UNIVERSITEIT VAN PRETORIA
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YUNIBESITHI YA PRETORIA

THE EFFECT OF A HEALTH PROMOTION INTERVENTION ON FOUNDATION PHASE LEARNERS' PHYSICAL FITNESS

by

MICHELLE MEYER

Submitted in partial fulfilment in accordance with the requirements for the degree

MAGISTER EDUCATIONIS

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SUPERVISOR

Mrs Karien Botha

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DECLARATION OF ORIGINALITY

I, Michelle Meyer (student number 29287414), declare that this study titled: **"The effect of a health promotion intervention on foundation phase learners' physical fitness"**, which I hereby submit for the degree Master Educationis in Educational Psychology at the University of Pretoria, is my own work and has not been previously submitted by me for a degree at this or any other tertiary institution.

31 August 2021

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Michelle Meyer Date

ETHICAL CLEARANCE CERTIFICATE

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RESEARCH ETHICS COMMITTEE

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- Compliance with approved research protocol,
- No significant changes,
- Informed consent/assent,
- Adverse experience or undue risk,
- Registered title, and
- Data storage requirements.

DECLARATION FROM THE LANGUAGE EDITOR

28 August 2021

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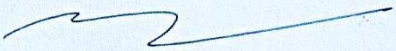
To whom it may concern:

This letter serves to confirm that I edited a dissertation by Michelle Meyer for English language usage, entitled:

The effect of a health promotion intervention on foundation phase learners' physical fitness.

submitted in partial fulfilment of the requirements for the degree Magister Education (Education Psychology) in the Department of Education Psychology, Faculty of Education, University of Pretoria.

Yours sincerely



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ABSTRACT

This study forms part of an existing NRF-funded project, which was conducted in collaboration with the University of Pretoria and Fordham University in New York City (US) during 2015. The project focused on the development and implementation of a health promotion intervention that aimed to improve learners' psychosocial well-being, nutrition and physical fitness. My study aimed to determine the effect of the health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk schools in Pretoria, Gauteng.

I applied Bronfenbrenner's bio-ecological model of human development, while conducting a secondary data analysis (SDA), embedded in a quantitative research approach. For the purposes of this study, I utilised post-positivism as the epistemological paradigm. I analysed both pre- and post-intervention data and employed the paired t-test for hypotheses testing. In addition, I used sections from the Nutritional Habits, Physical Activity and Well-being (NPWB) questionnaire which focused on physical fitness.

I utilised descriptive, inferential and parametric statistical procedures to obtain and discuss the results. I drew conclusions based on both the findings and existing literature. The results of the study indicated that there was no significant effect on the physical fitness of Foundation Phase learners in at-risk school-communities.

Based on the findings, several adaptations in respect of the development and implementation of health promotion interventions in at-risk school-communities are suggested. Furthermore, to improve the learners' physical fitness in at-risk school-communities, the support and collaboration of all role-players should be emphasised in future implementations of health promotion interventions in South Africa.

KEY CONCEPTS

- At-risk school-community contexts
- Foundation Phase learners
- Health promotion intervention
- Nutritional Habits, Physical Activity and Well-being (NPWB) questionnaire
- Physical fitness

ACRONYMS AND ABBREVIATIONS

AIDS	Acquired Immunodeficiency Syndrome
BMI	Body Mass Index
CAPS	Curriculum and Assessment Policy Statement
DBE	Department of Basic Education
H_0	Null Hypothesis
H_a	Alternative Hypothesis
HIV	Human Immunodeficiency Virus
IQR	Interquartile range
Max	Maximum
Min	Minimum
NCDs	Non-Communicable Diseases
NPWB	Nutritional Habits, Physical Activity and Well-being
NRF	National Research Foundation
PE	Physical Education
P-value	Probability value
SDA	Secondary data analysis
SES	Socio-Economic Status
US	United States
WHO	World Health Organization

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CHAPTER 1: OVERVIEW OF THE STUDY

1.1 INTRODUCTION TO AND RATIONALE FOR UNDERTAKING THE STUDY

This study of limited scope forms part of and consists of data from an existing NRF-funded project[1] which was undertaken in collaboration with the University of Pretoria and Fordham University in New York City (US) and which aimed to facilitate change by focusing on learners' well-being by means of a health promotion intervention. This health promotion intervention was developed in 2014 and was intended to enhance the physical fitness, psychosocial well-being and healthy eating habits of a sample of 330 Foundation Phase learners. The first step involved conducting assessments of the learners' health. The purpose of these health assessments was to inform the development and subsequent implementation of a six-week intervention during the second half of 2015. The six-week intervention comprised three sessions per week which focused on improving the nutrition-related practices, physical fitness and psychosocial well-being of the Foundation Phase learners. For the purposes of this study of limited scope, I focused specifically on determining the possible effect (or not) of the health promotion intervention on the physical fitness of the 330 Foundation Phase learners from two at-risk primary schools in Pretoria, Gauteng.

Within the developing countries the challenges related to the nutritional status of primary learners are often disguised by malnutrition (Kupolati et al., 2014; Mahmudiono et al., 2019; De Groot et al., 2017). The United Nations (2015) and Dukhi (2020) cite malnutrition as a chronic risk factor which is considered to be a global public health concern. Similarly, Emokpae and Odungide (2020), Kupolati et al. (2014) and Wells et al. (2020) emphasise the worldwide concern over non-communicable diseases (NCDs) and also highlight the increasing rate of diseases, such as diabetes, in South Africa. In school-going learners, malnutrition is usually related to decreased physical fitness, weakened resistance towards diseases, ill health, reduced psychosocial well-being and increased mortality rates (Marker et al., 2018; United Nations, 2015; Park et al., 2020).

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Learners in at-risk communities face numerous challenges including limited access to nutrition-rich foods, water, sanitation, electricity and adequate healthcare services (Landsberg et al., 2016; Holborn & Eddy, 2011; Allen et al., 2018). In addition, in these at-risk communities, learners often encounter several dangers related to their safety as well as their physical and psychosocial well-being (Bruner, 2017). According to Botha et al. (2015) and Frantz (2006), learners in at-risk communities are not only challenged by poverty but they also often become victims of abuse, violence and crime (Holborn & Eddy, 2011). In South Africa, at-risk communities are generally overpopulated and are characterised by below par living conditions for both learners and their families (Francis & Webster, 2019). Furthermore, aspects such as high unemployment rates, illiteracy, inadequate education and poor health are often endemic to at-risk communities (Bruner, 2017; Hughes & Tucker, 2018). In addition, learners in at-risk communities are prone to presenting more sedentary lifestyles as a result of their limited access to safe and secure playgrounds, parks and other recreational activities (Bruner, 2017; Singh et al., 2017).

Sigelman and Rider (2018), together with Silverman and Deuster (2014), indicate that regular engagement in physical fitness activities plays a significant role in sustaining good health. In the main, learners who are active tend to benefit from higher levels of health-related fitness and are, thus, at a lower risk of developing non-communicable diseases (NCDs) than may otherwise have been the case (Wells et al., 2020; Silverman & Deuster, 2014; Yuksel et al., 2020). According to the South African Department of Basic Education (DBE) (2011) and Fang et al. (2017), the implementation of health promotion interventions may provide various opportunities which may, in turn, impact on both the immediate and the long-term health-related behaviour of learners.

Fernández-Jiménez et al. (2020) and De Villiers et al. (2012) highlight the need for the development and implementation of health promotion interventions in at-risk school-communities in South Africa. However, despite the fact that health promotion interventions have been developed and implemented in several vulnerable South African contexts, Draper et al. (2017) and Naidoo et al. (2009) confirm that there are not sufficient studies available on the development, implementation and outcomes of health promotion interventions in at-risk school-communities in South Africa.

Yuksel et al. (2020) and Van den Broucke et al. (2010) indicate that the implementation of health promotion interventions in schools may help to address the health-related challenges which many South African learners face (Tian et al., 2017), for example, communicable and non-communicable diseases (NCDs). In addition, Naidoo and Coopoo (2012) and Fernández-Jiménez et al. (2020) are of the opinion that health promotion interventions may be of benefit to learners in relation to their physical fitness and, therefore, that schools may be the ideal setting in which to effect such health-related changes (Björklund et al., 2014). Enhanced physical fitness may also benefit learners by decreasing their risk of developing anxiety and depression while, at the same time, increasing their self-esteem and cognitive performance (Erwin et al., 2013; Schmidt et al., 2020). According to Reed et al. (2008) and Schmidt et al. (2020), it is essential that health promotion interventions that aim to enhance physical fitness and cardiovascular health are developed and implemented as it has been found that physical exercise has significant potential in relation to its future cardio-protective impact on learners.

It is, nevertheless, important to identify any relevant research gaps in existing literature to enable future researchers to address and minimise these limitations (Müller-Bloch & Kranz, 2015). Researchers often find it difficult to accurately measure the physical fitness levels of Foundation Phase learners (Sallis et al. 2000). Thus, it is vital that researchers use expert knowledge and appropriate instruments when trying to obtain results for physical fitness tests. Furthermore, the literature on the physical fitness and physical activity of learners is often blurred and used interchangeably (Martínez-Vizcaíno & Sánchez-López, 2008). It is vital that researchers are aware of the differences between physical activity and physical fitness and also that they report accurately on the required levels or intensities that are necessary if any health benefits are to be realised (Fang et al. 2017).

Several studies have reported on gender differences (Amusa et al., 2011; Fryar et al., 2018) in relation to the physical and motor development of learners. However, the literature on the differences between male and female physical fitness, specifically within the context of South African learners, is somewhat limited. Further limitations pertaining to Foundation Phase learners include the type of exercises, training and intensity that have been used to successfully enhance learners' fitness levels (Council on Sports Medicine Fitness, 2008; Committee on Sports Medicine Fitness, 2001). It is

imperative that researchers ensure that they report on the exercises and activities that were carried out in a precise and meticulous manner. Finally, it would appear that there are limited studies on aspects related to at-risk communities in South Africa that may influence the results of physical fitness studies (Kade, 2020).

1.2 PURPOSE OF THE STUDY

The purpose of this study of limited scope was to explore the possible effect (or not) of the health promotion intervention that had been developed and implemented on the physical fitness of Foundation Phase learners. The sample of learners was drawn from two at-risk school-community contexts in Pretoria, Gauteng. The study used a quantitative research approach and adopted a secondary data analysis research design (McMillan & Schumacher, 2014). Inferential statistical procedures were used to analyse existing pre- and post-intervention data to determine the possible effect (if any) of the health promotion intervention on the physical fitness of the Foundation Phase learners. The findings of this study may contribute to the broader NRF-funded project and provide a basis for the future development and implementation of health promotion interventions in similar at-risk school-community contexts.

1.3 RESEARCH QUESTIONS

This study of limited scope was guided by the following primary research question: *What was the effect of a health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk school-community contexts?*

I explored the following secondary research questions in order to address the primary research question cited above:

- What was the physical fitness profile of the Foundation Phase learners in the at-risk school-communities prior to the implementation of the health promotion intervention?
- What was the physical fitness profile of the Foundation Phase learners in the at-risk school-communities following the implementation of the health promotion intervention?
- Which areas of physical fitness (if any) were affected by the health promotion intervention?

1.4 HYPOTHESES

According to Creswell and Creswell (2018), within the context of a post-positivist paradigm, it is not possible to prove hypotheses which fail to be either rejected or not rejected as the evidence generated is seen to be fallible. In applying this view to the proposed study, it was, therefore, to be expected that the independent variable (health promotion intervention) may influence the dependent variable (physical fitness of the Foundation Phase learners). These variables were operationalised by using relevant scales and related theory that formed part of the data collection phase in the broader NRF-funded project. The statistical hypotheses related to these assumptions are stated as follows:

H_0: $\mu_{dif} = 0$ (mean population difference prior to and after the health promotion intervention is equal to zero)
H_a: $\mu_{dif} \neq 0$ (mean population difference prior to and after the health promotion intervention is not equal to zero)

The null hypothesis states that there was no significant difference between the physical fitness of the Foundation Phase learners prior to and after the implementation of the health promotion intervention while the alternative hypothesis states that there was a significant difference between the physical fitness of the Foundation Phase learners prior to and after the implementation of the health promotion intervention.

1.5 CLARIFICATION OF KEY CONCEPTS

This section provides clarity on the key concepts which featured in this study of limited scope.

