 1994 using leg strength



Assessing MS – 1-RM

TABLE 5.3. Fitness Categories for Leg Strength by Age and Sex*

		Age (year)				
Percentile		20-29	30-39	40-49	50-59	60+
Men						
90	Well above average	2.27	2.07	1.92	1.80	1.73
80	Above average	2.13	1.93	1.82	1.71	1.62
70		2.05	1.85	1.74	1.64	1.56
60	Average	1.97	1.77	1.68	1.58	1.49
50		1.91	1.71	1.62	1.52	1.43
40	Below average	1.83	1.65	1.57	1.46	1.38
30		1.74	1.59	1.51	1.39	1.30
20	Well below average	1.63	1.52	1.44	1.32	1.25
10		1.51	1.43	1.35	1.22	1.16
Women						
90	Well above average	1.82	1.61	1.48	1.37	1.32
80	Above average	1.68	1.47	1.37	1.25	1.18
70		1.58	1.39	1.29	1.17	1.13
60	Average	1.50	1.33	1.23	1.10	1.04
50		1.44	1.27	1.18	1.05	0.99
40	Below average	1.37	1.21	1.13	0.99	0.93
30		1.27	1.15	1.08	0.95	0.88
20	Well below average	1.22	1.09	1.02	0.88	0.85
10		1.14	1.00	0.94	0.78	0.72

*One repetition maximum leg press with leg press weight ratio = weight pushed per body weight.

Adapted from Institute for Aerobics Research, Dallas, 1994. Study population for the data set was predominantly white and college educated. A Universal Dynamic Variable Resistance (DVR) machine was used to measure the 1-repetition maximum (RM).

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ANNEXURE S

MUSCULAR PROTOCOL



Annexure S

Muscular Strength Protocol

Procedure and protocol for assessing muscular strength for one repetition maximum



Assessing MS – 1-RM

BOX 5.2 Procedures for a One Repetition Maximum (1-RM) Assessment (7)

1. The subject should warm up by completing several submaximal repetitions.
2. Determine the 1-RM (or any multiple-RM) within four trials with rest periods of 3–5 min between trials.
3. Select an initial weight that is within the subject's perceived capacity (~50%–70% of capacity).
4. Progressively increase resistance by 2.5–20 kg until the subject cannot complete the selected repetition(s); all repetitions should be performed at the same speed of movement and range of motion to ensure consistency between trials.
5. Record the final weight lifted successfully as the absolute 1-RM or multiple-RM.

American College of Sports Medicine. Health-related physical fitness testing and interpretation. In: *ACSM's Guidelines for Exercise Testing and Prescription*. 9th ed. Philadelphia: Wolters Kluwer Health Ltd; 2011. 480 p.

ANNEXURE T

**WAIST CIRCUMFERENCE AND
WAIST-HIP RATIO NORMS AND
PROTOCOL WORLD HEALTH
ORGANISATION**



Annexure T

Waist Circumference and Waist-hip Ratio Norms and Protocol

Waist Circumference and Waist–Hip Ratio: Report of a WHO Expert Consultation

Geneva, 8–11 December 2008 // WHO Library Cataloguing-in-Publication Data
Waist circumference and waist–hip ratio: report of a WHO expert consultation, Geneva, 8–11 December 2008.

1.Body mass index. 2.Body constitution. 3.Body composition. 4.Obesity.

I.World Health Organization.

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Abbreviations and acronyms

ATP Adult Treatment Panel

AUC area under the receiver operating characteristic curve

BMI body mass index

CARDIA Coronary Artery Risk Development in Young Adults

CVD cardiovascular disease

DEXA dual X-ray absorptiometry

FAO Food and Agriculture Organization of the United Nations

FPR false-positive rate

IDF International Diabetes Federation

MESA Multi-Ethnic Study of Atherosclerosis

NCD noncommunicable disease

NCEP National Cholesterol Education Program

NHANES National Health and Nutrition Examination Survey

NHLBI National Heart, Lung and Blood Institute

NIH National Institutes of Health

ROC receiver operating characteristic

STEPS STEPwise Approach to Surveillance (WHO)

SWAN Study of Women's Health Across the Nation

TPR true-positive rate

US United States
WHO World Health Organization

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1

1 Introduction

The World Health Organization (WHO) Expert Consultation on Waist Circumference and Waist–Hip Ratio was held in Geneva, Switzerland on 8–11 December 2008. The consultation was organized by WHO’s Department of Nutrition for Health and Development, in collaboration with the Department of Chronic Diseases and Health Promotion. It was opened by Dr Ala Alwan, WHO Assistant Director-General for Noncommunicable Diseases and Mental Health. The consultation was convened as part of WHO's:

- efforts in implementing the recommendations made at the WHO Consultation on Appropriate Body Mass Index for Asian Populations (WHO, 2004);
- response to the emerging problem of obesity and related chronic diseases, in particular in low- and middle-income countries.

The 1997 WHO Expert Consultation on Obesity recognized the importance of abdominal fat mass (referred to as abdominal, central or visceral obesity), which can vary considerably within a narrow range of total body fat and body mass index (BMI). It also highlighted the need for other indicators to complement the measurement of BMI, to identify individuals at increased risk of obesity-related morbidity due to accumulation of abdominal fat (WHO, 2000a). Waist–hip ratio (i.e. the waist circumference divided by the hip circumference) was suggested as an additional measure of body fat distribution. The ratio can be measured more precisely than skin folds, and it provides an index of both subcutaneous and intraabdominal adipose tissue (Bjorntorp, 1987). The suggestion for the use of proxy anthropometric indicators arose from a 12-year follow-up of middle-aged men, which showed that abdominal obesity (measured as waist–hip ratio) was associated with an increased risk of myocardial infarction, stroke and premature death, whereas these diseases were not associated with measures of generalized obesity such as BMI (Larsson et al., 1984). In women, BMI was associated with increased risk of these diseases; however, waist–hip ratio appeared to be a stronger independent risk factor than BMI (Lapidus et al., 1984).

The 2002 WHO Expert Consultation on Appropriate Body Mass Index for Asian Populations and Its Implications for Policy and Intervention Strategies (WHO, 2004) reviewed the issue of ethnic differences in the meaning of BMI cut-off values. In populations with a predisposition to central (i.e. abdominal or visceral) obesity and the related increased risk of developing metabolic syndrome, the consultation recommended that, where possible, waist circumference should be used to refine action levels based on BMI. For example, levels based on BMI might be increased by one level if the waist circumference were elevated above a specified level. The choice of the action level for waist circumference should be based on population-specific data and health considerations. An expert working group was formed by

the 2002 consultation, to start examining data on the relation between waist circumference and morbidity, and on any association between BMI, waist circumference and health risk. The aim was to develop recommendations for using waist measurements to further define risks.

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WHO's Global Strategy for the Prevention and Control of Noncommunicable Diseases (WHO, 2000b), and the more recent 2008–2013 Action Plan for the Global Strategy for the Prevention and Control of Noncommunicable Diseases (WHO, 2008a), provide the platform for WHO's work on noncommunicable diseases (NCDs). These publications identified the monitoring of NCDs and their determinants as a key component for:

- developing policies;
- evaluating the effectiveness and impact of interventions;
- assessing the progress made.

The Expert Consultation on Waist Circumference and Waist–Hip Ratio contributed to the implementation of the global strategy and NCD action plan. It achieved this by reviewing and updating the waist circumference and waist–hip ratio issues related to diagnostic criteria, classifications and (possibly) management guidelines for major NCDs. The overall aim of the expert consultation was to review the scientific evidence and make recommendations on the issues related to waist circumference and waist–hip ratio. It focused particularly on issues related to:

- methods of measurement;
- variations by sex, age and ethnicity;
- predicting risks of cardiovascular disease (CVD) and diabetes, and of overall mortality;
- relationship with BMI in predicting disease risks.

The specific objectives of the consultation were to:

- review the usefulness of waist circumference and waist–hip ratio measures as predictors of NCD risk;
- assess operational considerations related to measurement protocols and cut-off points for public health action;
- define potential cut-off points for public health action;
- identify future research needs.

To achieve these objectives, six peer-reviewed background papers were prepared by selected experts in the related fields. The selection of experts, both for the preparation of the background documents and for the actual consultation, followed WHO process and guidelines; as part of the process, all expert participants, peer reviewers and temporary advisors signed a declaration of interests.

Where possible, the background papers prepared for the consultation evaluated the strength of the evidence, using modified criteria from the World Cancer Research Fund, as adapted by

an earlier joint WHO and Food and Agriculture Organization of the United Nations (FAO) Expert Consultation on Diet, Nutrition and the Prevention of Chronic Disease (WHO/FAO, 2003) (see Table 1.1, below). Much of the data and many of the study designs did not easily lend themselves to rigorous evaluation based on these criteria. Nevertheless, the criteria were useful to the discussions at the expert consultation, in relation to understanding conclusions on the differences among diverse populations derived from examination of associations between BMI and proxy anthropometric indicators of abdominal fat, and different health outcomes.

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Table 1.1 Criteria for assessing strength of the evidence of association

Convincing evidence Probable evidence Possible evidence

- Based on epidemiological studies showing consistent associations between exposure and disease, with little or no evidence to the contrary
- Based on a substantial number of studies including prospective observational studies and, where relevant, randomized controlled trials of sufficient size, duration and quality showing consistent effects
 - Association should be biologically plausible
- Based on epidemiological studies showing fairly consistent associations, but with perceived shortcomings in available evidence or some evidence to the contrary, precluding a more definite judgement
 - Shortcomings in the evidence may include insufficient duration of trials/studies, insufficient availability of trials/studies, inadequate sample sizes, and incomplete follow-up
- Laboratory evidence is usually supportive
 - Association should be biologically plausible
- Based mainly from case–control and cross-sectional studies, and data from insufficient randomized control trials, observational studies, non-randomized control trials and evidence from non-epidemiological studies (i.e. clinical and laboratory based)
 - More trials are required to support tentative associations
 - Association should be biologically plausible

Adapted from WHO/FAO (2003)

This report provides a summary of the discussions of the expert consultation. It includes:

- discussion of the methods for measuring waist circumference and waist–hip ratio (Chapter 2);
- age, sex and ethnic variations in fat distribution (Chapter 3);
- associations of waist circumference and waist–hip ratio with BMI, and with health outcomes (Chapter 4).

Chapter 5 presents a summary and conclusions on these different aspects, and discusses

approaches and research needs for using measurements of waist circumference and waist–hip ratio. Chapter 6 outlines steps that could be taken to arrive at appropriate WHO recommendations. Annex A contains background information (compiled by the WHO Secretariat) on existing cut-off points for waist circumference and waist–hip ratio. These cut-off points are used to variable extents, some for clinical and diagnostic purposes, others for screening and surveillance for public health purposes. Annex B lists the participants in the consultation.

The detailed background papers, together with an overview of the expert consultation, have been published elsewhere (Huxley et al., 2010; Lear et al., 2010; Nishida et al., 2010; Qiao & Nyamdorj, 2010a; Qiao & Nyamdorj, 2010b; Seidell, 2010; Stevens et al., 2010). The main findings and key issues identified from these background papers are included in this report. Some of the potential uses of the cut-off points for waist circumference and waist–hip ratio include:

- surveillance
- screening
- diagnosis and decision to treat in a clinical situation
- assessing the value of treatment of an individual
- assessing the value of intervention in the community.

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To use either or both of these measures, the method for selecting cut-off points to indicate thresholds for risk needs to be specified (WHO, 1995). The basis for identifying these cut-off points may be identical for the different measurements or may differ, depending on the purpose for which the cut-off points are used. The relevance to public health is related to prevention and the prediction of disease burden, rather than the prediction of mortality. As part of an evidence base to inform policy, these measures may be used to assess the need for interventions, and to assess effectiveness of interventions in reducing health risks or associated costs and burdens.

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2 Methods for measuring waist and hip circumference

An important issue in using and interpreting waist circumference or waist–hip ratio is the protocol used to obtain the measurements. Also important is the extent to which the measurement protocol varies across studies, and the potential for standardizing these measurements within a study or survey, when taken by different people.

Theoretically, differences in measurements protocols across studies could be responsible for variation in the association of these measures with risk factors, or disease or mortality outcomes. Therefore, the expert consultation considered background information on

protocols currently in use, and the impact of differences in measurement approaches on measurement error and associations with health outcomes. The aim was to recommend an appropriate protocol for international use.

Elements of the protocol discussed below include:

- the anatomical placement of the measuring tape, its tightness and the type of tape used;
- the subject's posture, phase of respiration, abdominal tension, stomach contents and clothing.