1.5.1 Health promotion intervention

The World Health Organisation (WHO, 1986:1) confirms that health promotion is regarded as “the process of enabling people to increase control over and to improve their health”. The aim of health promotion within school contexts is, thus, to generate positive change in terms of the health-related behaviour of learners (WHO, 1986). In addition, Tortolero et al. (2002) indicate that health promotion interventions are effective strategies with which to support at-risk school-communities by strengthening the overall health and well-being of learners.

Despite the fact that the health promotion intervention that formed part of the broader NRF-funded project focused on the promotion of health-related behavioural change and psychosocial well-being, this study of limited scope focused on the possible effect of a health promotion intervention on the physical fitness of Foundation Phase learners. As such, for this study of limited scope, the health promotion intervention which was implemented aimed to improve the physical fitness of the Foundation Phase learners in relation to themselves, their families, their schools, their teachers and their peers.

1.5.2 Foundation Phase learners

According to the Curriculum and Assessment Policy Statement (CAPS), learners in Grades 1 to 3 form part of the Foundation Phase in the General Education and Training band (Department of Basic Education, 2011). Lomofsky and Lazarus (2001) point out that learners enrolled in Grade 1 are typically between the ages of six and seven years of age in their year of entry. Within the context of this study, Foundation Phase learners were seen as learners between the ages of six and nine years (at the time of the data collection).

1.5.3 Physical fitness

Keeley and Fox (2009) assert that physical fitness is a multifaceted series of functional abilities and competences which are, to a certain extent, established by one's genetic features, current phase of biological development as well as the total amount of physical movement attained. According to CAPS (Department of Basic Education, 2011), physical fitness includes the development of the learner's gross and fine motor skills. Furthermore, the Department of Basic Education (2011) highlights physical and motor development as essential features of development because it contributes to the learners' social, personal and emotional progress. In addition, Silverman and Deuster (2014, p.1) confirm that "physical fitness, attained through regular exercise or spontaneous physical activity, improves resilience". For the purpose of this study, physical fitness was regarded as a measure which indicates various bodily abilities such as balance and flexibility, strength and endurance, and speed and agility.

1.5.4 At-risk school-community contexts

Oldewage-Theron and Slabbert (2008), together with Armstrong et al. (2011), indicate that, as compared to elsewhere, the general standard of living tends to be lower for people living in developing countries, such as South Africa. Furthermore, Pebley and Sastry (2018) together with Oldewage-Theron and Slabbert (2008) claim that at-risk communities are characterised by high levels of unemployment, violence, low-income, poverty (Holborn & Eddy, 2011) ill-health and limited education. Studies by Turbeville et al. (2019) found that factors such as poverty and limited income have detrimental effects on the psychosocial well-being of learners as the latter is significantly correlated with poor physical growth, decreased academic performance, weakened cognitive and executive functioning and overall mental and physical health challenges. For the purpose of this study, at-risk school-community contexts refer specifically to school-community contexts that are characterised by high unemployment, low income, violence and limited education.

1.6 THEORETICAL FRAMEWORK

As a theoretical basis for the study, I relied on Bronfenbrenner's bioecological model of human development (Bronfenbrenner, 1977). This model (Bronfenbrenner, 1977), is a multidimensional model and indicates that a change in one system may lead to various changes in other systems (Keenan & Evans, 2010). Landsberg et al. (2011) propose that there are different, intermingling systems which affect a person's growth and development. However, Bronfenbrenner (1994) highlights that understanding human development involves understanding the ecological system around us as a whole while, at the same time, acknowledging that each individual and each system have their own independent features and qualities. For the purposes of this study, I took into account the various systems which had an impact on the learners' physical development and well-being, pertaining specifically to physical fitness.

Against the background of this study of limited scope, I aimed to gain insight into the effect of a health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk school-community contexts in Pretoria, Gauteng. In addition, I also aimed to gain insight into the way in which Foundation Phase learners' physical fitness may be applied to other systems as well as how it may be affected by the home and school environments of the learners. Accordingly, Bronfenbrenner's bio-ecological

model was deemed to be relevant to the study because the model indicates that the development of learners occur at home, at school and within a community, thus highlighting that, when different role-players, such as parents, teachers and other stakeholders, work collaboratively, it becomes possible to attain the goals related to physical fitness (Bronfenbrenner, 1979). A detailed discussion of Bronfenbrenner's bio-ecological model (Bronfenbrenner 1979), the different subsystems and the application of the model to this study of limited scope is provided in Chapter 2.

1.7 PARADIGMATIC APPROACHES

This section briefly discusses the epistemological and methodological paradigms that informed and guided this study.

1.7.1 Epistemological paradigm

In view of the fact that the primary focus of the study was on the possible effect of a health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk school-communities, I aimed to determine the intensity, multiplicity and complexity of the realities as constructed by the respondents (Henderson, 2011). Accordingly, I utilised post-positivism as an epistemological paradigm for the purposes of the study. Post-positivism acknowledges that reality is not a fixed entity but, instead, it is subjectively and mentally constructed by the individuals participating in a research study (Maree, 2016). According to Henderson (2011), post-positivism both emphasises meaning and seeks to clarify social concerns. Maree (2016) also indicates that post-positivism highlights the establishment and exploration of evidence that is valid and reliable and therefore, it follows a critical realist ontology.

The analysis of the pre- and post-data previously collected by means of questionnaires supported the use of post-positivism as the epistemological paradigm (Maree, 2016) for the study. Thus, the subjectivity (Ryan, 2006) which was in play could be considered as providing valid information as individuals are deemed to be competent in forming meaning and knowledge with regards to their own lives (Henderson, 2011). Post-positivism was deemed to be an appropriate paradigm for this study as the study aimed to ascertain the possible effect (or not) of the health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk school-community contexts.

1.7.2 Methodological approach

The study followed a quantitative methodological approach (Creswell & Creswell, 2018; Maree, 2016). Quantitative research involves the gathering and analysis of numerical data in order to define, clarify, foresee and/or manage variables as well as important phenomena (Mertler, 2018). Quantitative research is a structured, formalised and systematic approach (Morgan & Sklar, 2012). This, in turn, implies that all aspects relating to the research are planned and identified in detail before the commencement of the study. According to Mertler (2018), quantitative research suggests that the world is fairly stable and consistent, thus making it possible for us to measure phenomena, better comprehend such phenomena and also generalise the results of a study.

For the purposes of this study, I also utilised a quantitative methodological approach with the intention of comparing results from the pre- and post-data (Leavy, 2017) as well as evaluating existing theories (Joubert et al., 2016). Joubert et al. (2016) highlight that it is incumbent on researchers to know exactly what information they wish to obtain during a study. Maree (2016) further specifies that a quantitative research approach utilises various instruments, such as scales and descriptive or inferential statistics, to measure and analyse the data which has been collected. The quantitative methodological approach was, thus, deemed suitable for use in this study as the goal of the study was to explain and assess (Leavy, 2017) the effect (if any) of the health promotion intervention (Joubert et al., 2016). A quantitative approach allowed me to determine the effect (or not) of a health promotion intervention on Foundation Phase learners in two at-risk school-communities. By analysing the secondary data I was able to objectively measure the results which had been obtained by using statistical methods.

1.8 BRIEF OVERVIEW OF THE RESEARCH METHODOLOGY

The following sections briefly discuss the methodological approaches I applied in relation to the research design, sampling procedures and data analysis.

1.8.1 Research design

As the data had already been collected, I utilised secondary data analysis as a research design (Smith et al., 2011). When a secondary data analysis design is used,

the data is, in the main, quantitative in nature while the data analysis generally answers either descriptive or causal questions through standard statistical techniques (Mouton, 2001). Secondary data analysis may be regarded as the re-analysis of already existing data (Salkind, 2010) previously gathered by other researchers (Neuman, 2014). During the course of this study, I had regular contact with the original researchers, which allowed me to ask questions and guidance in planning and implementing my study.

An advantage of secondary data analysis is the possibility which is offered of examining questions relating to the data that were not examined in the previous research (Stewart & Kamins, 2011), thus bringing new viewpoints to existing data in order to attain a multidimensional understanding of social concerns (Greenhoot & Dowsett, 2012; De Vos et al., 2011). With this in mind, a secondary data analysis design enabled me to make additional contributions (McMillan & Schumacher, 2014) to the existing, collaborative research project, specifically on the effect of the health promotion intervention on the physical fitness of Foundation Phase learners. Furthermore, I considered a secondary data analysis design as suitable in terms of the ethical dilemmas usually involved with at-risk communities as this approach meant that direct harmful effects to the respondents were not possible (Alston & Bowles, 2003; Trzesniewski et al., 2011; De Vos et al., 2011).

1.8.2 Sampling of participants

The participants were selected during the initial phases of the NRF-funded project. To this end, 330 six- to ten-year-old respondents (in Foundation Phase) were purposively selected by means of non-probability sampling. The selection criteria for participation included the following: the schools had to be situated in at-risk community contexts; learners had to receive nutritional support at school; learners had to be in Foundation Phase and the parents of learners had to provide informed consent and the learners themselves informed assent. For the purposes of this study, I analysed the pre- and post-intervention data pertaining to the 330 Foundation Phase learners which had been collected by means of one questionnaire (NPWB questionnaire) that had already been administered to determine the effect of the health promotion intervention on the physical fitness of these learners.

1.8.3 Data collection instrument

For the purposes of this study, I utilised the sections of the NPWB questionnaire which related to physical fitness (Appendix A) as my focus was specifically on the data obtained pertaining to the learners' physical fitness. Thus, sections on both the indoor and outdoor testing of learners' physical abilities were utilised, specifically on page five of the NPWB questionnaire. Therefore, the scores that were obtained provided me with ratio-level data which, in turn, implied that I would be able to analyse the items by means of both descriptive and parametric inferential statistical procedures (Johnson & Christensen, 2014; Neuman, 2014).

1.8.4 Data analysis

In order to conduct the data analysis, I used the services of a statistician who assisted me with the data capturing, data cleaning and data analysis procedures. When capturing quantitative results, statistical packages require that the data is available electronically so as to run the statistical tests (Mouton, 2001). For the purposes of this study, I used R Core Team (2020) to analyse the data. I utilised descriptive and inferential statistics, as well as parametric tests, such as the paired t-test, to address the research questions. Parametric tests, like the paired t-test, are used to test hypotheses and appear to be more powerful than non-parametric tests (Kim, 2015; Bless & Kathuria, 1993). The paired t-test may be used when the results of the pre- and post-data reveal almost equal variances (Singh, 2007; Blaikie, 2003). The paired t-test is, therefore, used to determine any changes between pre- and post-data (Kim, 2015; Gorard, 2001; Singh, 2007).

1.8.4.1 Descriptive statistics

Descriptive statistics is an umbrella term used for numerous statistical methods which may be utilised to organise, summarise and describe data (Maree, 2016). According to McMillan and Schumacher (2014), the use of descriptive statistics is crucial in understanding the results of quantitative research and is necessary in order to summarise data which has been collected. McMillan and Schumacher (2014) further state that researchers may choose different types of descriptive statistics to describe data. The reason for conducting the research in question, the measurement scale used; and theories about the data all influence the types of descriptive statistics a researcher will utilise (McMillan & Schumacher, 2014). According to Cohen et al.

(2018), graphic methods are used to present data during descriptive statistics. Descriptive statistical techniques may be seen as the groundwork for inferential statistics as inferential methods rely on descriptive statistical techniques and utilise them as an initial foundation (Salkind, 2010). In this study, I applied descriptive statistical procedures to present and describe the results obtained from the pre- and post-tests, while also determining the distribution of the data (Cohen et al., 2018; Lune et al. 2010).

1.8.4.2 Inferential statistics

Maree (2016) points out that researchers do more than just summarise and describe the data which has been collected. To this end, such researchers (Maree, 2016) make use of inferential statistics to formulate generalisations and/or conclusions about certain data. According to McMillan and Schumacher (2014), inferential statistical methods are used to calculate the extent to which a sample resembles the population from which the sample was extracted (Johnson & Christensen, 2014; Neuman, 2014). Salkind (2010) declares that descriptive statistics complement inferential statistics and further explains that descriptive statistics are used to enhance the reader's understanding of the course and significance of the results emerging from the inferential statistical analysis (Salkind, 2010).

Even should non-probability sampling be used, Gravetter and Forzano (2018) argue that it is reasonable to presume that samples from one location are as representative as a sample from similar settings with this, in turn, leading to the assumption that it is possible to generalise findings from similar, at-risk settings. I used a confidence interval (significance level) to describe, with a level of confidence (Johnson & Christensen, 2014), the inferences that could be drawn from the sample and then applied to the population, or similar settings. When conducting the hypothesis testing, I worked on a 0,05 significance level. If it were found that the result could be ascribed to something other than chance, I rejected the null hypothesis but, if not, the null hypothesis was not rejected (Leedy & Ormrod, 2013). I utilised a parametric statistical procedure, known as the paired t-test, to test the hypotheses (Singh, 2007). Parametric statistics are generally considered to be more powerful than non-parametric tests (Bless & Kathuria, 1993) and may be used to compare two sets of

data, as was the case in this study with the pre- and post-data that had emerged from the original NRF-funded project.