2.1 Placement, tightness and type of measuring tape

2.1.1 Placement of tape

Waist circumference

The WHO STEPwise Approach to Surveillance (STEPS) provides a simple standardized method for collecting, analysing and disseminating data in WHO Member countries. The WHO STEPS protocol for measuring waist circumference instructs that the measurement be made at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest (WHO, 2008b). The United States (US) National Institutes of Health (NIH) protocol provided in the *NIH Practical guide to obesity* (NHLBI Obesity Education Initiative, 2000) and the protocol used in the US National Health and Nutrition Examination Survey (NHANES) III (Westat Inc, 1998) indicate that the waist circumference measurement should be made at the top of the iliac crest.

The NIH also provided a protocol for the measurement of waist circumference for the Multi-Ethnic Study of Atherosclerosis (MESA) study. This protocol indicates that the waist measurement should be made at the level of the umbilicus or navel. However, published reports indicate that measurements of waist circumference made at the level of the umbilicus may underestimate the true waist circumference (Croft et al., 1995). Some studies have assessed the waist circumference at the point of the minimal waist (Ross et al., 2008).

Hip circumference

All of the protocols mentioned in Section 2.1.1 indicate that the hip circumference measurement should be taken around the widest portion of the buttocks.

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2.1.2 Tightness and type of tape

The accuracy of waist and hip circumference measurements depends on the tightness of the measuring tape, and on its correct positioning (i.e. parallel to the floor at the level at which the measurement is made). The WHO STEPS protocol states that, for both waist and hip, the tape should be snug around the body, but not pulled so tight that it is constricting (WHO, 2008b). The protocol also recommends the use of a stretch-resistant tape that provides a

constant 100 g of tension through the use of a special indicator buckle; use of this type of tape reduces differences in tightness.

Both the protocol described in *NIH Practical guide to obesity* (NHLBI Obesity Education Initiative, 2000) and the NHANES III protocol (Westat Inc, 1998) recommend that the measurements be made with the tape held snugly, but not constricting, and at a level parallel to the floor.

2.2 Subject posture and other factors

2.2.1 Posture of the subjects during the measurement

The posture of the subject at the time the measurement is taken influences the accuracy of the measurement. Thus, the WHO STEPS protocol recommends that the subject stands with arms at the sides, feet positioned close together, and weight evenly distributed across the feet (WHO, 2008b). The NHANES III protocol recommends that the subject be standing erect, with the body weight evenly distributed (Westat Inc, 1998).

2.2.2 Phase of respiration at the exact point of measurement

The phase of respiration determines the extent of fullness of the lungs and the position of the diaphragm at the time of measurement; it also influences the accuracy of the waist circumference. The WHO STEPS protocol suggests that the waist circumference should be measured at the end of a normal expiration, when the lungs are at their functional residual capacity (WHO, 2008b). The NHANES III protocol states that the waist circumference should be measured at minimal expiration (Westat Inc, 1998).

2.2.3 Abdominal tension at the point of measurement

The tension of the abdominal wall influences the accuracy of the waist circumference measurement. Lowering the tension of the abdominal wall increases waist circumference, whereas increasing the tension (by sucking in) reduces waist circumference. Many individuals unconsciously react to waist measurements by sucking in the abdominal wall; hence, a relaxed posture is best for taking waist measurements. The WHO STEPS protocol recommends advising the subject to relax and take a few deep, natural breaths before the actual measurement is made, to minimize the inward pull of the abdominal contents during the waist measurement (WHO, 2008b).

2.2.4 Influence of stomach contents at time of measurement

The amount of water, food or gas in the gastrointestinal tract will affect the accuracy of the waist measurement. Gibson (1990) suggests that a waist measurement be made after the subject has fasted overnight or is in a fasted state, to reduce this effect. None of the protocols evaluated address this issue, perhaps because it would entail the subject being notified in advance of the measurement, and being present the morning after an overnight fast.

2.3 Measurement error

Information on the measurement error of the waist circumference and hip circumference has come from studies in adolescents. Lohman et al. (1988) calculated the technical error of waist circumference measurement in adolescents to be 1.31 cm from intrameasurer error and 1.56 cm from intermeasurer error. For hip measurements, the authors calculated the technical error to be 1.23 cm from intrameasurer error and 1.38 from intermeasurer error.

2.4 Implications of differences in methodology

There has been no evaluation of the effects of differences in the methods of measurements of waist and hip circumferences on measurement error and on the prediction or estimation of specific adipose tissue depots (e.g. abdominal fat). However, a systematic review of 120 studies examined whether measurement protocols influenced the relationship of waist circumference with morbidity from CVD and diabetes, and mortality from CVD and all causes (Ross, et al., 2008). The review only focused on the anatomical site of placement of the tape for waist circumference measurement. Most protocols measured at the midpoint (36%), umbilical level (28%) and minimal waist level (25%). Similar patterns of association were observed between health outcomes and all waist circumference protocols across sample size, sex, age, race and ethnicity. The review concluded that waist circumference measurement protocol had no substantial influence on the association between waist circumference, all-cause and CVD-specific mortality, and risk of CVD and diabetes (Ross, et al., 2008). Even when the same protocol is used, there may be variability within and between measurers when more than one measurement is made. The experts were uncertain whether these and other issues related to measurement are relevant at either the population or the clinical level, and felt that this may be an important area for inclusion in the future research agenda.

2.5 Summary and conclusions

Waist circumference should be measured at the midpoint between the lower margin of the least palpable rib and the top of the iliac crest, using a stretch-resistant tape that provides a constant 100 g tension. Hip circumference should be measured around the widest portion of the buttocks, with the tape parallel to the floor.

For both measurements, the subject should stand with feet close together, arms at the side and body weight evenly distributed, and should wear little clothing. The subject should be relaxed, and the measurements should be taken at the end of a normal expiration. Each measurement should be repeated twice; if the measurements are within 1 cm of one another, the average should be calculated. If the difference between the two measurements exceeds 1 cm, the two measurements should be repeated.

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3 Impact of variations in body fat distribution by sex, age and ethnicity

Commonly used cut-off points for waist circumference and waist-hip ratio are based on studies undertaken predominantly in populations of European origin. The importance of taking

into account ethnic differences in the amount of body fat associated with waist circumference or waist–hip ratio at different BMI levels was a primary motivation for this expert consultation, based on the findings of the 2002 WHO Expert Consultation on Appropriate Body Mass Index for Asian Populations and Its Implications for Policy and Intervention Strategies (WHO, 2004). The key issue is whether there are systematic differences in the extent to which a given waist circumference or waist–hip ratio level predicts disease outcomes in different ethnic groups, particularly if such differences could lead to underestimation of risk in certain populations. Systematic differences could relate to one or both of the following:

- differences in body composition – that is, the relative amounts or types of fat reflected

In the waist circumference or waist–hip ratio measurement;

- differences in disease risk for a particular body fat profile.

Also of interest were variations in body fat distribution that may affect all populations; for example, variations between men and women, and with ageing. This chapter summarizes the issues related to sex, age and ethnic variations. More detailed discussions were provided in the background paper that examined associations between sex, reproductive status and age, and waist circumference (Stevens, et al., 2010); and the paper that examined associations between ethnicity and waist circumference (Lear, et al., 2010).

3.1 Sex

Sex differences in deposition of body fat are evident even at the foetal stage, but they become much more pronounced during puberty (Wells, 2007). After adjusting for differences in height, men have greater total lean mass and bone mineral mass, and a lower fat mass than women; these differences continue throughout adult life. Women have substantially more total adipose tissue than men, and these whole-body sex differences are complemented by major differences in tissue distribution. Men have greater arm muscle mass, larger and stronger bones, less limb fat and a relatively greater central distribution of fat. Women have a more peripheral distribution of fat in early adulthood. Sex differences in body composition are primarily attributable to the action of sex steroid hormones, which drive the dimorphisms during pubertal development. In men, a reduction in free testosterone levels is associated with an increase in fat mass and reduction in muscle mass, and both total and free testosterone levels are inversely associated with obesity (Derby et al., 2006).

3.2 Reproductive status

Parity is an important contributor to changes in body composition and body shape in women. Pregnancy is associated with gains in visceral and central adiposity postpartum. Cross-sectional analysis of data from NHANES III illustrated how parity is associated with changes in body shape (Lassek & Gaulin, 2006). Data from 16 325 women showed that women who had given birth had less lower body fat and greater waist circumference. After controlling for age and BMI, increasing parity was associated with lower hip and thigh circumferences, and

higher waist circumference. These findings are supported by data over 10 years of follow-up from the Coronary Artery Risk Development in Young Adults (CARDIA) study of women aged 18–30 years (Gunderson et al., 2004). Both first and higher order births were associated with increases in waist circumference.

Menopause is also associated with an increase in fat mass, and a redistribution of fat to the abdominal area (Toth et al., 2000). It is not clear whether such changes are due to hormonal changes or to the ageing process. The Study of Women's Health Across the Nation (SWAN) included an ethnically-diverse cohort of 3064 women, with an average age of 45.9 years. SWAN showed no independent effect of menopause on fat distribution (Sternfeld et al., 2004). Over a 3-year follow-up, the study showed a mean weight gain of 2.1 kg (3% increase) and a mean increase in waist circumference of 2.2 cm (2.8% increase); gains that could be attributed to age and physical activity level. Other studies concurred with SWAN, suggesting that, on average, women experience a 0.68 kg per year increase in weight during their 40s and 50s, regardless of menopausal status (Macdonald et al., 2003; Wing et al., 1991).

3.3 Age

To appreciate the effect of ageing on fat distribution, changes in BMI that occur with increasing age need to be considered. Changes in body weight and BMI are strongly related to changes in fat-free mass, and explain 54% of the variance in those changes (Forbes, 1999). While the associations between BMI and body fat are linear, the association with per cent body fat is curvilinear, with the slope steeper at lower BMIs than at higher BMIs (Welch & Sowers, 2000). Per cent body fat may remain constant or increase with age, but ageing is associated with substantial redistribution of fat tissue among depots (Cartwright et al., 2007). From late middle age until the 80s or later, there is a decline in the volume of subcutaneous fat, and a redistribution of fat from subcutaneous to visceral depots. This age-associated decline in the size of adipose depots is accompanied by the accumulation of fat outside adipose tissue (in muscle, liver and bone marrow), and loss of lean body mass. Data from NHANES show that waist circumference increases with age, and is larger in older than in younger adults of both sexes up to the age of 70 years (Ford et al., 2003). Similarly, in the Baltimore Longitudinal Study of Aging, age-related differences in waist-hip ratio were also reported in all BMI categories examined in both men and women (Shimokata et al., 1989). Changes in waist circumference were followed up in Finnish adults (9025 men and 9950 women aged 25–64 years), and mean waist circumference was seen to increase by 2.7 cm in men and 4.3 cm in women over a 15-year period (Lahti-Koski et al., 2007). BMI also increased over the study period, but the changes were relatively small (1.2% or less per 5-year period) in all but the youngest age category (25–34 years), while increases in waist circumference were seen in every age group.

The Baltimore Longitudinal Study of Aging also examined the effects of weight change on changes in fat distribution (Shimokata, et al., 1989). The study found that changes in waist and hip circumferences correlated directly with changes in weight, but there were differences in the pattern of change by sex. In men, waist changes were larger than hip changes, whereas in women they were similar. This resulted in weight changes in men having a larger effect on waist–hip ratio. On average, with a 4.5 kg weight gain, men had a 4 cm increase in waist circumference and a 2.5 cm increase in hip circumference. Comparable values for women were 3.3 cm and 3.6 cm, respectively.

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3.4 Ethnicity

Interpretation of evidence on ethnic differences is complicated by issues related to defining ethnicity, and other methodological issues that are outlined in the background paper prepared by Lear et al. (2010). The background review only considered studies on populations that were not represented in earlier analyses and that led to recommendations about waist circumference or waist–hip ratio cut-offs in Europeans. The potential significance of these differences for identifying cut-off points to predict health outcomes is considered in Chapter 4.

3.4.1 Ethnic groups for which waist circumference or waist–hip ratio may reflect more body fat at a given body mass index level

Studies investigating body composition and the association with health outcomes in Asian populations have focused on study populations defined as Chinese, Japanese and Korean or South Asian (or Indian). However, a number of studies have analysed these ethnic groups as a homogeneous population labelled as “Asians”. These studies found a higher percentage of body fat in Asians at lower BMI (Deurenberg-Yap et al., 2001; Deurenberg-Yap et al., 2000), as well as an increased prevalence of truncal fat, compared to Caucasians (Wu et al., 2007).

3.4.2 Populations for which waist circumference or waist–hip ratio may reflect less body fat at a given body mass index level

Chinese and South Asian men and women display a greater amount of visceral adipose tissue for a given waist circumference than Europeans (Lear et al., 2007b). Similarly, a higher percentage of body fat across a range of waist circumference values has been documented in East Asia (Kagawa et al., 2007).

In North America, comparisons of Indigenous people and Caucasians have reported no difference in the relationships between visceral adipose tissue and BMI (Gautier et al., 1999), total body fat (Lear, et al., 2007b) or waist circumference (Lear et al., 2007a).

Australian Aboriginals living in a remote area were reported to have higher waist–hip ratios with lower BMIs than urban Australians of European origin (Piers et al., 2003).

Compared to European women, black women in South Africa have a slightly lower BMI at a given percentage body fat, but also have less abdominal adipose tissue – as determined by

dual X-ray absorptiometry (DEXA) – at the same waist circumference (Rush et al., 2007). A few small studies report African women as having less visceral adipose tissue than white women (Punyadeera et al., 2001a; Punyadeera et al., 2001b; van der Merwe et al., 2000). In Hispanics, one study reported that visceral adipose tissue at a given waist circumference was not appreciably different from that of whites (Carroll et al., 2008; Haffner et al., 1996; Nelson et al., 2008).

Some studies have reported that Pacific Islanders have larger muscle masses and lower percentage body fat than Europeans at similar BMIs (Rush et al., 2004; Rush et al., 2009). In women, this has also been reported for similar waist circumferences and waist–hip ratios (Rush, et al., 2007).

3.5 Summary and conclusions

There is substantial evidence of sex and age variations in waist circumference and waist–hip ratio, and some evidence for ethnic differences. Compared to Europeans, Asian populations have greater visceral adipose tissue, and African populations and, possibly, Pacific Islanders

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have less visceral adipose tissue or percentage of body fat at any given waist circumference. If higher levels of abdominal fat for a waist circumference or waist–hip ratio level are reflected in associations with health outcomes, then lower thresholds for these indicators might be needed for the affected populations than for European or other reference populations. There is relatively consistent evidence that this situation may apply to Asian populations. Data for Africans and Pacific Islanders are examples of possible indications for a need for higher cut-offs than those used for European reference populations. However, given that the objective is to predict disease risk, drawing conclusions about cut-offs solely on the basis of observed risks does not seem appropriate.

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4 Relationships of waist circumference and waist–hip ratio to disease risk and mortality

Both generalized and abdominal obesity are associated with increased risk of morbidity and mortality. The main cause of obesity-related deaths is CVD, for which abdominal obesity is a predisposing factor. It is unclear which anthropometric measure is the most important predictor of risk of CVD in adults – BMI, waist circumference, waist–hip ratio or even hip circumference. BMI has traditionally been the chosen indicator by which to measure body size and composition, and to diagnose underweight and overweight. However, alternative measures that reflect abdominal adiposity, such as waist circumference, waist–hip ratio and waist–height ratio, have been suggested as being superior to BMI in predicting CVD risk. This is based largely on the rationale that increased visceral adipose tissue is associated with a range

of metabolic abnormalities, including decreased glucose tolerance, reduced insulin sensitivity and adverse lipid profiles, which are risk factors for type 2 diabetes and CVD.

This chapter summarizes the experts' discussions on the strength of associations between anthropometric measures and health outcomes. More detailed reviews are provided in several of the background papers (Huxley, et al., 2010; Qiao & Nyamdorj, 2010a; Qiao & Nyamdorj, 2010b; Seidell, 2010).

One paper examined how waist circumference, waist–hip ratio and BMI perform in predicting and differentiating risks of hypertension, dyslipidaemia and diabetes (as major risk factors for CVD), and risks of CVD events (Huxley, et al., 2010). The authors reviewed data comparing Asian and Pacific with Caucasian populations, and data on other ethnically diverse study populations. Other studies examined the relative associations of waist circumference, waist–hip ratio and BMI with diabetes risk (Qiao & Nyamdorj, 2010a; Qiao & Nyamdorj, 2010b). Seidell (2010) reviewed data on all-cause mortality, cancer and sleep apnoea in association with waist circumference, waist–hip ratio and BMI, highlighting variations in findings according to choice of indicator, age and BMI status of the population.

4.1 Measures of obesity and abdominal obesity and cardiovascular disease risk

Based on an extensive review, Huxley et al. (2010) concluded that there was convincing evidence that measures of general obesity (e.g. BMI) and measures of abdominal adiposity (e.g. waist circumference, waist–hip ratio and waist–height ratio) are associated with CVD risk factors and incident CVD events. The authors also concluded that there was probable evidence that:

- measures of abdominal obesity are better than BMI as predictors of CVD risk, although combining BMI with these measures may improve their discriminatory capability;
- for any given level of BMI, waist circumference or waist–hip ratio, the absolute risk of diabetes or hypertension (risk factors for CVD incidence) is higher in some population groups than in Caucasian adults;
- universal cut-off points for BMI and waist circumference are not appropriate for use worldwide, given ethnic or population-specific differences in disease risk for any 13 particular anthropometric measure; however, there may be general consistency in the cut-off points of waist–hip ratio for predicting CVD risk.

4.2 Measures of obesity, abdominal obesity and type 2 diabetes risk

The positive association between obesity and the risk of developing type 2 diabetes has been repeatedly observed, both in cross-sectional studies (Hartz et al., 1983; Shaten et al., 1993; Skarfors et al., 1991) and in prospective studies (Cassano et al., 1992; Colditz et al., 1990; Ohlson et al., 1985). The consistency of the association across populations – despite differences in measures of fatness and diagnostic criteria for diabetes in adults – reflects the

strength of this relationship. The risk of type 2 diabetes in adults increases continuously with increasing obesity, and decreases with weight loss. A careful analysis of the relationship between obesity and adult-onset diabetes confirms that abdominal obesity is an important risk factor, even after controlling for age, smoking and family history. Since waist circumference correlates more closely with abdominal adipose tissue than BMI, the association between indicators of such obesity (e.g. waist circumference and waist–hip ratio) has been studied extensively in the last two decades.

Qiao & Nyamdorj (2010b) concluded that, with respect to type 2 diabetes, all anthropometric measures (BMI, waist circumference, waist–hip ratio and waist–height ratio) performed similarly in predicting risk. However, data from most of the cross-sectional studies suggested that waist circumference or waist–hip ratio are better indicators than BMI of the risk of diabetes. The number of prospective studies was limited, and the studies covered only a few ethnic or population groups; thus, the evidence that waist circumference or waist–hip ratio is preferable is neither convincing nor generalizable. The cross-sectional studies provide only possible association, and the strength of evidence may be considered as possible (see Table 1.1). All these studies have provided evidence that either BMI or waist circumference predicted an association with diabetes, and an increased risk of the disease, independent of other factors.

Key methodological issues that affected the ability to draw clear conclusions were emphasized by Qiao & Nyamdorj (2010b). In the reviews undertaken, most studies used the “sensitivity and specificity” approach to determine the optimal cut-off points for anthropometric measures predicting type 2 diabetes risk. Selection of cut-off points using such an approach is arbitrary, because values are based on analysis of the trade-offs between sensitivity and specificity. Although a high sensitivity for the waist circumference measurement may be preferred in health promotion (to increase public awareness of obesity and diabetes), a high specificity in diagnostic criteria is expected in clinical practice. Thus, the usefulness of waist circumference measurement as a first-step diagnostic tool when assessing an individual’s risk of diabetes is unclear. Further investigation based on well-designed prospective studies with incident type 2 diabetes as the outcome would be needed to make recommendations on the use of the waist circumference. Most published studies are cross-sectional, so the interpretation of results is likely to be confounded by other concurrent conditions such as hypertension and dyslipidaemia. However, the literature review and analysis did confirm that the optimal cut-off points for indicators of overweight and obesity, and measures of abdominal obesity, vary across different ethnicities and population groups. The findings also supported the view that there is no optimal cut-off point that can be applied worldwide. The review undertaken by Qiao & Nyamdorj (2010b) suggested that country or region-specific cut-off points may need to be

used, taking into consideration the purpose for which the value is required and the availability of resources.

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4.3 Measures of obesity and abdominal obesity and all-cause mortality and mortality from specific causes

Due to inconsistencies in the literature, controversy continues about the relationship between obesity and overall mortality (WHO, 2000a). Some studies have found a U or J shaped association, with higher mortality rates at both the upper and lower weight ranges. Others have shown a gradual and continuous increase in mortality with increasing body weight, or no association at all between body weight and mortality. Many of the studies on obesity and mortality have systemically underestimated the impact of obesity on premature mortality, due to bias in the study design. This bias may be the result of failure to control for smoking, inappropriate control for associated conditions (e.g. hypertension, dyslipidaemia and hyperglycaemia, which are essentially comorbidities of obesity), failure to control for weight loss with illness and failure to standardize for age (Manson et al., 1987; Seidell et al., 1996). Seidell (2010) concluded that:

- waist circumference and waist–hip ratio are both related to increased risk of all-cause mortality, throughout the range of adult BMIs;
- waist circumference and waist–hip ratio are strongly predictive in young and middle-aged adults compared to older people and those with low BMI;
- waist circumference alone could replace waist–hip ratio and BMI as a single risk factor for all-cause mortality.

However, data are lacking on appropriate cut-offs for measures of abdominal obesity for predicting risk of all-cause mortality in ethnic and population groups other than European, North American and Australian white populations. Evidence for use of waist circumference or waist–hip ratio to replace BMI for predicting morbidity related to cancer risk is less strong than for all-cause mortality.

4.4 Ethnic differences

Numerous studies of populations throughout the world have suggested using cut-off points specific to ethnic groups. This section highlights studies that have evaluated (directly or indirectly) the potential basis for waist circumference or waist–hip ratio cut-off points that differ from those proposed for general use and are based on European or Caucasian reference populations.

When studies in Asian populations are taken together, Asians appear to have an increased metabolic risk at lower waist circumference and waist–hip ratio than Europeans. This is

probably due to higher levels of body fat and abdominal adipose tissue. In particular, those studies that included a European or Caucasian comparison group indicated a lower waist circumference for Asians, and some also suggested a lower waist–hip ratio (Diaz et al., 2007; Huxley et al., 2007; 2008). These data indicate a lower waist circumference and waist–hip ratio cut-off point for Asians; for example, waist circumference values of 85 cm and 80 cm, and waist–hip ratio values of 0.90 and 0.80 for men and women, respectively.

Studies in populations residing in the Middle East have provided waist circumference and waist–hip ratio cut-off points similar to those suggested for Europeans. Only one analysis reported on waist circumference cut-off points in Africans (none investigated waist–hip ratio cut-off points). That analysis recommended 75.6 cm and 80.5 cm for men, and 71.5 cm and 81.5 cm for women of Nigerian and Cameroon origin, respectively, for the identification of hypertension (Okosun et al., 2000a; Okosun et al., 2000b). Given that no other studies have investigated cut-offs in this population group, there is insufficient evidence for recommending specific cut-offs for sub-Saharan Africans. Cut-off points for waist circumference of 94 cm and 80 cm (determined for European men and women, respectively) have been associated with a 1.5–2.0 fold increased risk in hypertension, and a 3.9 and 1.6 fold increase in diabetes, in men and women of African origin, respectively (Okosun et al., 1998). Findings that African-Americans tend to be leaner than Europeans are inconsistent with the data indicating that African-Americans are at increased risk for CVD at a given waist circumference (due to higher blood pressure and lipids). Studies investigating specific cut-off points for African-Americans either suggested similar cut-off points to those used for Europeans, based on the limited evidence available, or indicated that there was not enough evidence to set specific cut-off points for African-Americans.

Studies investigating South Americans recommended waist circumference cut-off points of 88–90 cm for men, and 83–84 cm for women (Lear, et al., 2010). Three studies reporting on waist–hip ratio indicated a value ranging from 0.85 to 0.95 in men, and from 0.80 to 1.18 in women. These studies suggested that waist circumference cut-off points should be lower than those for Europeans, but that waist–hip ratio cut-off points should be similar to those for Europeans. Only one study in Hispanics provided a recommendation for cut-off points; it suggested a waist circumference of 90 cm for men and 85 cm for women, and a waist–hip ratio of 0.90–0.91 for men and 0.84–0.86 for women (Berber et al., 2001). Another study suggested that the current waist circumference cut-off points based on Europeans provided low sensitivity with respect to metabolic risk factors for the Hispanic population (Okosun, et al., 2000a).

4.5 Summary and conclusions

The overall results of the evaluation of the associations between waist circumference and

waist–hip ratio with measures of metabolic diseases and risk factors are summarized in Table 4.1, and presented below.

4.5.1 Cardiovascular disease

The biological rationale for relating measures of central adiposity to CVD risk is that abdominal adipose tissue (which is positively associated with waist circumference and waist–hip ratio) is related to a range of metabolic abnormalities. These abnormalities include decreased glucose tolerance, reduced insulin sensitivity and adverse lipid profiles, which are risk factors for type 2 diabetes and CVD. Most anthropometric indicators of abdominal obesity have been derived from predominantly European populations. This has raised issues about the applicability of the recommended cut-off points to non-European populations, among whom the problem is currently of much greater concern. Neither is there consensus over which of these measures of central adiposity is most strongly associated with CVD risk, either within or between different ethnic groups.