1.9 STANDARDS OF RIGOUR

I adhered to two measures of quality assurance, namely, reliability and validity (Maree, 2016). According to Maree (2012), reliability refers to the consistency of a measuring instrument in the sense that, if the instrument were to be used again in a different timeframe and with other participants of the same population group, the measure should yield the same results. In addition, Wilson and Gochyyev (2013) indicate that the reliability of an instrument is in the degree to which the instrument consistently measures the construct it was intended to measure. In order to enhance the reliability of this study I approached the Statistics Department of the University of Pretoria who agreed to assist me in analysing the data objectively, hence ensuring the reliability of the results.

Wilson and Gochyyev (2013) declare that an instrument may be regarded as valid if it succeeds in measuring what it alleges to measure. According to Leavy (2017), there are two main types of validity, namely, internal validity and external validity. Internal validity refers to the process of determining the influence which variables will have on the research results to further enhance the validity of any conclusions made (Joubert et al., 2016). In this study I used data from both pre- and post-tests to ensure the internal validity of the study (Leavy, 2017). Joubert et al. (2016) point out that the focus in external validity is on whether the research results obtained may be generalised either to the whole and or to other populations.

1.10 ETHICAL CONSIDERATIONS

In this study of limited scope, I adhered to the guiding principles and ethical considerations which should be upheld when performing research (Pruzan, 2016). The secondary data analysis (SDA) conducted eliminated the possibility of harm to participants because I did not work directly with any of the participants (Trzesniewski et al., 2011) as the data used had previously been collected from the participants who had taken part in the NRF-funded University of Pretoria/Fordham University collaborative project. Nevertheless, I protected the privacy and confidentiality of all these participants by ensuring that the data was anonymously coded; that it would be securely stored for fifteen years and that all their identifying information was excluded

(Resnik, 2018). I also obtained permission from the University of Pretoria to conduct the study while ethical clearance for the research was granted by the Ethics Committee of the Faculty of Education (Annexure B). Furthermore, I adhered to the ethical guidelines which specified that I should truthfully and without any bias report on all the data results (Kumar, 2019).

1.11 OUTLINE OF CHAPTERS

The following section provides an overview of each chapter in this mini-dissertation:

Chapter 1: Overview of the study

Chapter 1 contained an introduction to the study and explained the background to and rationale for the study while also indicating the direction the study followed. I also clarified specific concepts utilised in the study and then briefly explained the research methodology and design that were used. In addition, I elaborated on aspects pertaining to the paradigmatic approach and sampling methods used, the data analysis and the quality measures adopted. Finally, I discussed the ethical considerations which were taken into account in the study.

Chapter 2: Literature Review

Chapter 2 presented a review of relevant literature and discussed important aspects and themes related to the study. The literature review focused on existing literature on the physical development and physical fitness of young learners; the relationship between physical fitness and physical activity; the health values that are linked with physical fitness, as well as the challenges and factors that increase sedentary behaviours. The chapter also discussed the theoretical framework which underpinned the study.

Chapter 3: Research Design and Methodology

Chapter 3 discussed the research design, research methodology and paradigmatic perspectives that informed the study. In addition, the chapter described the sampling and data analysis methods that were utilised and elaborated on the standards of rigour and ethical considerations applied in the study.

Chapter 4: Results of the Study

Chapter 4 presented and discussed the results obtained from the secondary data analysis. In this chapter I reported on the results by referring to the descriptive, inferential and parametric statistics that I utilised and, in addition, I discussed the results obtained on the effect of the health promotion intervention on the physical fitness of Foundation Phase learners.

Chapter 5: Findings, Conclusions and Recommendations

In reporting on the findings of the study, Chapter 5 linked the research results with relevant literature. I also drew conclusions and addressed the research questions. Finally, I mentioned possible limitations of the study and included recommendations for training, practice and future research.

1.12 CONCLUSION

Chapter 1 discussed the background to, purpose and rationale of the study as well as the research questions and hypotheses that guided the planning and implementation of the study. The chapter also clarified key concepts embedded in the study, presented an overview of the theoretical framework which underpinned the study and explained the paradigmatic approaches and research design used. Finally, the chapter outlined the standards of rigour and ethical considerations which were adhered in order to ensure ethical research.

Chapter 2 contains a discussion on relevant literature on the effect of a health promotion intervention on the physical fitness of learners in at-risk school-communities, as well as the theoretical framework which underpinned the study.

CHAPTER 2: LITERATURE REVIEW

2.1 INTRODUCTION

Chapter 1 contained a brief discussion on the purpose of and rationale behind this study of limited scope. The chapter also presented the primary and secondary research questions that supported the study and clarified key concepts used in the study. In addition, the chapter provided an overview of the paradigmatic approaches, research design, sampling methods and theoretical framework used. Finally, the chapter discussed the ethical considerations and standards of rigour which were upheld throughout the study.

This chapter presents a review of existing literature on health promotion interventions which have been implemented globally and especially, in the South African context. The chapter commences with a review of literature on the physical development of Foundation Phase learners in relation to their physical growth and the development of their motor skills. This is followed by a discussion on physical fitness as well as an explanation of the differences between physical fitness and physical activity. Literature on the health-related values of physical fitness, the factors that affect physical fitness as well as the physical fitness profiles of South African learners at the time of the study is then reviewed. The options available to address the low levels of physical fitness of Foundation Phase learners are then presented. The chapter concludes by explaining the theoretical framework which underpinned this study of limited scope.

2.2 PHYSICAL DEVELOPMENT OF FOUNDATION PHASE LEARNERS

According to Fernandez-Jimenez et al. (2018, p.1) and Gallahue and Donnely (2003), the early and middle childhood phases are the phases which are the most widely recognised as the “window of opportunity” in which to optimally develop the motor skills, physical development and physical activity patterns of learners as learners in this phase do not present with performance anxiety; they are not afraid of getting hurt and they have not yet formed long lasting, unhealthy, sedentary practices. As a result, it is especially beneficial for learners when schools implement health promotion interventions during this specific developmental phase (De Jager, 2009; DelGiudice, 2018).

The word “development” typically represents the changes and/or accomplishments of learners that occur throughout their various life stages and commencing during early childhood (Cheatum & Hammond, 2000; Geiger & Schelbe, 2021). These life stages, which are also acknowledged as developmental milestones, may be observed in a predictable and organised way. This is highlighted by Wait (2005), Davids et al. (2008), Haywood and Getchell (2009) and DelGiudice (2018) who all state that a learner’s development proceeds in a sequential manner. De Jager (2009) and Langley et al. (2021) confirm that all human development occurs in line with the same rudimentary laws from one stage to the next, thus signifying that the sequence of development is vital for optimal growth and development, irrespective of any diversities in respect of a learner’s gender, personality and ethnicity.

Erasmus (2009) and Boyd and Bee (2015) verify that it is important that certain developmental stages, which involve the development of the brain, take place during specific times as development following birth starts from the head and proceeds to the toes (De Jager, 2009; Scheffler & Hermanussen, 2018). Thus, stages that should develop within a specific timeframe do not develop to the same degree later on (Erasmus, 2009; Geiger & Schelbe, 2021). According to Davids et al. (2008), Haywood and Getchell (2009) and DelGiudice (2018), a learner’s development is influenced not only by the individual changes taking place within, but also by changes occurring in the learner’s surrounding environment. At the time, it is crucial to understand that every learner is different and will, therefore, go through these developmental stages at different times, regardless of age.

Cheatum and Hammond (2000), Haywood and Getchell (2009), Geiger and Schelbe (2021) and Langley et al. (2021) corroborate that development occurs at various rates and may differ between learners of the same age as development may, at times, occur at either a slower or a faster pace than expected. In addition, learners’ physical activity abilities may also develop at different rates although they will still be within the normal range. However, it is important to recognise that each learner is unique and will advance only to the next developmental milestone when the learner is ready developmentally (Scheffler & Hermanussen, 2018; Haywood & Getchell, 2009; Cheatum & Hammond, 2000; De Jager, 2009).

2.2.1 Overview of the physical growth of foundation phase learners

According to Louw and Louw (2014), physical development during middle childhood is characterised by a sudden growth in the learner's arms and legs as compared to the upper body. The growing rates of females and males are fairly similar in the final stage of early childhood and then change during middle childhood (Louw & Louw, 2014; Scheffler & Hermanussen, 2018). However, factors such as ethnicity and Socio-Economic Status may impact on the differences in the physical development of learners. A further characteristic of development during this phase is the acquisition of numerous psychomotor skills. The physical growth and development of learners are extremely intricate and are subject to both genetic and environmental influences (Boyd & Bee, 2015; Sigelman & Rider, 2018). Khan and Bell (2019) and Sigelman and Rider (2018) specify that a healthy diet (rich in protein, calcium and vitamins) during childhood is essential for proper physical development.

Boyd and Bee (2015) and also Sigelman and Rider (2018) highlight that the pituitary gland supplies growth hormones whereas the thyroid gland supplies other hormones which not only affect the development of the brain but which also regulate the physical growth and development of learners. Langley et al. (2021) and Sigelman and Rider (2018) suggest that, during middle childhood, although learners exhibit slight signs of growth, their lower bodies and extremities expand with mature body proportions starting to appear (Children's Wisconsin, 2021). According to Sigelman and Rider (2018), during middle childhood learners' muscles become stronger; the growth and hardening of bones persist and lung capacity improves (Kuther, 2018) while they also become physically stronger. It is important for learners to become skilled at modifying their movements in such ways so as to enable them to adjust to the changes in both their bodies and the environment.

Keenan and Evans (2010), Sigelman and Rider (2018) and Fryar et al. (2018) point out that there seems to be certain gender differences when it comes to physical development, with males developing greater upper body strength and shoulder width whereas females tend to be more skilled in activities that involve manual dexterity. Nonetheless, it may also be the case that many gender differences in physical development are due to varied exposure and gender expectations (Sigelman & Rider, 2018; Vaquero-Solís et al., 2020; Keenan & Evans, 2010; Louw & Louw, 2014).

According to Sigelman and Rider (2018) and Khan and Bell (2019), physical activity and nutrition are important factors that determine learners' health and wellness. Factors such as physical activity and nutrition are shaped through the learners' home environments, their Socio-Economic Statuses and the education levels of their caregivers (Sigelman & Rider, 2018; Fernandez-Jimenez et al., 2018).

Lally and Valentine-French (2019) maintain that it is not only the environment that affects a learner's physical development, but also the learner's own temperament which may, in some cases, influence the learner not to engage in any physical activities, thereby increasing sedentary behaviours. It has been found that, as compared to their more sedentary counterparts, learners who reach the daily suggested amount of physical activity tend to be more physically fit; they show improved cognitive and psychological functioning and they exhibit greater levels of academic performance (Lally & Valentine-French, 2019; Keenan & Evans, 2010; Louw & Louw, 2014; Sigelman & Rider, 2018).

2.2.2 Development of foundation phase learners' motor skills and movement

Motor development involves the continual progression in movement capabilities which are influenced by various factors in and around the learners as they grow older (Dapp et al., 2021; Pienaar, 2012; Haywood & Getchell, 2009). It should be acknowledged that motor development comprises several phases that take place from infancy and continue into old age (Lally & Valentine-French, 2019; Gallahue & Ozman, 2006; Pienaar, 2012).

The successful completion of the first two phases, also known as the reflexive and rudimentary phases, is crucial for the further development of the fundamental and specialised movement phases which should take place during early childhood (Burns et al., 2017; Gallahue & Donnely, 2003; Pienaar, 2012). The third motor development phase, also called the fundamental movement phase (Burns et al., 2017), is vital for the development and enhancement of the stability and the locomotor and manipulative abilities of learners (Fang et al., 2017), and should take effect during their early years (Pienaar, 2012; Gallahue & Donnely, 2003). The fundamental movement phase comprises the initial, elementary and mature phases (Burns et al., 2017; Pienaar, 2012; Gallahue & Donnely, 2003). According to Pienaar (2012) and Geiger and Schelbe (2021), it is essential that the motor movements characteristic of all the

previous phases are fully developed if a learner's specialised skills are to develop adequately. Burns et al. (2017), together with Pienaar (2012), further specify that improved technology, sedentary behaviours and at-risk environments have been found to impede the motor development of learners. The specialised movement phase, recognised as the fourth phase of motor development, may be divided into three sub-stages, known as the transitional stage, the application stage and the specialisation stage.