It has been suggested that waist circumference, waist–hip ratio and waist–height ratio, which reflect abdominal adiposity, are superior to BMI in predicting CVD risk. For example, in the INTERHEART case–control study of myocardial infarction in diverse populations in 52 countries (Yusuf et al., 2005), BMI, waist circumference and waist–hip ratio were all strongly and linearly associated with risk of myocardial infarction. Relationships with BMI were attenuated by adjustment for waist–hip ratio, but relationships with waist measures were relatively unaffected by adjustment for BMI, indicating the independence of measures of abdominal obesity in predicting risk. However, a combined analysis of the Physicians' Health Study and the Women's Health Study found that (Gelber et al., 2008):

- the magnitude of associations of BMI, waist circumference, waist–hip ratio and waist–height ratio with CVD risk were similar;
- these measures were not entirely independent as predictors of risk;
- differences according to the measure used were not likely to be clinically significant.

In the Asia Pacific Cohort Study, none of the anthropometric indices were clearly associated with stroke outcomes (APCSC, 2006). Overall, these measures seem to be comparable in their discriminatory capability – as assessed by the area under the receiver operating characteristic curve (AUC) – at identifying those individuals with the highest risk of CVD (Huxley, et al., 2010).

4.5.2 Diabetes

Data from prospective studies show a wide range of relationships between anthropometric measures and risk of type 2 diabetes; hence, it would be difficult to conclude that measures of abdominal obesity are always superior to BMI in predicting risk. However, most of the cross-sectional studies showed that the AUC was slightly larger for waist circumference or waist–hip ratio than for BMI.

4.5.3 Risk factors

This review suggests that, at any given level of body size, the prevalence of hypertension, diabetes and dyslipidaemia is higher in Asian than in non-Asian populations. It also suggests that no anthropometric measure is more strongly associated with blood pressure, plasma glucose, diabetes and lipid levels than any other measure. However, BMI appears to be less informative than other measures.

4.5.4 Mortality

The evidence with regard to anthropometric measures – in particular waist circumference or waist–hip ratio measures and all-cause mortality – is predominantly from white European and American adults, both in young and middle-aged adults and older people.

Few studies have examined African and Asian populations. When waist circumference was adjusted for BMI, the relationship appears J-shaped to almost linear.

4.5.5 Ethnic differences

Overall, the data suggested that, for a given combination of BMI and waist circumference or waist–hip ratio measures, the risk is higher for Asians for all disease outcomes; however, it was not possible to draw definitive conclusions, due to limitations of the data. Only in populations of Asian descent were differences in risk sufficient to warrant consideration of alternative cut-off points. The multiple causality and impact of the nutrition transition may also contribute to the interpretation of apparent ethnic differences. Specifically, the impact of exposure to undernutrition (including gestational exposure to maternal undernutrition) on subsequent weight gain and fat deposition was noted as a possible factor contributing to differences among populations. A rising relative risk of disease along the continuum of waist circumference or waist–hip ratio was also evident. However, the absolute risk currently determined by the multiple risk factors associated with body fat and its distribution may well reflect the phase of disease transition in a population. Hence, the thresholds for risk associated with waist circumference or waist–hip ratio may vary with time. These considerations make it difficult to specify cut-off points on the basis of ethnicity.

Table 4.1 Summary of the associations of body mass index, waist circumference, waist–hip ratio and waist–height ratio with disease risk

Body mass index **Waist circumference**

Waist–hip ratio **Waist–height ratio**

Relationship **Strength of evidence**

Relationship

Strength of

evidence

Relationship

**Strength of
evidencea**

Relationship

**Strength of
evidencea**

**Remarks and major
references**

CVD risk ++ Convincing ++++ Convincing ++++ Convincing +++ Convincing de Koning et al. (2007)

APCSC (2006)

Yusuf et al. (2005)

Gelber et al. (2008)

Zhu et al. (2005)

Overall CVD risk

factors

(mainly crosssectional
data)

++ Convincing +++ Convincing +++ Convincing +++ Convincing Lee et al. (2008)b

CVD risk factors

(from STEPS

analysis presented

in the WHO

meeting)

// +++ Probable +++ Probable // WHO (2008b)

Type 2 diabetes

mellitus

(prospective

studies)

+++ Convincing +++ Convincing +++ Convincing // Vazquez et al. (2007)

Type 2 diabetes

mellitus

(cross-sectional

studies)

+++ Convincing ++++ Convincing ++++ Convincing ++++ Convincing Huxley et al. (2007)

Huxley et al. (2008)

Nyamdorj et al. (2008)b

Qiao & Nyamdorj (2010b)

Hypertension

(mainly crosssectional
data)

+++ Convincing +++ Convincing +++ Convincing +++ Convincing Wolf & Colditz (1998)

James et al. (2004)

Huxley et al. (2007)

Huxley et al. (2008)

Nyamdorj et al. (2008)b

Overall mortality (without mutual adjustment of the anthropometric parameters)

+++ Convincing +++ Convincing +++ Convincing +++ Convincing Koster et al. (2008)

Zhang et al. (2008)

Welborn & Dhaliwal (2007)b

Remarks:

Some studies showed Jshape

relationship with BMI,

especially elderly people

(Dolan et al., 2007;

Katzmarzyk et al., 2002)

Evidence is less consistent

in elderly people (Baik et al.,

2000; Price et al., 2006)

Overall mortality

(with mutual

adjustment of the

0/– Probable +++++ Convincing +++++ Convincing / / Kalmijn et al. (1999)

Pischon et al. (2008)

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Body mass index Waist circumference

Waist–hip ratio Waist–height ratio

Relationship Strength of evidence

Remarks and major references anthropometric parameters)

Bigaard et al. (2003)

Cancer –

colorectum, breast

(post-menopause)

+++ Convincing ++ Convincing ++ Convincing NR NR Moghaddam et al. (2007)

Harvie et al. (2003)

Cancer –
pancreas,
endometrium,
cervix, kidney,
gallbladder

+ Possible + Possible + Possible NR NR AICR (2007)

APCSC, Asia Pacific Cohort Studies Collaboration; BMI, body mass index; CVD, cardiovascular disease; FAO, Food and

Agriculture Organization of the United Nations; NR, not reported; STEPS, STEP wise Approach to Surveillance; WHO, World Health Organization Levels of evidence are based on the report of the joint WHO/FAO expert consultation (WHO/FAO, 2003) (see Table 3.1 of that report) Relationship: + to ++++ = positive association, mild to strong; 0/– = negative association, nil to mild **a** Definitions of the strength of evidence are based on those that were used by the 2002 joint WHO/FAO Expert Consultation on diet, nutrition and the prevention of chronic diseases (WHO/FAO, 2003)

b References with evidence on waist–height ratio

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5 Summary and conclusions

The aim of the expert consultation was to provide guidance that WHO could use to develop recommendations and ultimately provide guidelines for the effective use of specific cut-off points for waist circumference and waist–hip ratio. Making definitive decisions on actual cut-off points was outside the scope of the consultation. However, the expert consultation was asked to advise WHO on how the process of developing actual cut-off points could be moved forward, and to identify any gaps in the data.

This chapter summarizes the potential usefulness and relative advantages of:

- waist circumference versus waist–hip ratio, with or without accompanying BMI measurements;
- measurement protocols for waist circumference and waist–hip ratio;
- methods for selecting cut-off points;
- considerations for determining the need for population-specific cut-off points.

5.1 Usefulness of waist circumference and waist–hip ratio for prediction of disease risk

The fundamental question of whether waist circumference and waist–hip ratio are useful measures for predicting disease risk was answered with convincing evidence. An increase in both of these indices is associated with increased disease risk, and this association is evident in diverse populations, although most of the data were derived from populations of European descent. Waist circumference and waist–hip ratio (as measures of abdominal obesity) were

correlated with BMI, but the level of association varied, suggesting that these measures may provide different information and thus may not be interchangeable. Practical considerations appeared to favour the use of waist circumference as an alternative to BMI. For example, waist circumference may be justified when measuring the waist is easier and more accurate than measuring weight and height. Measuring hip circumference may be more difficult than measuring waist circumference alone; this could limit the potential use of waist–hip ratio as an alternative to either waist circumference alone or BMI.

In assessing the complementarity of BMI and waist measures, the main issue was whether there was a substantial gain in information when using both measures, as suggested in the *NIH Practical guide to obesity* (Table 5.1) and the International Diabetes Federation (IDF) guidelines (Table 5.2). This also raised some more general issues:

- the extent to which the range of waist circumference depends on body size;
- whether differences in the waist circumference distribution in populations with different body sizes may create problems in arriving at appropriate cut-off points that would be similarly sensitive to health risk in all populations (e.g. the *NIH Practical guide to obesity* suggests that waist circumference cut-offs are only useful up to a BMI of 35, after which most individuals will exceed the cut-off points).

Due to the relative ease of obtaining waist circumference, its use is favoured over waist–hip ratio. There was insufficient data on other proxy measures (e.g. waist–height ratio), to suggest giving other measures any priority at present. Although BMI and abdominal adiposity measures may be highly correlated, it is desirable to obtain a BMI, where possible, and consider the utility of joint use of the two indicators.

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Table 5.1 Combined recommendations of body mass index and waist circumference cut-off points made for overweight or obesity, and association with disease risk
Body mass index Obesity class Disease risk (relative to normal weight and waist circumference)

Men < 102 cm

Women < 88 cm

Men >102 cm

Women >88 cm

Underweight <18.5

Normal 18.5–24.9

Overweight 25.0–29.9 Increased High

Obesity 30.0–34.9

35.0–39.9

I

II

High

Very high

Very high

Very high

Extreme obesity >40.0 III Extremely high Extremely high

Source: NHLBI Obesity Education Initiative (2000)

Table 5.2 International Diabetes Federation criteria for ethnic or country-specific values for

waist circumference

Country or ethnic group Sex Waist circumference (cm)

European

Men

Women

>94

>80

South Asian

Men

Women

>90

>80

Chinese

Men

Women

>90

>80

Japanese Men

Women

>90

>80

Source: Adapted from Zimmet & Alberti (2006)

5.2 Measurement protocol

It was relatively straightforward to determine the recommended protocol for the standardized measurement of waist circumference and hip circumference, and for the assessment of abdominal obesity. There are many potential points of variation in how these measurements can be taken, and many potential sources of measurement error among and within measurers.

Nevertheless, the consultation agreed that the measurement protocol previously approved by WHO should be recommended. This protocol is in extensive use by STEPS, and has been featured in several previous WHO expert meeting reports (WHO, 1995; WHO, 2000a; WHO/FAO, 2003).

This protocol can be summarized as outlined below.

- Measure the **waist circumference** at the end of several consecutive natural breaths, at a level parallel to the floor, midpoint between the top of the iliac crest and the lower margin of the last palpable rib in the mid axillary line.
- Measure the **hip circumference** at a level parallel to the floor, at the largest circumference of the buttocks.
- Make both measurements with a stretch-resistant tape that is wrapped snugly around the subject, but not to the point that the tape is constricting. Keep the tape level and parallel to the floor at the point of measurement.

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- Ensure that the subject is standing upright during the measurement, with arms relaxed at the side, feet evenly spread apart and body weight evenly distributed.

5.3 Selecting cut-off points

The experts generally agreed that the basis for effective use of waist circumference and waist–hip ratio cut-off points in clinical and public health should relate to health outcomes rather than to associations with intra-abdominal fat, because risk prediction is more straightforward if based on health outcomes. Other issues that need to be considered are outlined below:

- *Which health outcome or outcomes should be used?*
- *Should outcome measures from cross-_____sectional data be used?* – Although use of crosssectional data is practical, the data may be confounded by effects of existing disease and its diagnosis and treatment on risk status or associations. A clear preference was stated for outcomes from longitudinal data, which avoid the bias associated with relying on prevalent cases.
- *Are relative risks or absolute risks preferable when comparing risk factor or disease levels at different levels of waist circumference or waist–hip ratio?* – *Relative risks* (the outcome in those with waist circumference or waist–hip ratio above a given cut-off point compared to the outcome in those below the cut-off point) vary, depending on the reference category used to calculate the ratio; thus, they do not necessarily reflect the disease burden on an absolute scale. *Absolute risks* (the difference, by subtraction, in disease burden among those with waist circumference or waist–hip ratio above or below a specified cut-off point) may be more relevant from a policy perspective. This situation may be particularly relevant to the issue of

ethnic differences. A high baseline disease rate will decrease ratios relative to populations with lower baseline rates, but will not influence the calculation of risk differences.

- *Would linking waist circumference or waist–hip ratio measures to overall body size or generalized obesity grades (e.g. by using BMI categories) add valuable information within populations, within a given range of body size, or across population subgroups with substantially different BMI distributions?* – This question could be answered by analysing potential differences in the range and distribution of waist circumference or waist–hip ratio in populations with different BMI range and distribution. For example, such analyses might compare waist circumference and waist–hip ratio distributions and health outcomes in Asian populations (in whom mean BMI levels are relatively low) with European or other populations (in whom mean BMI levels are relatively high), to determine whether one set of waist circumference or waist–hip ratio cut-off points would be sufficiently sensitive in both populations. The performance of measures such as waist circumference and waist–hip ratio, used in conjunction with BMI, might contribute to the development of composite indices for use with individuals and the community.

- *Should cut-off points be determined using statistical approaches such as receiver operating characteristic (ROC) curves; if so, how should such approaches be used?* – With respect to the use of ROC curves, questions included whether to choose cut-off points on the basis of the maximum level of sensitivity identified, likelihood ratios or equivalence of sensitivity to specificity, and whether to resort to an arbitrarily designated level of sensitivity (e.g. 85%) as criteria for cut-off values. As indicated in Annex A, all of these measures are currently in use by various countries. The consultation did not identify a basis for giving priority to a particular approach. In addition, potential limitations of the ROC method were noted, including differences in 22 cut-off points based on differences in population characteristics (e.g. average body size or disease prevalence).

All these questions need to be carefully considered when determining the method and process used to derive cut-off points for waist circumference and waist–hip ratio for recommendation by WHO. The choice of method and the process to be outlined will also depend on the potential uses of the derived cut-off points and health-relevant policy considerations. For example, specific problems of the population group for which the cutoff points are to be used should be taken into account.

5.4 Universal or population-specific cut-off points

The issue of sex-specific cut-off points was not deliberated as such, but the consultation noted that many countries or settings currently specify different cut-off points for men and women (see Annex A). The experts did not identify evidence for discontinuing the use of sex-specific cut-off points.

With respect to ethnicity-specific cut-off points, there was substantial evidence of population-dependent variations in association of disease risk with measures of abdominal obesity. However, other evidence discouraged the development and use of ethnically based cut-off points. The populations of greatest interest in this respect are of Asian descent, because risks of certain diseases (e.g. diabetes) are notably higher in these populations than would be expected from their mean BMI levels. Understanding the basis for this increased risk of diabetes among Asian populations, for instance, would be important to identify the potential environmental variations and the heterogeneity among populations designated as Asian. The consultation identified the need for a transparent and methodologically sound empirical approach to developing population or geography-specific cut-off points for abdominal obesity. At the same time, the experts recognized the utility of the current recommended cut-off points, which are simple and universally applicable. The background paper by Lear and colleagues (2010) provided examples of how it might be possible to set cut-off points that are generally applicable, but also recognize the differences in risk among populations. However, there were too many unresolved issues for the consultation to determine whether this process would be useful.

The consultation identified many challenges related to the use of surrogate measures of abdominal obesity for the derivation of universally applicable cut-off points for health outcomes. For example, there are inherent challenges related to determination of health outcomes, including sex differences; age-related changes in body composition and conformation; and group, population and geographical differences. Some of these confounders need to be evaluated more carefully, as outlined below:

- In individuals of the same sex and age anywhere in the world, is the same level, proportion or quantity of:
 - total fat or adipose tissue present for a given BMI?
 - intra-abdominal or visceral adipose tissue present for a given waist circumference or waist–hip ratio?
- In individuals of the same sex and age anywhere in the world, is the risk of disease and mortality the same for a given BMI (i.e. level of obesity), or waist circumference or waist–hip ratio (i.e. level of abdominal obesity)?

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- Is the relationship between adiposity and the proxy measure, and the association with a given health risk, the same for both sexes?
- Is the relationship between adiposity and the proxy measure, and the association with a given health risk, affected by increasing age for both sexes?

Addressing these issues will be a major challenge. It is clear from the data reviewed at this expert consultation and from previous WHO publications that the current evidence base cannot answer these questions. Further studies are needed to determine whether recommended cut-off points should be specific to sex, age and population.

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6 Recommendations

The expert consultation agreed that the anthropometric indicators and measures used previously (i.e. BMI, waist circumference and waist–hip ratio) are predictive of the risk of chronic disease. Hence, any waist circumference and waist–hip ratio cut-off points developed following the process recommended by the consultation could be used alone or in conjunction with BMI.

Ideally, the characteristics associated with the most useful analyses for one or more uses of waist circumference or waist–hip ratio would be that:

- the data are representative of all population groups (with respect to age, sex, social class and concurrent diseases) in countries from all regions;
- data collected include anthropometric measures (of both central adiposity and BMI) and at least three risk factors (e.g. blood pressure, blood glucose and cholesterol);
- standardized methods were used for measurement of waist circumference and other anthropometric indicators;
- measured weight and height were available and were not self-reported data;
- the dataset include information on characteristics such as age, sex and demographics;
- sufficient longitudinal data from appropriate populations be available, with high quality follow-up of disease status along the time course, to permit confirmation of key conclusions about cut-off points derived using cross-sectional data. Given the data available, the consultation felt that the steps presented below (which are not in any specific order) could be taken to arrive at appropriate WHO recommendations in this critical area:
- Determine whether multiple sets of cut-off points will be needed (e.g. by sex, body size or health-status characteristics of the population).

This could be accomplished by evaluating similarities or differences in the associations of waist circumference or waist–hip ratio with various health outcomes, across populations or population subgroups. The approach would compare populations that differ in distributions of waist circumference and waist–hip ratio, or in disease profiles. Type 2 diabetes should be considered as a major health risk factor or outcome in evaluating associations with waist circumference and waist–hip ratio. In populations throughout the world, diabetes apparently increases with overall and abdominal fat gain and obesity development. Comparisons based

on diabetes would allow identification of the potential variations in the predictive potential of various cut-off points.

- For any set of cut-off points to be developed, choose the most sound and policy relevant statistical approach to determine cut-off points for waist circumference and waist-hip ratio, and specify the resulting decision rules.
- Develop a schema with different levels of risk and three sets of cut-off points. This could be achieved by linking datasets to diabetes prevalence for countries, and examining whether the recommended cut-off points are appropriate for the reliable identification of disease risk. In addition, it would be helpful to analyse populations with high risk, to ensure that the cut-off points developed are a sensitive measure of risk.

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- Alternatively, choose a set of three indicative risk factors (e.g. high blood pressure, elevated cholesterol and elevated blood glucose), whereby a population or group could be identified by waist circumference cut-off points as having one of three levels of risk:
 - *Level I: Minimal risk* – At this cut-off point, less than 10% of people would have any one of the three indicative risk factors; hence, this would be the lowest level of risk. The objective is to identify a value that national governments could use for surveillance and to determine the need for public health interventions.
 - *Level II: Moderate risk* – At this cut-off point, there would be a high probability that 80% of people have at least one of the three indicative risk factors, in which case, giving health advice or other appropriate action would be deemed essential. The suggestion was to examine combined datasets (bearing in mind global variation), to judge whether it was possible to arrive at a universal cut-off point to indicate this level of population risk. Issues to consider would be the effects of using 80% as the basis for Level II classification, and whether this value would have the same utility across population groups. Critical analysis of the data should ultimately enable WHO to create a scheme to derive cut-off points tailored for different purposes.
 - *Level III: Substantial or high risk* – At this cut-off point, everyone in the population group would be almost certain to have at least one of the three indicative risk factors. This determination would be based on national or regional datasets that suggest that the individuals in this group will have a doubling of risk compared to low-risk groups. High-risk groups may include subgroups or populations defined by obesity or diabetes prevalence.
- The question of how to cope with transitions in disease risk also needs to be addressed. Associations of waist circumference or waist-hip ratio with risk factors and diseases may change over time in populations in which incidence of obesity-related diseases is increasing in association with social and economic transitions.

To facilitate the implementation of the proposed next step and carry this process forward, the consultation formed a working group of experts in this area to work closely with WHO.¹ The working group comprises academic researchers, clinicians who have expertise in this field, statisticians and data analysts. The working group will also consider gaps in the available global data and items appropriate for future research.

The consultation recommended that the working group be asked to develop and suggest the appropriate methods and criteria for a process for open and transparent analysis and clarification of the relationships between abdominal fat distribution and its measures, and disease risk and health outcomes.

It was agreed that the working group needs access to a wide range of databases worldwide, including the STEPS data within WHO. The consultation recommended that the working group be assisted to gain access to the available datasets.

The consultation urged WHO to view this matter as being of utmost urgency, and to enable completion of the task within a 2-year period. The ultimate recommendations from WHO will depend on whether WHO can obtain representative datasets to permit systematic 1 The recommended follow-up work to be carried out by the working group that was formed by the consultation has been overtaken by the new guideline development process implemented by WHO as of 1 January 2009. During 2011–2012, the WHO Nutrition Guidance Expert Advisory Group (NUGAG) will take forward the follow-up action recommended by the expert consultation, through its subgroup on Diet and Health.

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analysis of all the issues raised in the consultation. Ultimate recommendations from WHO need to take into consideration:

- the various waist circumference and waist–hip ratio criteria that are already in use by national governments, and by national and international medical organizations;
- the potential policy and practical implications associated with any attempts to align diverse cut-offs.

On the other hand, timely and authoritative guidance is needed to ensure that measures that can guide appropriate public health and clinical actions on the problems related to NCDs are brought into full use as quickly as possible. NCDs are rapidly increasing worldwide, particularly in low- and middle-income countries.

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Annex A: Current uses of waist circumferences and waist–hip ratios, and recommended cut-off points

A1 Recommendations from different organizations

World Health Organization

A number of WHO publications make recommendations for waist circumference and waist–hip ratio.

Recommendations about abdominal obesity and waist circumference have been made as one of the components of metabolic syndrome in a report on diabetes mellitus (WHO, 1999), under the definition of metabolic syndrome. According to this report, the working definition of metabolic syndrome is a condition characterized by “glucose intolerance, IGT [impaired glucose tolerance] or diabetes mellitus, and/or insulin resistance together with two or more components listed below”, which includes abdominal obesity in addition to raised arterial pressure, raised plasma triglycerides and microalbuminuria. Abdominal obesity is further defined as waist–hip ratio above 0.90 for males and above 0.85 for females, or a BMI above 30.0.

The more recent report of the WHO Expert Consultation on Obesity (2000a) stated the “need to develop sex-specific waist circumference cut-off points appropriate for different populations”. That report provides a table as an example of sex-specific waist circumference and risk of metabolic complications associated with obesity in Caucasians. The table is based on the increased relative risk observed in the Netherlands from a random sample of 2183 men and 2698 women aged 20–59 years (Han et al., 1995). The recommended sex-specific cut-off points are 94 cm (men) and 80 cm (women) for increased risk, and 102 cm (men) and 88 cm (women) for substantially increased risk.

Based on these two WHO reports, the recommendations often attributed to WHO are shown in Table A1 although those sex-specific cut-off points cited in the report of the WHO Expert Consultation on Obesity (2000b) were an example only and not WHO recommendations.

Table A1 World Health Organization cut-off points and risk of metabolic complications

Indicator	Cut-off points	Risk of metabolic complications
Waist circumference	>94 cm (M); >80 cm (W)	Increased
Waist circumference	>102 cm (M); >88 cm (W)	Substantially increased
Waist–hip ratio	≥0.90 cm (M); ≥0.85 cm (W)	Substantially increased

M, men; W, women

International Diabetes Federation

The International Diabetes Federation (IDF) has also provided recommendations for cut-offs for waist circumference and waist–hip ratio (IDF, 2006; Zimmet & Alberti, 2006). The recommendations of IDF for waist circumference are not only sex specific, but are also population and geography specific. Values are shown in Table A2.

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Table A2 International Diabetes Federation cut-off points for different ethnic groups

Men	Women	
Europeans	>94 cm	>80 cm

South Asians, Chinese and
Japanese
>90 cm >80 cm

United States National Cholesterol Education Program

Another set of recommendations widely used are the ones recommended by the experts of the Adult Treatment Panel (ATP) (APT III, 2001) under the aegis of the National Cholesterol Education Program (NCEP) of the NIH's National Heart, Lung, and Blood Institute. The NCEP recommends a single set of sex-specific cut-offs, of above 102 cm for men and above 88 cm for women.

Other countries

An analysis conducted by WHO as part of the preparations for the expert consultation showed that some countries adhered to one or the other of the three recommendations mentioned above, whereas others had their own specific recommendations. For example, many countries use the WHO cut-off points; South Africa uses the IDF recommendations; and the Republic of Korea, Saudi Arabia, Singapore, Slovakia and Turkey use the IDF recommendations plus other specified sources. The NCEP recommendations are used by Ecuador, Greece, Italy, Jordan, Thailand, Turkey and the US, with several of these countries also using other sources of recommendations. Saudi Arabia, Singapore and Slovakia, use both the IDF and the NCEP recommendations.