Foundation Phase learners are expected to fall within the transitional stage of the specialised movement phase during which their motor skills become better developed and refined (Dapp et al., 2021; Pienaar, 2012; Gallahue & Donnely, 2003). It is during this transitional stage that learners pay attention to their motor skills, compete with other learners and display an interest in sports. The learners' motor abilities are, however, still restricted to a certain degree as they are only becoming aware of their performance in relation to specific motor skills at this time. Although accuracy and skill refinement remain important during the transitional stage; the development of these specialised motor skills tends to rely heavily on the expertise, reinforcement and practice of instruction (Cook et al., 2019; Gallahue & Donnely, 2003; Pienaar 2012).

After middle childhood, the learners enter the application stage during which their neurological and physical development is considered to be better established than was previously the case and they appear to have greater control over their bodies' physical and mental needs than before. During the application stage learners discover their weaknesses and strengths in relation to their motor development as well as any physical limitations they may have. Consequently, the learners aim to advance and refine their abilities through the persistent practice of more complex motor skills (Dapp et al., 2021; Gallahue & Donnely, 2003; Pienaar, 2012).

Sigelman and Rider (2018) are of the opinion that gross motor movements relating to the arms and legs of learners develop in advance of their fine motor movements which, in turn, involve their hands, fingers, feet and toes. General motor skills are developed before specific motor skills in a precise order, which is determined by the development of the learner's nervous system. In other words, learners' gross motor movements are more developed than their fine motor movements (Dapp et al., 2021), thus clarifying why young learners and learners with motor impediments typically choose to

participate in activities which are of a gross motor nature (Burns et al., 2017; Cheatum & Hammond, 2000: De Jager, 2009).

Fine motor skills are executed using small muscle groups, primarily in the fingers, wrists and hands, to perform tasks such as writing, drawing, cutting, stringing and building with blocks. On the other hand, gross motor skills include using the large muscle groups to perform tasks such as walking, running, jumping, throwing, hitting and climbing (Dapp et al., 2021; Cheatum & Hammond, 2000: De Jager, 2009; Cook et al., 2019). According to Sigelman and Rider (2018), the motor development of school age learners improves every year, thus indicating that they should be able to run faster, jump higher, throw further and climb better than was previously the case before (Kuther, 2018).

Kuther (2018) explains that learners gain greater control over their coordination capabilities as certain portions of the brain, which are responsible for sensory and motor development, mature. Kuther (2018) further elaborates that Foundation Phase learners become capable of playing and participating in more demanding and more complex activities. It has been found that learners from at-risk communities often present poor motor skills, probably because, as compared to their more fortunate counterparts, they have less access to opportunities to practise their motor skills and, in addition, they are more likely to present with malnutrition (Kuther, 2018; Boyd & Bee, 2015). As learners mature they develop greater competency in controlling and coordinating their gross motor skills. However, according to Kuther (2018) and Dapp et al. (2021), it is the development of fine motor skills, such as small muscles and hand-eye coordination, which enables learners to become more independent and care better for themselves than was previously the case.

2.3 UNDERSTANDING PHYSICAL FITNESS

This section explains the relationship between physical fitness and physical activity. It also contains a discussion on the health-related values of physical fitness, it describes the physical fitness profiles of Foundation Phase learners in South Africa and, finally, it elaborates on the factors that affect the physical fitness of Foundation Phase learners.

According to Martínez-Vizcaíno and Sánchez-López (2008), as well as Yuksel et al. (2020), the physical fitness of learners is related to their cardio-respiratory capacity, muscle strength, motor ability, endurance (Rauner et al., 2013), agility, flexibility, muscle resistance, body composition (IOM, 2012a), body mass index (Kuriyan, 2018; Tanita, 2020), and speed. Janz et al. (2000) and Mora-Gonzalez et al. (2019) emphasise the significance of maintaining and enhancing the physical fitness levels of learners as part of a health promotion intervention, particularly in view of the causal link between decreased cardiovascular disease (Fernandez-Jimenez et al., 2018) and improved physical fitness during adulthood which has been found.

Chen et al. (2018) confirm that sufficient physical fitness during childhood may have several benefits, including the enhancement of learners' overall health condition; improved health as adults and ongoing physically fitness during adulthood. Chomitz et al. (2009) and Vaquero-Solís et al. (2020) declare that, although the direction of causality is unknown, there is a statistically significant correlation between academic performance and physical fitness which may, in turn, prove vital when designing and implementing new health policies in school settings. Martínez-Vizcaíno and Sánchez-López (2008), IOM (2012a) and Popovic et al. (2021) all mention that, although physical fitness is determined hereditarily, other components within the surrounding environment, including learners' pattern of behaviour and physical exercise, may improve their physical fitness.

According to Yuksel et al. (2020) and IOM (2012a), health-related fitness includes cardiorespiratory endurance which is extremely important for adequate oxygen distribution in a learner's blood. Rowland (2005), Malina et al. (2004) and Barbosa et al. (2018) indicate that male and female cardiorespiratory, endurance capabilities often increase twofold during the Foundation Phase although it has been found that the cardiorespiratory endurance levels of females stagnate at about 14 years of age whereas those of males continue to advance until 17 to 18 years of age. Eisenmann (2003; 2007), Carnethon et al. (2005), Pate et al. (2006) and Chen et al. (2018) all found that adiposity, inactivity and a higher risk for cardiorespiratory disease were strongly linked to decreased cardiorespiratory endurance levels of young learners.

Muscle strength and endurance (Amusa, et al., 2011; Mora-Gonzalez et al., 2019) are both features that may be measured when considering an individual's physical fitness.

According to the Council on Sports Medicine Fitness (2008), the Committee on Sports Medicine Fitness (2001) and Cook et al. (2019), learners may definitely improve their muscle strength and endurance when a health promotion intervention includes opportunities to enhance the duration, amount and intensity of physical exercises (Vaquero-Solís et al., 2020). Faigenbaum et al. (2009), the Council on Sports Medicine Fitness (2008) and Khan and Bell (2019) further state that resistance training is also an effective way of improving both muscle strength and endurance. It is, however, important that such resistance training is carried out according to regulations that are suited to the learner's age and developmental level.

Furthermore, Barbosa et al. (2018) and IOM (2012b) indicate that flexibility may be used to measure a learner's mobility. This, in turn, is important for the prevention of joint injuries during physical exercise. Although flexibility is more advanced in females than males throughout their lifespans, the IOM (2012b) found that flexibility in both genders start to decrease after puberty due to higher inactivity levels and ordinary maturation. Body composition (Going et al., 2012; Vaquero-Solís et al., 2020), including that of learners, consists of all the fatty tissues, muscles, organs and skeletal parts that comprise body weight. Fernandez-Jimenez et al. (2018), Ogden and Flegal (2011), and IOM (2012b) emphasise that many learners across the globe are at risk of becoming overweight and/or obese as it has been found that at least 33% of all learners are overweight and almost 20% obese when body composition is measured.

2.3.1 Relationship between physical fitness and physical activity

According to Kim et al. (2020), the phrases "physical fitness" and "physical activity" are often used interchangeably. However, they indicate that this should not be the case as these two phrases are, in fact, very different. Martínez-Vizcaíno and Sánchez-López (2008) explain that the proper definition of each phrase may give researchers a better understanding of what each one means and also how to effectively include them in their research.

Yuksel et al. (2020), highlight that there are significant differences between the physical fitness and physical activity of Foundation Phase learners. Despite the fact that both physical fitness and physical activity lead to favourable health outcomes (Vaquero-Solís et al., 2020), it has been found that physical activity does not guarantee physical fitness and that physical fitness does not necessarily increase

physical activity. However, Fang et al. (2017) declare that sufficient physical activity has proved to constitute an important foundation on which learners may develop and improve their physical fitness.

“Physical activity refers to any bodily movements produced by skeletal muscle which requires consumption of energy, whereas physical exercise is any planned, structured, and systematic physical activity designed to improve or maintain one or more components of physical fitness” (Martínez-Vizcaíno & Sánchez-López, 2008, p.108; Kim et al., 2020). According to Proper et al. (2003), there is an extensive range of physical, mental and health benefits for learners who participate in an adequate level of physical activity (Dapp et al., 2021) as compared to learners who are inactive. As specified by Sallis et al. (2000) and Vaquero-Solís et al. (2020), ongoing modest-to-strong physical activities are related to various health advantages for learners and, therefore, an awareness of the aspects that influence physical activity is of paramount importance when designing health promotion intervention programmes.

Meredith and Welk (2007) and Fernandez-Jimenez et al. (2018) assert that, due to the enormous prevalence of obesity across the globe, several researchers have, in recent years, begun to emphasise the significant benefits of daily physical activity. Researchers have found that obesity rates have increased markedly among all ages, genders and nations (Klingberg et al., 2019; Meredith & Welk, 2007). Overweight and obese learners are at a significant risk of developing cardio-vascular diseases, poor overall health and immobility and also encountering social ridicule. Khan and Bell (2019) and Meredith and Welk (2007) highlight that, due to the obesity pandemic, many schools have already started to encourage physical activity among their learners and are also developing various strategies to enable teachers to promote participation in physical activity.

The recommended physical activity levels of learners are nearly twice those of adults with it being suggested that learners should participate in 60 minutes of physical activity per day as compared to the 30 minutes recommended for adults (Martínez-Vizcaíno & Sánchez-López, 2008; Hills et al., 2015). These guidelines aim both to promote positive attitudes towards physical activity on the part of learners and also to improve their motor skills and motor development (Burns et al., 2017). It is important for learners to develop healthy physical activity patterns during early and middle

childhood as this may lead to their becoming more physically active adults than may otherwise have been the case. Vaquero-Solís et al. (2020) and Meredith and Welk (2007) also observed that sedentary behaviours and inactive lifestyle patterns early on may lead to increased health risks and will, in all likelihood, be carried through into adulthood (Fernandez-Jimenez, 2018).

2.3.2 Value of physical activity for Foundation Phase learners

Inactivity is emerging as a severe health epidemic which is exacerbating learners' risk of developing metabolic, pulmonary and/or skeletal disorders (Rauner et al., 2013); obesity (Beets et al., 2009), orthopaedic problems; psychosocial constraints (Kriemler et al., 2010); atherothrombotic-cardiovascular disease (Fernandez-Jimenez et al., 2018) and premature fatality (Vanhees et al., 2005). According to Martínez-Vizcaíno and Sánchez-López (2008), the health benefits for physically active learners include a significantly decreased risk of cardiovascular disease, high blood pressure, malignant tumours, diabetes, obesity and early mortality (Klingberg et al., 2019; Mora-Gonzalez et al., 2019). Increased physical activity also promotes physical fitness, bone health and aspects related to body composition (Fang et al., 2017). Consequently, learners who are physically active on a regular basis tend to develop the same beneficial and habitual patterns of behaviour when they become adults (Fernandez-Jimenez, 2018; Martínez-Vizcaíno & Sánchez-López, 2008).

Research conducted by Hills et al. (2015) indicates that the value and advantages of moderate to vigorous physical activity, namely, enhanced self-worth; skeletal and metabolic health; improved body image; cardiovascular fitness; decreased childhood obesity, depression, chronic illness and lower levels of tension and anxiety have already been recorded in detail (Vaquero-Solís et al., 2020). Martínez-Vizcaíno and Sánchez-López (2008), as well as Vaquero-Solís et al. (2020), have highlighted that, although the recommended amounts of physical activity may not always improve physical fitness, they will almost certainly enhance a learner's confidence, scholastic achievement and bone density (Domville et al., 2019). Amusa et al. (2011) and Popkin et al. (2020) furthermore explain that the global epidemic of inactivity may definitely be attributed to both modern day technology as well as the lifestyle patterns of young learners.

2.3.3 Physical activity levels of South African learners

Amusa et al. (2011) and Cook et al. (2019) indicate that South African learners who demonstrate high levels of physical fitness are also more likely to exhibit higher levels of physical activity as compared to their less fit counterparts. According to Tian et al. (2017) and Domville et al. (2019), the high prevalence of inactive behaviour among South African learners may be partly due to the past absence of physical education (PE) in South African schools. Despite the fact that, at the time of this study, the Department of Basic Education (DBE) had once again included physical education as part of Life Skills (CAPS), Tian et al. (2017) argue that one hour of physical activity per week is not nearly enough to address the health epidemic of excessive weight and adiposity among school going learners in South Africa (Klingberg et al., 2019). Tian et al. (2017) and Silva et al. (2018) found that only about 54.3 % of learners in South Africa are offered physical education at school and also that several schools are inadequately equipped to promote physical activity.

The South African Youth Risk Behaviour Survey reported that 41,5% of South African learners are inactive (Naidoo & Coopoo, 2012), thus highlighting the urgent need for relevant intervention. Previous studies have found that young males tend to be more physically active as compared to young females. This may be due to the custom whereby young males usually worked on farms and carried out heavy physical tasks, whereas, in the main, young females attended to less physical household responsibilities (Amusa et al., 2011; Klingberg et al., 2019).

Naidoo and Coopoo (2012) and Vaquero-Solís et al. (2020) believe it will be beneficial to prepare all role players for and educate them on the various techniques involved in incorporating physical activity into the demanding school curriculum. In other words, teachers should undergo support and training courses on various ways in which to promote physical active behaviours in learners, for example, acquiring the necessary skills to adapt their teaching and incorporating one minute of physical activities before the commencement of each lesson (Naidoo & Coopoo, 2012; Domville et al., 2019). Several studies indicate that health promotion interventions may be both sustainable and effective if it is included in school policies and also that the specialised training of all teachers in relation to physical education plays a vital role in its success. Finally, Naidoo and Coopoo (2012) and Burns et al. (2017) mention that equipping learners

with the right tools, guidance and structured activities during recess may also lead to an overall increase in their daily level of physical activity.

In addition to indications that South African learners tend to eat unhealthy food, Naidoo et al. (2009) confirm that less than 40% of learners are involved in physical activity on a weekly basis. Cook et al. (2019) and Naidoo et al. (2009) point out that the purpose of physical education is to improve the overall health and fitness of learners and to enhance their motor development. Furthermore, Naidoo et al. (2009) and Vaquero-Solís et al. (2020) highlight the relationship between physical fitness and scholastic performance, as well as the positive impact of physical activities on conduct in the classroom as well as on learner concentration and memory (Cook et al., 2019).

Moselakgomo et al. (2014) and Klingberg et al. (2019) discovered that many South African learners tend to participate in low to moderate levels of physical activity and also stated that learners who demonstrate low levels of physical activity were predisposed to exhibit low levels of physical fitness. Studies conducted in numerous schools throughout South Africa, with diverse Socio-Economic Status and widespread ethnicity, correspondingly found that approximately 8.1% of learners were stunted while 15.4% of learners were either overweight or obese. These studies also highlighted a negative correlation between physical activity and Socio-Economic Status (Domville et al., 2019; Armstrong et al., 2017).

Researchers have also found that, as compared to their more fortunate counterparts, South African learners from low Socio-Economic Status (Klingberg et al., 2019) were prone to do the least number of sit-ups; jumped and threw the shortest distances and ran the slowest (Armstrong et al., 2011). In this vein Fernandez-Jimenez et al. (2018) and Armstrong et al. (2011) indicate that physically fit learners from higher Socio-Economic Status may, as compared to their less fortunate counterparts, exhibit better physical development and well-being while they may also have access to healthier nutritional options. It has been found that many learners from at-risk communities have to walk approximately 10km or more a day to and from school. In addition, many of these learners have often not eaten for up to 3 days. These findings may, in turn, explain the poor results these learners obtained in the fitness tests (Cook et al., 2019; Armstrong et al., 2011).

2.3.4 Factors affecting the physical fitness of Foundation Phase learners

Learner physical fitness is declining significantly across the globe. According to Fang et al. (2017), some of the reasons for this may include urbanisation, the pollution of the environment; limited space in which to engage in physical activities to promote fitness; crime and the concomitant dangers; as well as certain fluctuations in the family dynamics of learners (Fernandez-Jimenez et al., 2018; Klingberg et al., 2019). Studies conducted by Sallis et al. (2000) and Burns et al. (2017) found that factors which contributed to improved physical fitness among young learners included access to facilities, resources and programmes; available time; direct and indirect parental assistance; encouragement from significant individuals; individual physical abilities; objectives and opportunities to be more physically active.

2.3.4.1 Influence of poverty and the Socio-Economic Status of learners on their physical fitness

According to Armstrong et al. (2011) and Omodan and Ige (2021), South Africa is a country which is characterised by enormous diversity in terms of Socio-Economic Status and wealth distribution. These factors pose challenges to studying and may also result in learner inactivity and malnutrition which, in turn, impact adversely on the health of learners in the country. It has been found that the previous apartheid regime in South Africa resulted in the majority of black South African learners coming from poor Socio-Economic Status while most white South African learners come from more affluent Socio-Economic Status (Armstrong et al., 2011). Walter (2011) and Fernandez-Jimenez et al. (2018) have further confirmed that lower levels of physical activity are more evident in at-risk communities of a low Socio-Economic Status and, yet, that the level of these learners' screen-time, such as watching television, is high.

At-risk communities of a low Socio-Economic Status are known to present with a decrease in the learners' physical activity levels (Fernandez-Jimenez et al., 2018), particularly those of females (Vaquero-Solís et al., 2020). This is primarily because play areas in these communities are considered to be unsafe (Gómez et al., 2004; Carver et al., 2008; Lopez, 2011). Cradock et al. (2005), Lopez (2011) and Douglas et al. (2018) report that potential harm and danger in surrounding areas, for example, parks, are determining factors as to whether learners will play in such areas or not. Another distressing factor is that, in the main, at-risk communities of a low Socio-

Economic Status have access to few resources and almost no facilities where learners may perform physical activities (Klingberg et al., 2019; Cradock et al., 2005; Gordon-Larsen et al., 2006; Lopez, 2011).

Cook et al. (2019) and Armstrong et al. (2011) found that, in general, learners from low socio-economic communities typically spend 19 minutes each day in active travelling to and from school whereas learners from wealthier socio-economic communities typically spend, on average, 2 minutes. It has also been found, in the main, that learners from lower socio-economic communities participated nearly 4.5 times less in formal sporting events as compared to their counterparts from wealthier socio-economic communities (Klingberg et al., 2019; Armstrong et al., 2011).

Once again financial constraints; insufficient training; poor facilities and inadequate physical education are the main reasons why health promotion interventions are stagnant in at-risk schools (Walter, 2011; Klingberg et al., 2019). Walter (2011), Armstrong et al. (2011) and Vaquero-Solís et al. (2020) emphasis that it is imperative that feasible and sustainable health promotion interventions become a priority in all South African school policies and curricula, especially those pertaining to at-risk communities of a low Socio-Economic Status (Fernandez-Jimenez et al., 2018) where physical activity should be promoted throughout the school day.

2.3.4.2 Prevalence of malnutrition and impact on learners' physical fitness

Increased obesity rates are prevalent among at-risk communities in developing countries such as South Africa (Fernandez-Jimenez et al., 2018; Kearney, 2010) with the health-related needs of at-risk communities not being met as a result of unhealthy food choices (Khan & Bell, 2019; Kearney, 2010). According to Oldewage-Theron and Egal (2012) and Klingberg et al. (2019), poverty contributes to less than optimal dietary diversity, poor nutrition and increased micronutrient deficiencies. The Global Nutrition Report confirms that malnutrition (over- and undernutrition) is the primary cause of the worldwide burden of diseases (Kearney, 2010; Wells et al., 2020; Demaio & Branca, 2018).

Sigelman and Rider (2018) and Khan and Bell (2019) maintain that learners from at-risk communities do not consume the recommended daily portions of fruit and vegetables while 27% of their total daily calories comprise unhealthy foods. Reardon

et al. (2021) and Sigelman and Rider (2018) also found that sodas are some of the fluids mainly ingested by learners, thereby hampering the milk and calcium consumption which is vital for bone health. Sigelman and Rider (2018) claim that caregivers with higher education levels may prove to be of benefit to learners' health as they tend to be more aware than their less educated counterparts of the dangers of malnutrition; they are more likely to model healthy eating habits and they may implement strategies other than that of bribes using unhealthy treats in order to manage learner behaviours.

According to Kruger et al. (2005) and Khan and Bell (2019), non-communicable diseases (NCDs), malnutrition, overweight, hypertension, diabetes and coronary heart disease are widespread among South African learners. They recommend that health promotion interventions should aim to treat and prevent further health risks. Studies have found that approximately 17.1% of learners are overweight with females showing a greater tendency to become obese as compared to their male counterparts (Kruger et al., 2005; Vaquero-Solís et al., 2020). Urbanisation and globalisation have led to an increase in unhealthy food consumption practices with the fat and sugar intake of individuals being significantly higher than it was in the past (Misselhorn & Hendriks, 2017; Monyeki et al., 2005).

According to Oldewage-Theron and Egal (2012), Popkin et al. (2020) and Wells et al. (2020), learners' health has deteriorated over the last decade. Globally, more than 159 million learners are stunted while almost 50 million learners are underweight (UNDP, 2016). Shisana et al. (2014) emphasise that obesity affects almost 14% of South African learners between the ages of 6 and 14 years (Domville et al., 2019). The United Nations (2015), Steyn et al. (2015) and Khan and Bell (2019) confirm that both unhealthy food choices and learner inactivity are the main causes of obesity and other non-communicable diseases. Fernandez-Jimenez et al. (2018) and Steyn et al. (2015) also highlight that, as learners spend most of their time at school, it is imperative to implement health promotion interventions which focus on healthy nutrition at school.

2.3.4.3 Effect of physical inactivity and sedentary behaviour on learners' physical fitness

Piek et al. (2010) state that the use of modern technology may increase sedentary behaviours (Vaquero-Solís et al. 2020) with the prolonged use of televisions,

computers, mobile phones and the internet impacting dangerously on both the physical and motor development (Cook et al., 2019; Pienaar, 2009) of learners during middle childhood. Studies based on learner television viewing and video game playing practices conducted by Janz et al. (2000) revealed that young males with inactive lifestyles were 2.2 times more prone to remain sedentary as compared to their more active counterparts (Tanaka et al., 2018). Janz et al. (2000) and Park et al. (2020) further mentioned that it would appear that young females generally spend less time watching television and playing video games than males and are also more likely to participate in physical activities. It may, therefore, be concluded that it would appear that young males establish their patterns of physical behaviour activities much sooner than their female equivalents, thus highlighting the critical need for early interventions with males (Janz et al., 2000).

Park et al. (2020) and Boreham and Riddoch (2001) argue that young learners will, in all likelihood, play and discover and create physically active ways of passing the time when no sedentary options are available, further advocating that such increases in activity may improve cardiorespiratory development, speed, flexibility, power, muscle strength and endurance. Recent studies indicate that males are more likely to participate in physical activities while females prefer to socialise in sedentary ways. Accordingly, Vaquero-Solís et al. (2020) and Walter (2011) recommend that females from at-risk communities be exposed to moderate to vigorous physical activities on a daily basis in order to improve their physical fitness levels and lower their risk of disease. According to Fang et al. (2017), there is a strong correlation between sedentary behaviour patterns, inadequate physical fitness and cardiovascular disease.

Amusa et al. (2011) and Silva et al. (2018) point out that physical education, play and physical activities are almost non-existent in the majority of public schools in South Africa as it has been found that many new schools are developed without any playgrounds or play areas. Despite the fact that research indicates a strong positive correlation between physical fitness and academic performance, many schools are moving away from organised and planned physical education, thus encouraging inactive behaviours among learners (Amusa et al., 2011; Cook et al., 2019). Evidence shows that learners tend to participate more often in free play and spontaneous physical activities at school than at home (Burns et al., 2017). Thus, opportunities for

physical education, play, and exercise in South African schools are vital to decrease sedentary behaviours and improve the physical fitness and overall health of young learners (Amusa et al., 2011; Burns et al., 2017).

2.3.4.4 Parental support for learners' physical fitness

Hills et al. (2015) are of the opinion that the inclusion of families and communities in physical fitness interventions and physical activity opportunities are crucial for promoting and sustaining healthy behaviour patterns in learners. Although schools aim to offer learners numerous intervention possibilities, De Meij et al. (2011) and Fernandez-Jimenez et al. (2018) suggest that learners in at-risk schools are in urgent need of parental support and afterschool physical activity programmes in order to increase their physical fitness levels that are not up to standard. Hills et al. (2015) go on to suggest that the physical activity practices of learners are affected by various systems within their environment, such as their families, schools, communities, churches, governments as well as the mass media (Burns et al., 2017).