There is little information on the endorsement of waist circumference and waist–hip ratio cut-off points at national level by national ministries of health. However, the most popular cut-off points used worldwide were the ones attributed to two reports from WHO (WHO, 1999; WHO, 2000a). The IDF recommendations and the NCEP cut-off points were frequently used in research or national surveys in many countries. However, the rationale for the choice and use of a specific recommendation was often unknown and unclear.

Several other countries have developed their own recommendations and cut-off points. However, some of these are simply suggested or used in specific populations in published studies, rather than being national recommendations. Some examples are provided in the following section.

A2 Rationale for selection of cut-off points

The most common approach to determining cut-off points is based on the use of sensitivity and specificity as interpreted from receiver operating characteristic (ROC) curves.

Sensitivity measures the proportion of actual positives correctly identified as such, and specificity measures the proportion of actual negatives correctly identified as such.

In any test, there is usually a trade-off between optimizing sensitivity and optimizing specificity. This can be represented graphically using a ROC curve (see Figure A1) (WHO,

2003), which is a plot of the true-positive rate (TPR, or sensitivity) against the false-positive rate (FPR, or $1 - \text{specificity}$). Useful cut-off points are those that provide for a high proportion of true positives while giving a low proportion of false positives. A ROC curve is also known as a “relative operating characteristic” curve, because it compares two

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operating characteristics (TPR and FPR) as the criterion changes. Thus, ROC is directly related to diagnostic decision-making.

There are limitations to using a ROC approach for choosing a single cut-off point (e.g. to designate a “high waist circumference”), particularly if the intent is to choose a single cutoff point that is applicable across different populations and survey conditions. The ROC approach should take into account the validity, reliability and reproducibility of the test or criterion measure (e.g. the waist measurement), and the prevalence of the condition of interest (e.g. high blood pressure or diabetes) in the population to be screened. Population prevalence is important because the predictive value (e.g. the probability of having a disease given a positive test result) is higher in populations with a high prevalence of the disease compared to populations with a low prevalence. This would apply to differences in disease prevalence both across and within populations (e.g. if only high-risk individuals are selected for screening, as opposed to the population at large). Measurement errors also reduce the utility of ROC curves.

Figure A1 Example of a ROC curve

Source: WHO (2003: p 40)

Below are examples of how these concepts have been used as the rationale for waist circumference and waist–hip ratio cut-off points in different countries.

Sensitivity is equal to specificity

Table A3 shows examples of studies from different countries that have set cut-off points based on sensitivity being equal to specificity.

1–specificity (false-positive probability)

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Table A3 Cut-off points based on sensitivity being equal to specificity

Country Cut-off point Men Women Reference Notes

Barbados Waist

circumference

for general risk

87.3 cm 87.5 cm (Okosun, et al.,

2000b)

China Waist circumference for obesity, diabetes, and CVD risk 80–85 cm 75–80 cm (Wildman et al., 2004) In this range, the sensitivity equaled the specificity Islamic Republic of Iran Waist circumference for CVD for those at risk of CVD but requiring only life style change 90 cm 90 cm

Islamic Republic of Iran

Waist circumference for CVD for those at high risk for CVD events, requiring immediate intervention for CVD prevention 95 cm 95 cm (Delavari et al., 2009; Esteghamati et al., 2009; Mirmiran et al., 2004)

Mexico Diabetes and CVD

90 85 (Berber, et al., 2001)

Mexico Waist–hip ratio 0.90 0.85 (Berber, et al., 2001) Sensitivity equals specificity (based on the ROC technique), from a study in a hospital population in Mexico City Mexico Waist circumference for diabetes 93–98 cm 94–99 cm

Mexico Waist circumference for hypertension 92–96 cm 93–96 cm (Sanchez-Castillo et al., 2003)

These national recommendations are based on the intersection of lines of specificity and sensitivity CVD, cardiovascular disease; ROC, receiver operating characteristic

Maximum sensitivity

A study from France provided cut-off points for the most corpulent 30% of the population (Balkau et al., 2006):

- waist circumference for obesity, diabetes, and CVD: 96 cm for men and 83 cm for women;
- waist–hip ratio for general risk and obesity: 0.96 for men and 0.83 for women.

Sensitivity was of paramount importance, with waist circumference sensitivities of 74% for men and 82% for women, and for waist–hip ratio of 66% for men and 77% for women.

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Optimal sensitivity and specificity

A study from Chile, for example, provided cut-off points for CVD and metabolic risk for women: a waist circumference of at least 87.7 cm and a waist–hip ratio of at least 0.84 (Koch et al., 2008). Specific cut-off points were based on optimal sensitivity and specificity for detecting one or more cardiovascular and metabolic risk factors in the population under study.

Shortest distance between any point on the ROC curve and top-left corner on the y-axis

A study from Oman provided cut-off points for CVD as follows (Al-Lawati & Jousilahti, 2008):

- waist circumference: 80 cm for men and 84.5 cm for women;
- waist–hip ratio: 0.91 for both men and women.

Separate ROC curves were plotted for waist circumference and waist–hip ratio.

Range of values and best cut-off points for multiple indicators

A study from Tunisia provided a cut-off point for waist circumference (for obesity, diabetes, and CVD) of 85 cm for both men and women, based on sensitivity being equal to specificity (Bouguerra et al., 2007).

However, the study also provided individual cut-off points for each disease risk, and would clearly be applicable for clinical use (whereas the single value given above would be useful for public health purposes):

- for men: 82 cm (hypertension); 83 cm (glycaemia); 87 cm (diabetes); 85 cm (total cholesterol and triglycerides);
- for women: 81 cm (hypertension); 82 cm (glycaemia); 87 cm (diabetes); 83 cm (total cholesterol and triglycerides).

A3 Summary

Cut-off points chosen vary considerably between countries; also, the variation is greater for waist circumference than for waist–hip ratio. The cut-off points appear to be chosen based on disease risk (e.g. CVD, type 2 diabetes and risk factors of CVD) and on hard outcomes such as mortality. Rationales vary, but are generally based on indices of sensitivity and specificity. In some cases, there are multiple specific cut-off points for different diseases or risk factors. In addition to the above examples, some countries (e.g. Japan) have based their cut-off points on assessment of visceral adipose tissue from computerized tomography – that is, the extent to which measurements predict intra-abdominal fat rather than disease risk (JSSO, 2002) – and DEXA (Ito et al., 2003).

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Annex B: List of participants

This annex lists the participants at the WHO Expert Consultation on Waist Circumference and Waist–Hip Ratio, Geneva, Switzerland, 8–11 December 2008.

B1 Members2

Professor Sir George Alberti, SCMS (Diabetes Research Group), The Medical School, University of Newcastle upon Tyne, Newcastle upon Tyne, United Kingdom

Professor Fereidoun Azizi, Director, Research Institute for Endocrinology and Metabolism, Shaheed Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran

Professor Juliana CN Chan, Director, Hong Kong Institute of Diabetes and Obesity, The Chinese University of Hong Kong, Department of Medicine and Therapeutics, The Prince of Wales Hospital, Shatin, Hong Kong SAR, People's Republic of China

Professor Rachel Huxley, Director, Nutrition & Lifestyle Division, The George Institute for Global Health, Camperdown, Sydney, New South Wales, Australia

Professor Philip James, International Obesity Task Force, London, United Kingdom

Professor Takashi Kadowaki, Department of Metabolic Diseases, Graduate School of Medicine, University of Tokyo, Tokyo, Japan

Professor Kay-Tee Khaw, Department of Clinical Gerontology, University of Cambridge, Addenbrooke's Hospital, Cambridge, United Kingdom

Dr Gary Tin-Choi Ko, Hong Kong Institute of Diabetes and Obesity, The Chinese University of Hong Kong, The Prince of Wales Hospital, Shatin, Hong Kong SAR, People's Republic of China (*Rapporteur*)

Professor Shiriki Kumanyika, Center for Clinical Epidemiology & Biostatistics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania, US (*Chairperson*)

Professor Scott Lear, School of Kinesiology, Simon Fraser University, Vancouver, British Columbia, Canada

Professor Jean Claude Mbanya, Vice Dean/Professor of Medicine and Endocrinology, Faculty of Medicine and Biomedical Sciences, University of Yaoundé, Yaoundé, Cameroon

Dr Qing Qiao, Academy Research Fellow, Department of Public Health, University of Helsinki, Helsinki, Finland

Professor K. Srinath Reddy, President, Public Health Foundation of India, New Delhi, India

Professor Jaap Seidell, Head, Department of Nutrition & Health, Faculty of Earth and Life Sciences, Free University of Amsterdam, Amsterdam, The Netherlands

2 Unable to attend: Dr Viswanathan Mohan, President & Chief of Diabetes Research, Madras Diabetes Research

Foundation, Indian Council of Medical Research (ICMR) Advanced Centre for Genomics of Diabetes, Chennai, India

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Professor Thorkild IA Sørensen, Institute Director and Professor of Clinical Epidemiology, Institute of Preventive Medicine, Centre for Health and Society, Copenhagen, Denmark

Professor June Stevens, Chair, Department of Nutrition, Schools of Public Health and Medicine, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, US

Professor Paul Zimmet, Emeritus Director and Director of International Research, Baker IDI Heart and Diabetes Institute, Caulfield, Victoria, Australia

B2 Secretariat

Dr Ala Alwan, Assistant Director-General, Noncommunicable Diseases and Mental Health, WHO, Geneva, Switzerland

Dr Francesco Branca, Director, Nutrition for Health and Development, WHO, Geneva, Switzerland

Dr Chizuru Nishida, Scientist, Country focused nutrition policies and programmes, Nutrition for Health and Development, WHO, Geneva, Switzerland

Dr Jonathan Siekmann, Technical Officer, Country focused nutrition policies and programmes, Nutrition for Health and Development, WHO, Geneva, Switzerland

Dr Prakash Shetty, Temporary Advisor, Country focused nutrition policies and programmes, Nutrition for Health and Development, WHO, Geneva, Switzerland

Dr Elaine Rush, Consultant, Country focused nutrition policies and programmes, Nutrition for Health and Development, WHO, Geneva, Switzerland

Ms Ying Liu, Technical Assistant, Country focused nutrition policies and programmes, Nutrition for Health and Development, WHO, Geneva, Switzerland

Dr Fiona Adshead, Director, Chronic Diseases and Health Promotion, WHO, Geneva, Switzerland

Dr Timothy Armstrong, Coordinator, Surveillance and Population-based Prevention, Chronic Diseases and Health Promotion, WHO, Geneva, Switzerland

Mr Godfrey Xuereb, Technical Officer, Surveillance and Population-based Prevention, Chronic Diseases and Health Promotion, WHO, Geneva, Switzerland

Mrs Leanne Riley, Scientist, Surveillance and Population-based Prevention, Chronic Diseases and Health Promotion, WHO, Geneva, Switzerland

Dr Shanthi Mendis, Coordinator, Chronic Diseases Prevention and Management, Chronic Diseases and Health Promotion, WHO, Geneva, Switzerland

Dr Gojka Roglic, Medical Officer, Chronic Diseases Prevention and Management, Chronic Diseases and Health Promotion, WHO, Geneva, Switzerland

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ANNEXURE U

BODY MASS INDEX NORMS OF WORLD HEALTH ORGANISATION



Annexure U

Body Mass Index of World Health Organisation

World Health Organisation Non-Communicable Diseases 2008

Age category in years		1 waist circumference		
	N _{pre} = 28	Pre-Test	Pre-Test	N _{post} = 28
20 to 29	8	1.10 ±0.17 *Well above average	1.14 ±0.12 *Well above average	8
30 to 39	10	1.17 ±0.18 *Well above average	1.16 ±0.21 *Well above average	10
40 to 49	8	1.13 ±0.13 *Well above average	1.17 ±0.11 *Well above average	8
50 to 59	2	1.14 ±0.12 *Well above average	1.15 ±0.08 *Above average	2
* Norm for females by age category (World Health Organization's guidelines (2008:21))				

ANNEXURE V

**AMERICAN THORACIC SOCIETY
SIX MINUTE WALK TEST**



Annexure V
American Thoracic Society Six Minute Walk Test

American Thoracic Society

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ATS Statement: Guidelines for the Six-Minute Walk Test

THIS OFFICIAL STATEMENT OF THE AMERICAN THORACIC SOCIETY WAS
APPROVED BY THE ATS BOARD OF DIRECTORS
MARCH 2002

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PURPOSE AND SCOPE

This statement provides practical guidelines for the 6-minute walk test (6MWT). Specifically, it reviews indications, details factors that influence results, presents a brief step-by-step protocol, outlines safety measures, describes proper patient preparation and procedures, and offers guidelines for clinical interpretation of results. These recommendations are not intended to limit the use of alternative protocols for research studies. We do not discuss the general topic of clinical exercise testing. As with other American Thoracic Society statements on pulmonary function testing, these guidelines come out of a consensus conference. Drafts were prepared by two members (P.L.E. and R.J.Z.) and were based on a comprehensive Medline literature search from 1970 through 2001, augmented by suggestions from other committee members. Each draft responded to comments from the working committee. The guidelines follow previously published methods as closely as possible and provide a rationale for each

specific recommendation. The final recommendations represent a consensus of the committee. The committee recommends that these guidelines be reviewed in five years and in the meantime encourages further research in areas of controversy.