Thus, Fernandez-Jimenez et al. (2018) emphasise the importance of including learners' families and the school-community in the physical and nutrition education components of any health promotion interventions. Previous studies conducted by the "HealthKick" intervention indicated that specific factors, such as limited resources and time; inadequate facilities and little parental support, have led to minimal improvement in the physical fitness of learners. De Villiers et al. (2015) advise that increased parental support as well as assistance from the Department of Basic Education (DBE) is vital if any prospective health promotion intervention is to be successfully implemented.

Burns et al. (2017) and Amusa et al. (2011) emphasise that it is crucial for parents to encourage and demonstrate adequate physical fitness and healthy lifestyles at home. According to Magano (2016), parental support is vital for the effective encouragement of socialisation and physical exercise among learners. It may be assumed that parents often present their children with new opportunities, model certain behaviours and influence their thinking in ways that may promote learners' development and improve their attitudes towards various aspects, such as the importance of physical fitness and health promotion (Vaquero-Solís et al., 2020).

2.4 ADDRESSING LOW LEVELS OF PHYSICAL FITNESS AMONG FOUNDATION PHASE LEARNERS

Roux and Sakala (2020) and Blankenship (2017) are of the opinion that schools across the globe should provide learners with access to proper physical education, sport programmes, adequate training fields, playground areas and school gymnasiums. The following sections focus on measures aimed to address the low levels of physical fitness among learners by discussing aspects related to physical education, sport participation, nutrition as well as policies and legislation.

2.4.1 Implementation of physical education to support learners' physical fitness

In the Curriculum and Assessment Policy Statement (CAPS) (DBE, 2011), the focus in physical education (PE) is on physical growth, development, perceptual and motor skill development (Cook et al., 2019), sport and recreation, physical games and play. Physical education for Foundation Phase learners comprises 90 minutes per week and aims to promote the physical activity of the learners. CAPS also aim to improve their physical fitness and overall well-being by fostering positive attitudes towards both physical education and participation in physical activity (DBE, 2011).

Coe et al. (2006), Ahmed et al. (2007), Trost (2007) and Domville et al. (2019) have attested that the disappearance of physical education programmes in schools may lead to a decrease in learner academic performance which is in contradiction to the belief that an increase in the time spent on academics alone may lead to improved learner performance. However, according to Trost (2007) and Vaquero-Solís et al. (2020), it has been found that physical education programmes may even enhance academic performance and improve learner grades. It is, therefore, apparent that there is a positive correlation (Tomporowski, 2003; Strong et al., 2005) between physical fitness and scholastic achievement (Vaquero-Solís et al., 2020). Various researchers (Cook et al., 2019; Dwyer et al., 2001; Field et al., 2001; Taras, 2005; Nelson and Gordon-Larson, 2006; Trost, 2007 & Strong et al., 2005) indicate that adequate physical activity and fitness levels may improve a learner's memory, concentration and conduct in the classroom. Learners who are physically fit (Dwyer et al., 2001; Kim et al., 2003; Castelli et al., 2007; Trost, 2007) appear to demonstrate higher academic achievements as compared to their less fit counterparts (Domville et al., 2019).

According to Trost (2007), Pienaar (2009) and Silva et al. (2018), it is disheartening that many South African schools do not offer their learners physical education programmes and that, as a result, many of these learners do not discover the important role of physical fitness and activity in their overall well-being. Mahar et al. (2006) and Trost (2007) further advocate that physical activities during their academic programme may advance learners' cognitive performance and also provide ample opportunities for learners to develop their motor skills (Cook et al., 2019). Many teachers have further confirmed that physical education helps to prevent or, at least, minimise disorderly conduct and mischief on the part of learners in at-risk communities. This behaviour, in turn, impacts adversely on the surrounding community. This is particularly important in South Africa in view of the prevalence of crime and violence in the country. Researchers have also observed that almost all learners seem to enjoy physical education (Blankenship, 2017; Du Toit et al. 2007).

Van Deventer (2009; 2012) and Klingberg et al. (2019) point out that many at-risk South African schools have inadequate facilities and few or no trained physical education teachers (Vaquero-Solís et al., 2020), thus making it almost impossible to encourage participation in physical activities. Accordingly, several researchers question the importance of including Life Skills in school curricula (Van Deventer, 2009; 2012; Roux & Sakala, 2020). In addition, many South African Foundation Phase teachers have testified that they do not have access to adequate facilities and the requisite equipment (Domville et al., 2019) to teach physical education properly and/or to coach sports and other physical activities (Armstrong et al.,2011; Van Deventer et al., 2010; Cook et al., 2019).

According to Du Toit et al. (2007), Armstrong et al. (2011) and Silva et al. (2018), physical education was removed from the National Curriculum in 1994 and was only recently added as a subsection in the Life Skills subject as a result of the marked prevalence of increased obesity, cardiovascular disease and other non-communicable diseases among South African learners. Several teachers throughout South Africa took part in a study on the difficulties, drawbacks and shortcomings of offering physical education in schools (Domville et al., 2019; Du Toit et al., 2007). It was found that the factors which hindered physical education included unqualified teachers, scarce resources, insufficient amenities, time constraints, demanding curricula, minimal

subject importance, lack of financing and practical complications such as large, extremely diverse classes (Cook et al., 2019; Du Toit et al., 2007).

2.4.2 Participation in sport-related activities

Fang et al. (2017) highlight that physical fitness is regarded as an essential component of a learner's fundamental motor skills (Burns et al., 2017). Learners with well-developed motor skills tend to participate in sports and other physical activities (Truter et al., 2010), whereas learners with underdeveloped fundamental motor skills usually choose to not participate in any form of sport and/or physical activity (Fang et al., 2017; Mészáros, 2008). Rauner et al. (2013) found that male learners with average weight and body mass indexes (BMI) tend to demonstrate higher sport participation rates as compared to their overweight and/or obese peers. According to Amusa et al. (2011), an improvement in a learner's physical fitness is correlated with enhanced gross motor skills (Burns et al., 2017), quality of life, and social and general well-being.

Participation in sport and sport education classes play an important role in the development of the perceptual motor skills which learners will use throughout life while performing various physical tasks (Cook et al., 2019; Amusa et al., 2011). Moselakgomo et al. (2014) and Domville et al. (2019) also agree that sport events, including physical education, should be encouraged in both schools and communities in order to effectively increase the physical activity and physical fitness levels of South African learners.

2.4.3 Importance of correct nutrition to improve physical fitness

According to Moselakgomo et al. (2014), South Africa is placed amongst the 20 nations with the highest occurrences of undernutrition. It has been found that at least 1 in 5 learners is stunted while at least 1 in 10 learners is underweight. Many cases of malnutrition (Khan & Bell, 2019), overweight and obesity have been found among South African learners, thus highlighting the importance of implementing health promotion interventions to reverse such tendencies (Klingberg et al., 2019; Moselakgomo et al., 2014). Popkin et al. (2020), Amusa et al. (2011), Demaio and Branca (2018) emphasise the prevalence of obesity among learners in South Africa, and also warn about the detrimental effects of malnutrition.

Accordingly, it is essential that learners are educated and motivated both to consume less high fat and sugary foods and to increase their physical activities and participation in sport (Khan & Bell, 2019; Amusa et al., 2011). In addition, Reardon et al. (2021) and Amusa et al. (2011) specify that it is important for learners to maintain a healthy balance between calorie intake and calorie expenditure. Studies have shown that some schools throughout the world are including healthier food choices in their tuckshops and vending machines and also that they are providing one healthy meal to more than 50% of the school going learners each day in order to try solve the problem of malnutrition (Wechsler et al., 2000; Domville et al., 2019).

According to Wells et al. (2020), Armstrong et al. (2017) and Demaio and Branca (2018), it may be difficult for health promotion interventions to satisfactorily address the two ends of the malnutrition spectrum. According to Armstrong et al. (2017), underweight and stunted learners achieve the poorest results on physical fitness tests as malnutrition leads to structural, metabolic and functional complications in the development of learners' skeletal muscles which play a vital role in their physical performance.

2.4.4 Associated policies, programmes and interventions

Fang et al. (2017) highlight that the findings of previous studies may inform researchers and policy developers on ways in which to implement health promotion interventions that aim to encourage physical fitness and overall well-being in at-risk school-communities. Sallis et al. (2000) and Tanaka et al. (2018) discovered that it is often difficult to determine the physical activity and fitness levels of young learners as it would appear that significant measurement errors and limitations occur during studies. According to Burns et al. (2017) and Sparling et al. (2000), health promotion interventions have the potential to enhance the physical fitness and health of learners when components such as physical education, nutrition education, extracurricular activities and access to available health promoting resources are incorporated into the interventions.

Cassar et al. (2019) compiled several guidelines to use when aiming to improve the physical fitness levels of Foundation Phase learners. These guidelines require that policy designers increase the daily amount of time spent on physical activity (Vaquero-Solís et al., 2020), include several types of physical activities and decrease sedentary

behaviours and activities (Janssen & LeBlanc, 2010; Cook et al., 2019). According to Joens-Matre et al. (2008) and Fernandez-Jimenez et al. (2018), it is essential that a health promotion intervention, which aims to improve the physical fitness of learners, is distinctively designed and takes into account both the learners' schools and their families. It has been specified that individuals from different backgrounds and with different lifestyles and Socio-Economic Status require differentiated health promotion support (Joens-Matre et al., 2008; Omodan & Ige, 2021).

Resaland et al. (2011) discuss some of the barriers encountered during the implementation of health promotion interventions. For example, time and space were limited; it was difficult to obtain approval for the intervention from all the participants and role players and, in addition, adequately trained teachers proved to be problematic (Domville et al., 2019; Resaland et al., 2011). However, Hills et al. (2015) confirm that institutional barriers; teacher related barriers and learner related barriers can have detrimental effects on the promotion of learners' physical fitness and activity levels, which is evident throughout many schools around the world.

Hills et al. (2015) declare that there are several factors which hinder the promotion of learners' physical fitness, for example, school curriculums which focuses on academic performance only, sparse resources and financing; inadequate quality education and the lack of guidance and assistance in schools. All these factors may also have detrimental effects on health promotion interventions. In addition, Hills et al. (2015) advise that schools should implement wide-ranging health promotion interventions which include increased physical activity before, during and after school. They proceed to argue that both teachers and schools have a responsibility towards society (Vaquero-Solís et al., 2020) to accept, promote and implement such active strategies. Cook et al. (2019) and Resaland et al. (2011) conclude that an effective health promotion intervention should be of adequate length and should aim to include modest to vigorous physical activities, which are well-organised, structured and managed by capable teachers on a daily basis.

The "HealthKick" programme implemented in several at-risk schools in South Africa (De Villiers et al., 2015) aspired to increase healthy behaviours on the part of the learners, their families, schools and communities by introducing the Action Planning Process (APP). The APP recommends that schools determine their own objectives in

relation to health promotion, taking into account the following four dimensions: (1) physical fitness and physical activity; (2) nutrition and healthy eating practices; (3) health risks and inactivity-related diseases; and (4) school employee health (De Villiers et al., 2015). Moselakgomo et al. (2014) and Armstrong et al. (2017) similarly emphasise the importance of understanding the way in which factors such as under- and overnutrition; stunting and underweight; overweight and obesity; physical activity and physical fitness should be considered when designing and implementing health-related policies.

2.5 THEORETICAL FRAMEWORK

I relied on Bronfenbrenner's bio-ecological model of human development as the guiding framework for this study of limited scope (Bronfenbrenner, 1979). According to Bronfenbrenner, it is important that we consider the individual within the context of his/her ecological system (Bronfenbrenner, 1994), thereby highlighting the way in which individuals are influenced by the contexts in which they live. According to Bronfenbrenner (1979), any change in one part of a system will cause changes in other parts of the system (Bronfenbrenner, 1994; Bronfenbrenner & Crouter, 1983). Accordingly, changes in the school system may initiate and support positive changes in the individual and community systems or vice versa. Shaffer and Kipp (2010) point out that it is important to understand that an individual's development occurs within the context of several systems and not in isolation. As such, the systems in which individuals function have both direct and indirect influences on their development, growth and learning (Bronfenbrenner, 1979).

According to Bronfenbrenner (1979), schools throughout the world may be regarded as capable systems with the ability to have a positive impact on learners' level of physical fitness, physical activity, nutrition and overall well-being. The bio-ecological model of human development involves the investigation of an individual's development in an ever-changing environment, where the growth and maturation of an individual is influenced by the relationships and connections constructed within these bi-directional systems. Examples include the bi-directional changes that may occur (Bronfenbrenner, 1994) in learner behaviour, attitude, belief, perception and ability in terms of learner physical fitness because of the influences between the learners,

parents, schools, teachers and communities, as well as the influence of policies and legislations within these systems (Bronfenbrenner, 1994; 2005).

Bronfenbrenner (1979) introduces human development as a process through which developing individuals become more inspired and driven to engage in certain activities as they obtain sound perceptions of their environments. However, for the purposes of this study, human development comprises Foundation Phase learners attempting to improve their physical fitness both during and after the implementation of a health promotion intervention. Furthermore, the bio-ecological model assists in understanding learners, schools and their families by viewing them both as individual and as collaborating systems. Bronfenbrenner's bio-ecological model may also identify the direct and indirect influences on the learners' development in terms of their physical fitness (Landsberg et al., 2011).

The systems identified in the bio-ecological model of human development include the individual system, microsystem, mesosystem, exosystem, macrosystem and chronosystem (Keenan & Evans, 2010; Bronfenbrenner, 1994; 1979; 2005). In highlighting the link between a learner's physical fitness and the health promotion intervention which was developed, individual systems represented each of the 330 Foundation Phase learners who participated in the study. According to Bronfenbrenner (1979), the individual level entails that the focus is on the learners as the core of their environments and includes the interactions they have within these environments.

The microsystem is the system which is closest to an individual and which affects his/her development and physical fitness (Bronfenbrenner, 1986). Learners interact within their microsystem with other microsystems, such as their schools, families, friends and teachers. Hence, it is within the microsystem where learners are proximately affected by what they are taught and shown and what they experience (Tudge et al., 2009). According to Korb (2015), learners' behaviour is cultivated in the microsystem by ongoing encounters, roles and interactions within their environment. It is for this reason that it is assumed that health promotion interventions implemented in schools may positively affect learners' behaviours and attitudes towards physical fitness and their overall well-being. Donald et al. (2010) further explain that the microsystem is reciprocal in the sense that, while the school may affect the behaviours and opinions of learners, the learners may also affect the behaviours and opinions of

the school. Accordingly, the microsystems in this study involved the learners' interactions in the school and at home and among their peers in terms of their physical fitness before and after the implementation of the health promotion intervention.

In the school context the mesosystem involves the simultaneous interactions and exchanges between two or more surroundings that involve the learner (Bronfenbrenner, 1979; Krishnan, 2010). According to Bronfenbrenner (1994; 1979), the mesosystem which encircles an individual involves the individuals' interactions between their home, school, community and peer groups. Therefore, when a learner's home environment affects the learner's perceptions and behaviours about physical fitness at school, this home environment may be regarded as a mesosystem influence. For example, the culture at home may influence learners' opinions about physical fitness. In this study, the interactions of various microsystems surrounding the Foundation Phase learners included the relationship between learner parents and teachers; the relationship between learner parents and their peers; the relationship between teachers and learner peer groups; and the relationship and support between the school, teachers and the parents in respect of the successful implementation of the health promotion interventions.

The exosystem consists of interactions within the environment that have an indirect impact on the individual (Bronfenbrenner 1994; 1979). Therefore, the exosystem represents one or more system where the learner is not actively involved, such as the parents' workplace, the parents' peer group, healthcare services or the undertakings of the school's staff members and governing board (Bronfenbrenner, 1979). In this study the exosystem included the actions, decisions, policies and legislations implemented by the school and government officials; school policies; parents and communities which indirectly affected the physical fitness and overall well-being of the Foundation Phase learners who participated in the study. For example, in the Curriculum and Assessment Policy Statement (CAPS), physical education involves the physical growth, physical development, perceptual and motor skill development (Burns et al., 2017), sport and recreation, physical games and play of learners (DBE, 2011). Furthermore, the Department of Basic Education aims to encourage physical activity and improve physical fitness among Foundation Phase learners in South Africa (DBE, 2011).

According to Bronfenbrenner (1979, p.26), “the macrosystem involves consistencies in the form of lower-order systems (micro-, meso-, and exo-) that may exist at the level of the subculture and are adjacent to any belief system or ideology which is fundamental to such consistencies”. The macrosystem incorporates the traditions, beliefs, knowledge, rituals and practices of an individual’s culture (Bronfenbrenner 1994; 1979). In this study, the macrosystem involved the culture, beliefs, perceptions and ethos in relation to the physical fitness of the learners and which are instilled by the learners’ parents, teachers, schools and communities. For example, many South African teachers indicate that they do not have access to adequate facilities (Klingberg et al., 2019) to teach physical education, and also that they do not consider themselves skilled enough to do so (Cook et al., 2019; Naidoo & Coopoo, 2012; Armstrong et al., 2011; Van Deventer et al., 2010).

According to Bronfenbrenner (1994; 1979), the chronosystem involves all the adjustments an individual has lived through over an extended period of time. In this study, this included any unforeseen circumstances, changes in the school environment or at home, changes in the learners’ health conditions and/or families’ Socio-Economic Status. In the context of this study, the chronosystem also referred to the individual changes that took place both during and after the implementation of the health promotion intervention. In addition, the chronosystem may also involve illness, disability or physical incapacity, changes in the learners’ Socio-Economic Status, parental unemployment as well as changes made to health care services and infrastructures in their communities (Fernandez-Jimenez et al., 2018; Gordon-Larsen et al., 2006; Lopez, 2011). For example, Sigelman and Rider (2018) declare that learners’ physical fitness and nutrition habits are shaped by both their surrounding environments and their Socio-Economic Status. Literature states that, as compared to their more privileged counterparts, learners of a lower Socio-Economic Status generally present with inadequate physical development and also malnutrition (Klingberg et al., 2019; Armstrong et al., 2011). Lastly, learners from at-risk communities tend to display lower levels of physical activity because most of the areas where the learners should play are considered to be dangerous and unsafe (Carver et al., 2008; Lopez, 2011; Cradock et al., 2005; Fernandez-Jimenez et al., 2018).

In line with Bronfenbrenner’s assertions, (1979) in the context of this study it could be concluded that human development had taken place, when, for example, changes in

the Foundation Phase learners' physical fitness transferred into other systems and over varying periods of time. Although I did not depend on qualitative data to determine the factors that influenced change within the framework underpinning the study, I relied on Bronfenbrenner's bio-ecological model of human development (Bronfenbrenner, 1979) to hypothesise about factors that may have influenced the physical fitness of the learners. This model demonstrated the interactions between all the systems which may have both directly and indirectly influenced the learners (Bronfenbrenner, 1979; 1994; 2005) and guided me in determining the effect the health promotion intervention had had on the physical fitness of the Foundation Phase learners from the participating, at-risk school-communities.

2.6 CONCLUSION

Chapter 2 presented a review of available literature on health promotion interventions and the physical fitness of Foundation Phase learners in South Africa and throughout the world. The chapter discussed the physical growth and motor skill development of Foundation Phase learners and also explained the differences between physical fitness and physical activity. The chapter touched on the health values of physical fitness and discussed potential factors that may affect the physical fitness of learners. In addition, the chapter discussed the physical fitness profiles of South African learners and included possible solutions to address the low levels of physical fitness of Foundation Phase learners. Finally, the chapter concluded by elaborating on the theoretical framework that informed the study.

The next chapter discusses the research design, paradigmatic approaches and data analysis utilised in the study. In addition, the chapter also expands on the ethical considerations and standards of rigour which were adhered to throughout the study.

CHAPTER 3: RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

Chapter 2 presented a review of existing literature on physical development and explained the relationship between physical activity and physical fitness. The chapter emphasised the value of physical activity for Foundation Phase learners and described the physical fitness levels of South African learners in at-risk communities. This was followed by a discussion on factors that may affect learners' physical fitness. The chapter then highlighted strategies to address the low levels of physical fitness of South African learners. The chapter concluded with an explanation of the theoretical framework (Bronfenbrenner, 1977) which underpinned this study of limited scope.

This chapter briefly refers back to the purpose, background and research questions as discussed in the first chapter. The chapter then discusses the paradigmatic perspectives that informed the study and explains the research process adopted in detail. In addition, the chapter elaborates on the data analysis which was conducted, including the inferential, descriptive and parametric statistics that were used to answer the research questions and test the hypotheses which had been formulated. Thereafter, the chapter discusses the standards of rigour and ethical considerations which were upheld throughout the study.

3.2 BACKGROUND INFORMATION ON EXISTING DATA

As previously indicated in Chapter 1, as part of this study of limited scope, I analysed data from an existing broader project. This broader NRF-funded project focused on the nutritional habits, physical activity and well-being of Foundation Phase learners in two at-risk communities. The data analysed in this study originated from pre- and post-test questionnaires (NPWB) that had been completed by 330 Foundation Phase learners before and after they had participated in the health promotion intervention. The focus in this study was on the sections related to physical fitness in order to determine the effect (if any) of the health promotion intervention which had been implemented on the physical fitness of the participating Foundation Phase learners.

The study used non-probability sampling strategies, such as, purposive and convenience sampling methods (Maree, 2016), to ensure that all the completed

questionnaires were included in the data analysis. As mentioned earlier, close attention was paid to the sections on physical fitness included in the NPWB questionnaire during the data analysis which was conducted for the purposes of this study (Appendix A).

3.3 RESEARCH QUESTIONS AND HYPOTHESES

This study of limited scope, aimed to address the following primary research question: *What was the effect of a health promotion intervention on Foundation Phase learners' physical fitness in two at-risk school-community contexts?* The secondary research questions presented in Chapter 1 (Section 1.3) served as a guideline to address the primary research question as stated above. The following hypotheses were formulated to test for statistical differences:

- **Null hypothesis (H_0)**

  The null hypothesis states that there was no significant difference between the physical fitness of Foundation Phase learners prior to and after the implementation of the health promotion intervention.

- **Alternative hypothesis (H_a)**

  The alternative hypothesis states that there was a significant difference between the physical fitness of Foundation Phase learners prior to and after the implementation of the health promotion intervention.

3.4 PARADIGMATIC PERSPECTIVES

The study used a quantitative research approach set within a post-positivist paradigm.

3.4.1 Epistemological perspective: Post-positivism

The post-positivistic stance was utilised as the paradigmatic perspective to inform the study. Post-positivism was established as a paradigm in response to all the critiques directed at positivism over the years (Ryan, 2006). Consequently, post-positivism challenges the positivist belief about the absolute truth of knowledge (Phillips & Burbules, 2000) by stating that it is impossible to be absolutely certain about our alleged knowledge when considering or studying the subjective nature of human behaviour (Creswell, 2014; Maree, 2016). The post-positivist paradigm was, therefore, used as the lens throughout this study on which the findings and results were based.

In addition, the paradigm also presented specific criteria in terms of which measurements or judgements could be made when sharing the information with the public (Maree, 2012).

According to Ramlo and Newman (2011), post-positivism may be combined with research that is objective and quantitative in nature and where meaning or purpose is constructed by social perceptions. Creswell (2014) further emphasises the importance of understanding and interpreting results within a specific context or system. As the philosophical worldview utilised in this study, post-positivism is based on the cause-and-effect notion which assumes that all actions are determined by previously existing causes (Creswell, 2014).

Furthermore, Popper (2002) believed that post-positivists should embrace falsification, and stated that any notion, concept and/or hypotheses that cannot be contradicted by evidence (falsified) are not scientific in nature. Accordingly, this study utilised a post-positivist perspective to determine the effect (if any) that the health promotion intervention had had on the physical fitness levels of the Foundation Phase learners who participated in this study of limited scope.

Post-positivism alleges that science involves sound reasoning, accuracy and truth and focuses on the evidence collected. Nevertheless, it also indicates that knowledge should not be limited to that which is clearly apparent (Clark, 1998). According to O'Leary (2021) and Creswell (2014), the findings from a study conducted in one context may not necessarily be generalisable to other contexts and, thus, post-positivism embraces the belief that there are endless possibilities. Post-positivism directs the attention to determining and evaluating possible relationships or correlations that may be found in research (Creswell, 2014). Consequently, post-positivism emphasises the importance of developing objective measures which may be converted into numerical data when conducting a study. Therefore, in this study of limited scope, ratio level data was captured and utilised in order to obtain results.

The post-positivist paradigm contains five core assumptions, as acknowledged by Phillips and Burbules (2000), and which were applied during this study. Firstly, knowledge is hypothetical and, thus, it is not possible to obtain the absolute truth, thereby highlighting that most research findings are limited. Post-positivism also indicated that it is not possible to verify hypotheses and, instead, decided to challenge

hypotheses. Accordingly, researchers adopted the notion of preferring to reject hypotheses when conducting a study (Phillips & Burbules, 2000). For the purposes of this study, a secondary data analysis (SDA) was performed, thus indicating that the data had not been collected by the researcher and, therefore, that any possible errors in the collection process were unknown.