BACKGROUND

There are several modalities available for the objective evaluation of functional exercise capacity. Some provide a very complete assessment of all systems involved in exercise performance (high tech), whereas others provide basic information but are low tech and are simpler to perform. The modality used should be chosen based on the clinical question to be addressed and on available resources. The most popular clinical exercise tests in order of increasing complexity are stair climbing, a 6MWT, a shuttle-walk test, detection of exercise-induced asthma, a cardiac stress test (e.g., Bruce protocol), and a cardiopulmonary exercise test (1, 2). Other professional organizations have published standards for cardiac stress testing (3, 4). Assessment of functional capacity has traditionally been done by merely asking patients the following: "How many flights of stairs can you climb or how many blocks can you walk?" However, patients vary in their recollection and may report overestimations or underestimations of their true functional capacity. Objective measurements are usually better than self-reports. In the early 1960s, Balke developed a simple test to evaluate the functional capacity by measuring the distance walked during a defined period of time (5). A 12-minute field performance test was then developed to evaluate the level of physical fitness of healthy individuals (6). The walking test was also adapted to assess disability in patients with chronic bronchitis (7). In an attempt to accommodate patients with respiratory disease for whom walking 12 minutes was too exhausting, a 6-minute walk was found to perform as well as the 12-minute walk (8). A recent review of functional walking tests concluded that "the 6MWT is easy to administer, better tolerated, and more reflective of activities of daily living than the other walk tests" (9). The 6MWT is a practical simple test that requires a 100-ft hallway but no exercise equipment or advanced training for technicians. Walking is an activity performed daily by all but the most severely impaired patients. This test measures the distance that a patient can quickly walk on a flat, hard surface in a period of 6 minutes (the 6MWD). It evaluates the global and integrated responses of all the systems involved during exercise, including the pulmonary and cardiovascular systems, systemic circulation, peripheral circulation, blood, neuromuscular units, and muscle metabolism. It does not provide specific information on the function of each of the different organs and systems involved in exercise or the mechanism of exercise limitation, as is possible with maximal cardiopulmonary exercise testing. The self-paced 6MWT assesses the submaximal level of functional capacity. Most patients do not achieve maximal exercise capacity during the 6MWT; instead, they choose their own intensity of exercise and are allowed to stop and rest during

the test. However, because most activities of daily living are performed at submaximal levels of exertion, the 6MWD may better reflect the functional exercise level for daily physical activities.

INDICATIONS AND LIMITATIONS

The strongest indication for the 6MWT is for measuring the response to medical interventions in patients with moderate to severe heart or lung disease. The 6MWT has also been used as a one-time measure of functional status of patients, as well as a predictor of morbidity and mortality (see Table 1 for a list of these indications). The fact that investigators have used the 6MWT in these settings does not prove that the test is clinically useful (or the best test) for determining functional capacity or changes in functional capacity due to an intervention in patients with these diseases. Further studies are necessary to determine the utility of the 6MWT in various clinical situations.

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Formal cardiopulmonary exercise testing provides a global assessment of the exercise response, an objective determination of functional capacity and impairment, determination of the appropriate intensity needed to perform prolonged exercise, quantification of factors limiting exercise, and a definition of the underlying pathophysiologic mechanisms such as the contribution of different organ systems involved in exercise. The 6MWT does not determine peak oxygen uptake, diagnose the cause of dyspnea on exertion, or evaluate the causes or mechanisms of exercise limitation (1, 2). The information provided by a 6MWT should be considered complementary to cardiopulmonary exercise testing, not a replacement for it. Despite the difference between these two functional tests, some good correlations between them have been reported. For example, a significant correlation ($r=0.73$) between 6MWD and peak oxygen uptake has been reported for patients with end-stage lung diseases (36, 37). In some clinical situations, the 6MWT provides information that may be a better index of the patient's ability to perform daily activities than is peak oxygen uptake; for example, 6MWD correlates better with formal measures of quality of life (38). Changes in 6MWD after therapeutic interventions correlate with subjective improvement in dyspnea (39, 40). The reproducibility of the 6MWD (with a coefficient of variation of approximately 8%) appears to be better than the reproducibility of 1-second forced expiratory volume in patients with chronic obstructive pulmonary disease (COPD) (8, 41–43). Questionnaire indices of functional status have a larger short-term variability (22–33%) than does the 6MWD (37).

The shuttle-walking test is similar to the 6MWT, but it uses an audio signal from a tape cassette to direct the walking pace of the patient back and forth on a 10-m course (44–47). The walking speed is increased every minute, and the test ends when the patient cannot reach the turnaround point within the required time. The exercise performed is similar to a symptom

limited, maximal, incremental treadmill test. An advantage of the shuttle walking test is that it has a better correlation with peak oxygen uptake than the 6MWD. Disadvantages include less validation, less widespread use, and more potential for cardiovascular problems.

CONTRAINDICATIONS

Absolute contraindications for the 6MWT include the following:

unstable angina during the previous month and myocardial infarction during the previous month. Relative contraindications include a resting heart rate of more than 120, a systolic blood pressure of more than 180 mm Hg, and a diastolic blood pressure of more than 100 mm Hg. Patients with any of these findings should be referred to the physician ordering or supervising the test for individual clinical assessment and a decision about the conduct of the test. The results from a resting electrocardiogram done during the previous 6 months should also be reviewed before testing. Stable exertional angina is not an absolute contraindication for a 6MWT, but patients with these symptoms should perform the test after using their antiangina medication, and rescue nitrate medication should be readily available.

Rationale

Patients with the previously mentioned risk factors may be at increased risk for arrhythmias or cardiovascular collapse during testing. However, each patient determines the intensity of their exercise, and the test (without electrocardiogram monitoring) has been performed in thousands of older persons (31, 48–50) and thousands of patients with heart failure or cardiomyopathy (32, 51, 52) without serious adverse events. The contraindications listed previously here were used by study investigators based on their impressions of the general safety of the 6MWT and their desire to be prudent, but it is unknown whether adverse events would occur if such patients performed a 6MWT; they are, therefore, listed as relative contraindications.

SAFETY ISSUES

1. Testing should be performed in a location where a rapid, appropriate response to an emergency is possible. The appropriate location of a crash cart should be determined by the physician supervising the facility.
2. Supplies that must be available include oxygen, sublingual nitroglycerine, aspirin, and albuterol (metered dose inhaler or nebulizer). A telephone or other means should be in place to enable a call for help.
3. The technician should be certified in cardiopulmonary resuscitation with a minimum of Basic Life Support by an American Heart Association–approved cardiopulmonary resuscitation course. Advanced cardiac life support certification

is desirable. Training, experience, and certification in related health care fields (registered nurse, registered respiratory therapist, certified pulmonary function technician, etc.) are also desirable. A certified individual should be readily available to respond if needed.

4. Physicians are not required to be present during all tests. The physician ordering the test or a supervising laboratory physician may decide whether physician attendance at a specific test is required.

5. If a patient is on chronic oxygen therapy, oxygen should be given at their standard rate or as directed by a physician or a protocol.

Reasons for immediately stopping a 6MWT include the following:

(1) chest pain, (2) intolerable dyspnea, (3) leg cramps, (4) staggering, (5) diaphoresis, and (6) pale or ashen appearance.

Technicians must be trained to recognize these problems and the appropriate responses. If a test is stopped for any of these reasons, the patient should sit or lie supine as appropriate depending on the severity of the event and the technician's assessment of the severity of the event and the risk of syncope. The following should be obtained based on the judgment of the technician: blood pressure, pulse rate, oxygen saturation, and a physician evaluation. Oxygen should be administered as appropriate.

TABLE 1. INDICATIONS FOR THE SIX-MINUTE WALK TEST

Pretreatment and posttreatment comparisons

Lung transplantation (9, 10)

Lung resection (11)

Lung volume reduction surgery (12, 13)

Pulmonary rehabilitation (14, 15)

COPD (16–18)

Pulmonary hypertension

Heart failure (19, 20)

Functional status (single measurement)

COPD (21, 22)

Cystic fibrosis (23, 24)

Heart failure (25–27)

Peripheral vascular disease (28, 29)

Fibromyalgia (30)

Older patients (31)

Predictor of morbidity and mortality

Heart failure (32, 33)

COPD (34, 35)

Primary pulmonary hypertension (10, 36)

Definition of abbreviation

: COPD

—

chronic obstructive pulmonary disease.

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TECHNICAL ASPECTS OF THE 6MWT

Location

The 6MWT should be performed indoors, along a long, flat, straight, enclosed corridor with a hard surface that is seldom travelled. If the weather is comfortable, the test may be performed outdoors. The walking course must be 30 m in length. A 100-ft hallway is, therefore, required. The length of the corridor should be marked every 3 m. The turnaround points should be marked with a cone (such as an orange traffic cone). A starting line, which marks the beginning and end of each 60-m lap, should be marked on the floor using brightly coloured tape.

Rationale.

A shorter corridor requires patients to take more time to reverse directions more often, reducing the 6MWD. Most studies have used a 30-m corridor, but some have used 20- or 50-m corridors (52–55). A recent multicenter study found no significant effect of the length of straight courses ranging from 50 to 164 ft, but patients walked farther on continuous (oval) tracks (mean 92 ft farther) (54). The use of a treadmill to determine the 6MWD might save space and allow constant monitoring during the exercise, but the use of a treadmill for 6-minute walk testing is not recommended. Patients are unable to pace themselves on a treadmill. In one study of patients with severe lung disease, the mean distance walked on the treadmill during 6 minutes (with the speed adjusted by the patients) was shorter by a mean of 14% when compared with the standard 6MWD using a 100-ft hallway (57). The range of differences was wide, with patients walking between 400–1,300 ft on the treadmill who walked 1,200 ft in the hallway. Treadmill test results, therefore, are not interchangeable with corridor tests.

REQUIRED EQUIPMENT

1. Countdown timer (or stopwatch)
2. Mechanical lap counter
3. Two small cones to mark the turnaround points
4. A chair that can be easily moved along the walking course
5. Worksheets on a clipboard
6. A source of oxygen

7. Sphygmomanometer
8. Telephone
9. Automated electronic defibrillator

PATIENT PREPARATION

1. Comfortable clothing should be worn.
2. Appropriate shoes for walking should be worn.
3. Patients should use their usual walking aids during the test (cane, walker, etc.).
4. The patient's usual medical regimen should be continued.
5. A light meal is acceptable before early morning or early afternoon tests.
6. Patients should not have exercised vigorously within 2 hours of beginning the test.

MEASUREMENTS

1. Repeat testing should be performed about the same time of day to minimize intraday variability.
2. A "warm-up" period before the test should not be performed.
3. The patient should sit at rest in a chair, located near the starting position, for at least 10 minutes before the test starts. During this time, check for contraindications, measure pulse and blood pressure, and make sure that clothing and shoes are appropriate. Complete the first portion of the worksheet (see the APPENDIX).
4. Pulse oximetry is optional. If it is performed, measure and record baseline heart rate and oxygen saturation (SpO₂) and follow manufacturer's instructions to maximize the signal and to minimize motion artifact (56, 57). Make sure the readings are stable before recording. Note pulse regularity and whether the oximeter signal quality is acceptable. The rationale for measuring oxygen saturation is that although the distance is the primary outcome measure, improvement during serial evaluations may be manifest either by an increased distance or by reduced symptoms with the same distance walked (39). The SpO₂ should not be used for constant monitoring during the exercise. The technician must not walk with the patient to observe the SpO₂. If worn during the walk, the pulse oximeter must be lightweight (less than 2 pounds), battery powered, and held in place (perhaps by a "fanny pack") so that the patient does not have to hold or stabilize it and so that stride is not affected. Many pulse oximeters have considerable motion artifact that prevents accurate readings during the walk. (57)
5. Have the patient stand and rate their baseline dyspnea and overall fatigue using the Borg scale (see Table 2 for the Borg scale and instructions [58]).
6. Set the lap counter to zero and the timer to 6 minutes. Assemble all necessary equipment (lap counter, timer, clipboard, Borg Scale, worksheet) and move to the starting point.
7. Instruct the patient as follows:

“The object of this test is to walk as far as possible for 6 minutes. You will walk back and forth in this hallway. Six minutes is a long time to walk, so you will be exerting yourself. You will probably get out of breath or become exhausted. You are permitted to slow down, to stop, and to rest as necessary. You may lean against the wall while resting, but resume walking as soon as you are able. You will be walking back and forth around the cones. You should pivot briskly around the cones and continue back the other way without hesitation. Now I’m going to show you. Please watch the way I turn without hesitation.”

Demonstrate by walking one lap yourself. Walk and pivot around a cone briskly. “Are you ready to do that? I am going to use this counter to keep track of the number of laps you complete. I will click it each time you turn around at this starting line. Remember that the object is to walk AS FAR AS POSSIBLE for 6 minutes, but don’t run or jog. Start now, or whenever you are ready.”

TABLE 2. THE BORG SCALE

0	Nothing at all
0.5	Very, very slight (just noticeable)
1	Very slight
2	Slight (light)
3	Moderate
4	Somewhat severe
5	Severe (heavy)
6	
7	Very severe
8	
9	
10	Very, very severe (maximal)

This Borg scale should be printed on heavy paper (11 inches high and perhaps laminated) in 20-point type size. At the beginning of the 6-minute exercise, show the scale to the patient and ask the patient this: “Please grade your level of shortness of breath using this scale.” Then ask this: “Please grade your level of fatigue using this scale.” At the end of the exercise, remind the patient of the breathing number that they chose before the exercise and ask the patient to grade their breathing level again. Then ask the patient to grade their level of fatigue, after reminding them of their grade before the exercise.

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8. Position the patient at the starting line. You should also stand near the starting line during the test. Do not walk with the patient. As soon as the patient starts to walk, start the timer.

9. Do not talk to anyone during the walk. Use an even tone of voice when using the standard phrases of encouragement.

Watch the patient. Do not get distracted and lose count of the laps. Each time the participant returns to the starting line, click the lap counter once (or mark the lap on the worksheet). Let the participant see you do it. Exaggerate the click using body language, like using a stopwatch at a race. After the first minute, tell the patient the following (in even tones): "You are doing well. You have 5 minutes to go." When the timer shows 4 minutes remaining, tell the patient the following: "Keep up the good work. You have 4 minutes to go." When the timer shows 3 minutes remaining, tell the patient the following: "You are doing well. You are halfway done." When the timer shows 2 minutes remaining, tell the patient the following: "Keep up the good work. You have only 2 minutes left." When the timer shows only 1 minute remaining, tell the patient: "You are doing well. You have only 1 minute to go." Do not use other words of encouragement (or body language to speed up). If the patient stops walking during the test and needs a rest, say this: "You can lean against the wall if you would like; then continue walking whenever you feel able." Do not stop the timer. If the patient stops before the 6 minutes are up and refuses to continue (or you decide that they should not continue), wheel the chair over for the patient to sit on, discontinue the walk, and note on the worksheet the distance, the time stopped, and the reason for stopping prematurely. When the timer is 15 seconds from completion, say this: "In a moment I'm going to tell you to stop. When I do, just stop right where you are and I will come to you." When the timer rings (or buzzes), say this: "Stop!" Walk over to the patient. Consider taking the chair if they look exhausted. Mark the spot where they stopped by placing a bean bag or a piece of tape on the floor.

10. Post-test: Record the postwalk Borg dyspnea and fatigue levels and ask this: "What, if anything, kept you from walking farther?"

11. If using a pulse oximeter, measure SpO₂ and pulse rate from the oximeter and then remove the sensor.

12. Record the number of laps from the counter (or tick marks on the worksheet).

13. Record the additional distance covered (the number of meters in the final partial lap) using the markers on the wall as distance guides. Calculate the total distance walked, rounding to the nearest meter, and record it on the worksheet.

14. Congratulate the patient on good effort and offer a drink of water.

QUALITY ASSURANCE

Sources of Variability

There are many sources of 6MWD variability (see Table 3).

The sources of variability caused by the test procedure itself should be controlled as much as possible. This is done by following the standards found in this document and by using a quality-assurance program.

Practice Tests

A practice test is not needed in most clinical settings but should be considered. If a practice test is done, wait for at least 1 hour before the second test and report the highest 6MWD as the patient's 6MWD baseline.

Rationale.

The 6MWD is only slightly higher for a second 6MWT performed a day later. The mean reported increase ranges from 0 to 17% (23, 27, 40, 41, 54, 59). A multicentre study of 470 highly motivated patients with severe COPD performed two 6MWTs 1 day apart, and on average, the 6MWD was only 66 ft (5.8%) higher on the second day (54). Performance (without an intervention) usually reaches a plateau after two tests done within a week (8, 60). The training effect may be due to improved coordination, finding optimal stride length, and overcoming anxiety. The possibility of a practice or training effect from tests repeated after more than a month has not been studied or reported; however, it is likely that the effect of training wears off (does not persist) after a few weeks.

Technician Training and Experience

Technicians who perform 6MWTs should be trained using the standard protocol and then supervised for several tests before performing them alone. They should also have completed cardiopulmonary resuscitation training.

Rationale.

One multicenter study of older people found that after correction for many other factors, two of the technicians had mean 6MWDs that were approximately 7% lower than the other two sites (31).

Encouragement

Only the standardized phrases for encouragement (as specified previously here) must be used during the test.

Rationale.

Encouragement significantly increases the distance walked (42). Reproducibility for tests with and without encouragement is similar. Some studies have used encouragement every 30 seconds, every minute, or every 2 minutes. We have chosen every minute and standard phrases. Some studies (53) have instructed patients to walk as fast as possible.

Although larger mean 6MWDs may be obtained thereby, we recommend that such phrases not be used, as they emphasize initial speed at the expense of earlier fatigue and possible excessive cardiac stress in some patients with heart disease.

TABLE 3. 6MWD SOURCES OF VARIABILITY

Factors reducing the 6MWD

Shorter height

Older age

Higher body weight

Female sex

Impaired cognition

A shorter corridor (more turns)

Pulmonary disease (COPD, asthma, cystic fibrosis, interstitial lung disease)

Cardiovascular disease (angina, MI, CHF, stroke, TIA, PVD, AAI)

Musculoskeletal disorders (arthritis, ankle, knee, or hip injuries, muscle wasting, etc.)

Factors increasing the 6MWD

Taller height (longer legs)

Male sex

High motivation

A patient who has previously performed the test

Medication for a disabling disease taken just before the test

Oxygen supplementation in patients with exercise-induced hypoxemia

Definition of abbreviations

: COPD

—

chronic obstructive pulmonary disease; 6MWD

—

6-minute walking distance.

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Supplemental Oxygen

If oxygen supplementation is needed during the walks and serial tests are planned (after an intervention other than oxygen therapy), then during all walks by that patient oxygen should be delivered in the same way with the same flow. If the flow must be increased during subsequent visits due to worsening gas exchange, this should be noted on the worksheet and considered during interpretation of the change noted in 6MWD. The type of oxygen delivery device should also be noted on the report: for instance, the patient carried liquid oxygen or pushed or pulled an oxygen tank, the delivery was pulsed or continuous, or a

technician walked behind the patient with the oxygen source (not recommended). Measurements of pulse and SpO₂ should be made after waiting at least 10 minutes after any change in oxygen delivery.

Rationale.

For patients with COPD or interstitial lung disease, oxygen supplementation increases the 6MWD (17, 59, 61, 63). Carrying a portable gas container (but not using it for supplemental oxygen) reduced the mean 6MWD by 14% in one study of patients with severe respiratory disability, but using the container to deliver supplemental oxygen during the exercise increased the mean 6MWD by 20–35% (59).

Medications

The type of medication, dose, and number of hours taken before the test should be noted.

Rationale.

Significant improvement in the distance walked, or the dyspnea scale, after administration of bronchodilators has been demonstrated in patients with COPD (62, 63), as well as cardiovascular medications in patients with heart failure (19).

INTERPRETATION

Most 6MWTs will be done before and after intervention, and the primary question to be answered after both tests have been completed is whether the patient has experienced a clinically significant improvement. With a good quality-assurance program, with patients tested by the same technician, and after one or two practice tests, short-term reproducibility of the 6MWD is excellent (37). It is not known whether it is best for clinical purposes to express change in 6MWD as (1) an absolute value, (2) a percentage change, or (3) a change in the percentage of predicted value. Until further research is available, we recommend that change in 6MWD be expressed as an absolute value (e.g., the patient walked 50 m farther). A statistically significant mean increase in 6MWD in a group of study participants is often much less than a clinically significant increase in an individual patient. In one study of 112 patients (half of them women) with stable, severe COPD, the smallest difference in 6MWD that was associated with a noticeable clinical difference in the patients' perception of exercise performance was a mean of 54 m (95% confidence interval, 37–71 m) (64). This study suggests that for individual patients with COPD, an improvement of more than 70 m in the 6MWD after an intervention is necessary to be 95% confident that the improvement was significant. In an observational study of 45 older patients with heart failure, the smallest difference in 6MWD that was associated with a noticeable difference in their global rating of worsening was a mean of 43 m (20). The 6MWD was more responsive to deterioration than to improvement in heart failure symptoms.

Reported Mean Changes in 6MWD After Interventions

Supplemental oxygen (4 L/min) during exercise in patients with COPD or interstitial lung disease increased mean 6MWD by approximately 95 m (36%) in one study (59). Patients taking an inhaled corticosteroid experienced a mean 33 m (8%) increase in 6MWD in an international COPD study (16). Patients with COPD in a study of the effects of exercise and diaphragmatic strength training experienced a mean increase in 6MWD of 50 m (20%) (65). Lung volume reduction surgery in patients with very severe COPD has been reported to increase 6MWD by a mean of 55 m (20%) (13). Cardiac rehabilitation in patients referred with various heart diseases increased 6MWD by a mean of 170 m (15%) in a recent study (66). In 25 older patients with heart failure, an angiotensin-converting enzyme inhibitor medication (50 mg captopril per day) improved 6MWD a mean of 64 m (39%) compared with a mean increase of only 8% in those receiving a placebo (19).

Interpreting Single Measurements of Functional Status

Optimal reference equations from healthy population-based samples using standardized 6MWT methods are not yet available. In one study, the median 6MWD was approximately 580 m for 117 healthy men and 500 m for 173 healthy women (50). A mean 6MWD of 630 m was reported by another study of 51 healthy older adults (55). Differences in the population sampled, type and frequency of encouragement, corridor length, and number of practice tests may account for reported differences in mean 6MWD in healthy persons. Age, height, weight, and sex independently affect the 6MWD in healthy adults; therefore, these factors should be taken into consideration when interpreting the results of single measurements made to determine functional status. We encourage investigators to publish reference equations for healthy persons using the previously mentioned standardized procedures. A low 6MWD is nonspecific and nondiagnostic. When the 6MWD is reduced, a thorough search for the cause of the impairment is warranted. The following tests may then be helpful: pulmonary function, cardiac function, ankle–arm index, muscle strength, nutritional status, orthopedic function, and cognitive function.

Conclusions

The 6MWT is a useful measure of functional capacity targeted at people with at least moderately severe impairment. The test has been widely used for preoperative and postoperative evaluation and for measuring the response to therapeutic interventions for pulmonary and cardiac disease. These guidelines provide a standardized approach to performing the 6MWT. The committee hopes that these guidelines will encourage further research into the 6MWT and allow direct comparisons among different studies.

This statement was developed by the ATS Committee on Proficiency Standards for Clinical Pulmonary Function Laboratories.

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APPENDIX

The following elements should be present on the 6MWT worksheet and report:

Lap counter: _____

Patient name: _____ Patient ID# _____

Walk # _____ Tech ID: _____ Date: _____

Gender: M F Age: _____ Race: _____ Height: _____ ft _____ in, _____ meters

Weight: _____ lbs, _____ kg Blood pressure: _____ / _____

Medications taken before the test (dose and time): _____

Supplemental oxygen during the test: No Yes, flow _____ L/min, type _____

Baseline End of Test

Time ____:____:____

Heart Rate _____

Dyspnea _____ (Borg scale)

Fatigue _____ (Borg scale)

SpO2 _____ % _____ %

Stopped or paused before 6 minutes? No Yes, reason: _____

Other symptoms at end of exercise: angina dizziness hip, leg, or calf pain

Number of laps: _____ (_____ 60 meters) _____ final partial lap: _____ meters _____

Total distance walked in 6 minutes: _____ meters

Predicted distance: _____ meters Percent predicted: _____ %

Tech comments:

Interpretation (including comparison with a pre-intervention 6MWD):