Secondly, researchers continue to modify and discard certain theories and assumptions throughout their studies for it to become more defendable (Schoenfeld, 2008; Phillips & Burbules, 2000). Thirdly, data that is gathered by the participants in a study as well as the observations made by the researcher provide knowledge (Creswell, 2014; Phillips & Burbules, 2000). For the purposes of this study, the researcher used data on 330 Foundation Phase learners in two at-risk school-communities that had been collected previously. Fourthly, researchers develop appropriate hypotheses which may explain the phenomena in question (Furragia et al., 2010; Phillips & Burbules, 2000). In this study, a primary research question was formulated as well as three secondary research questions to support the hypotheses which had been formulated. Fifthly, objectivity is a fundamental component of post-positivism and, therefore, it is incumbent on researchers both to cautiously investigate the measures used to obtain data and to scrutinise any findings that may be biased (Drew et al., 2009; Phillips & Burbules, 2000).

Post-positivism also recognises that results, effects and findings are all influenced (affected) by various causes (Creswell, 2014) and, hence, the cause-and-effect notion which the researcher attempted to explore during the study. According to O'Leary (2021), Ryan (2006) and Tekin and Kotaman (2013), it is recommended that post-positivist researchers approach their research with holistically, reflexive, objective and flexible intentions in order to gain knowledge of the picture as a whole. O'Leary (2021) further indicates that post-positivists always take into account the various cultures and specific conditions inherent in a study, thus making it possible to, at times, generalise findings to populations of the same culture and context as those in the study in question. However, the results and findings in this study may not necessarily be generalisable as Creswell (2014) states that reality is subjective, situational and provisional in nature. Consequently, Tekin and Kotaman (2013) also confirm that research within a post-positivist paradigm is prone to be both conditional and temporary. As a result there are limitations when utilising a post-positivist paradigm.

Researchers may not always have full access to or even the means to grasp the personal feelings, experiences and understandings of the participants in a study. This, in turn, also makes generalisability more difficult as reality is mentally constructed by individuals in a specific context (O'Leary, 2021; Ryan, 2006, Tekin & Kotaman, 2013, Creswell, 2014).

3.4.2 Methodological paradigm: Quantitative research approach

As previously stated, Maree (2012) and Johnson and Gray (2010) are of the opinion that post-positivism is a suitable epistemological paradigm to use when conducting quantitative research, as was the case in this study of limited scope. Quantitative research may be used to confirm causal relationships within a study (Maree 2012). Accordingly, with the aim of conducting research effectively, I utilised a non-experimental and quantitative research design (Creswell, 2014) through the use of a secondary data analysis (SDA) process. The data had previously been collected by other researchers who had formed part of the broader NRF-funded project. In order to determine the effect (if any) the health promotion intervention had had on the physical fitness levels of Foundation Phase learners in at-risk school-communities, I analysed the secondary data from the NPWB questionnaire that had been administered during the original study.

Field (2018) points out that quantitative research studies the relationship(s) between variables by using specific and carefully planned instruments. These variables are quantifiable and may, therefore, be converted into numerical data that may be analysed using precise and reliable statistical techniques. In this study, descriptive and inferential statistics, which are rooted in a quantitative research design, were used to objectively analyse and assess the data (Maree, 2016). However, it must be remembered that the quantitative approach is underpinned by several principles that researchers should bear in mind, for example, the use of deductive reasoning, prejudice and the generalisability of the results (Creswell, 2014). According to Mertler (2018), a quantitative research design supports the claim that knowledge about certain aspects, for example, in this context of Foundation Phase learners' perceptions, attitudes and behaviours in relation to their physical fitness, may be measured, explored and understood. As a result, quantitative research involves observations, investigations and measurements of specific phenomena around the world (Gravetter

& Forzano, 2018) in a formalised, structured and systematic manner (Morgan & Sklar, 2012). Accordingly, researchers are encouraged to remain unbiased and objective when conducting quantitative research (Maree, 2016; Fetters et al., 2013).

In addition, the study utilised a quantitative research design to evaluate existing theories (Joubert et al., 2016) in relation to the physical fitness of Foundation Phase learners in at-risk communities by comparing the results obtained prior to and after the implementation of the health promotion intervention and by corroborating the findings with existing literature in the South African context (Leavy, 2017). Mertler (2018) furthermore declares that knowledge about phenomena is consistent and predictable and, hence, the results and findings of this quantitative study of limited scope may be generalisable to similar at-risk school-communities.

Although the data used in this study was initially collected for different purposes, Greenhoot and Dowsett (2012) maintain that SDA, which forms part of the quantitative research design, allows a researcher to explore additional research questions (Stewart & Kamins, 2011). Thus, it was possible for the researcher in this study to address research questions that had not been addressed during the original NRF-funded project. In addition, research may identify potential challenges and limitations (Stewart & Kamins, 2011) that arose in the original project. SDA is also more economical and less time-consuming (Kiecolt & Nathan, 2011; Vartanian, 2011). However, limitations in relation to SDA meant that I had no control over the participants who were sampled, concepts which were evaluated and means by which the concepts was measured; nor did I have any authority over the instruments which were used to capture the data (Greenhoot & Dowsett, 2012). Furthermore, in line with assertions made by Stewart and Kamins (2011) and Vartanian (2011), it was possible that specific questions which were vital to this study of limited scope may not have been incorporated into the measurements or instruments used during the original NRF-funded project. Nevertheless, the quantitative research design enabled me to explore and determine the effect of the health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk schools, thus making it possible to address the research questions which had been formulated.

3.5 RESEARCH PROCESS AND METHODOLOGICAL STRATEGIES

This section discusses the research methodology, research design and sampling strategies used during this study of limited scope. Secondary data analysis (SDA) was selected as the research design to be used with the non-probability convenience and purposive sampling pertaining to the NPWB questionnaire that had already been electronically entered and secured. The data collection had been conducted (in two at-risk schools in the Pretoria region with the focus on Foundation Phase learners) by the members of the NRF-funded research project before this study was conducted. Descriptive and inferential statistics were used to analyse and interpret the datasets which had already been captured. I obtained ethical clearance from the Ethics Committee of the Faculty of Education at the University of Pretoria to use, analyse and report on the data. In addition, I ensured confidentiality, discretion and privacy throughout the study.

3.5.1 Sampling of documentation

The data which had previously been collected by the NRF-funded research team was analysed with the purpose of studying the effect (if any) that a health promotion intervention had had on the physical fitness of Foundation Phase learners. Two at-risk school-communities in Pretoria had taken part in the broader project with this initial NRF-funded research project focusing on Foundation Phase learners presenting with poor eating habits, risky lifestyle practises and sedentary behaviours. The project had included 330 seven- to nine-year old respondents who had been selected by the research team through non-probability, purposive sampling methods. When using purposive sampling (Maree, 2016), it is vital that researchers critically consider all the components of the population in question and ensure that respondents are chosen correspondingly (De Vos et al., 2011). For any school or learner to participate in the study, the following criteria had to be met, namely, schools had to be located in at-risk or impoverished areas, schools had to form part of the national feeding scheme, learners had to receive at least one meal per day at school as part of the school feeding programme, learners had to be between seven and nine years old at the time of the study, learners had to be available after school hours to participate in the research activities, parents had to provide informed consent and learners informed assent.

As already mentioned, data from the pre- and post-questionnaires that had been collected by the original research team prior to my involvement in the study was analysed. As a result, I was not part of the data collection process and, therefore, I used the completed NPWB questionnaires to conduct a SDA. I merely included the data obtained from specific sections of the NPWB questionnaire (Appendix A) that focused on the physical fitness of the learners. Sampling may be described as selecting a portion of the population to participate in a study on the basis that this portion of the population resembles the broader population which is the focus of the study in question (Maree, 2016). Sampling procedures may be performed either randomly (probability sampling) or non-randomly (non-probability sampling), depending on the researcher's requirements. For the purposes of this study, non-probability, purposive and convenience sampling was used to obtain the data which had been collected from 330 Foundation Phase learners from two at-risk schools in Pretoria. Participants who had been chosen during the original research project were selected with the notion that they would be able to provide all the information required while also acting as representatives of the population in question (Babbie, 2016).

I utilised non-probability sampling because I had had no control over the respondents who had been chosen to participate in the original study (Leedy & Ormrod, 2013). In addition, I used purposive sampling by merely including specific parts of the NPWB questionnaire that were related to physical fitness in order to address the research questions (Mouton, 2001). According to Tongco (2007), purposive sampling may be valuable in relation to the time and costs available for research. Although purposive sampling may be more effective than random sampling, it may, however, be challenging to generalise the results obtained from such samples to either the population selected or to other similar populations (Tongco, 2007).

Furthermore, I relied on convenience sampling (Maree, 2016) as I analysed the data that had been previously collected from respondents who had been readily available during the original NRF-funded research project. The data used in this study was, therefore, purposefully and conveniently selected for the SDA which was conducted to determine the effect (if any) the health promotion intervention had had on the physical fitness of Foundation Phase learners in at-risk school-communities. A potential limitation of convenience sampling is that the results are not necessarily generalisable (McMillan & Schumacher, 2014). While I did not aim to generalise the

results of this study, I used convenience sampling to achieve a greater understanding of the effects of the health promotion intervention than may otherwise have been the case. On the other hand, Gravetter and Forzano (2018) argue that samples included from a specific setting may be representative of other similar settings, thus indicating that it may be possible to generalise the results from this study to similar, at-risk school-communities.

3.5.2 Research design

In order to determine the effect (if any) of the health promotion intervention on the physical fitness levels of Foundation Phase learners in at-risk school-communities, a secondary data analysis (SDA) design, embedded in quantitative research, was used. The study used secondary data that had previously been collected during the NRF-funded research project and then employed reliable and valuable statistical techniques to analyse the data. SDA was conducted because the data was quantitative in nature. According to Burns and Grove (2005) and Mouton (2001), during SDA various statistical techniques should be conducted to test and then either reject or accept newly formulated hypotheses.

The study was non-experimental as the purpose of the SDA was to address a causal issue and test the hypotheses on whether the health promotion intervention (independent variable) had had an effect on the physical fitness (dependent variable) of Foundation Phase learners. Questionnaires that had previously been used by the original research team had provided quantitative data about the participants' physical fitness. According to Creswell (2014), in such cases, the quantitative data collected may provide results and findings that may be generalisable to similar populations. Kiecolt and Nathan (2011) agree that SDA may also be valuable in identifying changes and trends with regard to population tendencies, viewpoints and conduct, as was the case in this study in relation to the Foundation Phase learners' physical fitness.

Cheng and Phillips (2014) and Goodwin (2012) highlight that SDA has become progressively more popular among researchers in the field of social and behavioural sciences as secondary data may be analysed for reasons other than those for which the data had originally been intended (McMillan & Schumacher, 2014). Primary data is collected by the original researchers for a specific project or purpose, whereas secondary data refers to data which is analysed by other researchers after the original

researchers have already collected and captured said data for their primary research purposes (Boslaugh, 2007; Goodwin, 2012; McMillan & Schumacher, 2014). Although either primary or secondary data may be used during research, it is, however, the datasets which have been selected which assist the researchers in answering their research questions and testing their hypotheses (Boslaugh, 2007; Coyer & Gallo, 2005).

When using a quantitative research design, Leedy and Ormrod (2013) state that the researcher should start with a hypothesis, analyse the data which has been collected using reliable and accurate statistical techniques and, finally, draw conclusions based on the results and findings of the study (deductive reasoning). I was able to analyse both the pre and post physical fitness profiles of the participants to determine the effect (if any) of the health promotion intervention. I used parametric statistical methods to enhance the accuracy of the results by comparing constructs from both the pre and post data. In Chapter 5, the research questions are discussed and answered based on the study results.

The advantages of utilising SDA when conducting quantitative research is that researchers are able to investigate and analyse additional hypotheses and, in addition, they may use certain parts of the datasets that have not been previously addressed or even considered in order to gain a better understanding of specific populations than may otherwise have been the case (Burns & Grove, 2005; De Vos et al., 2011). SDA is also more economical in terms of time and cost when compared to primary data collection as secondary researchers do not have to supply and utilise numerous resources in order to obtain the required data (Boslaugh, 2007; Rosenberg et al., 2006; Trzesniewski et al., 2011). Furthermore, it has been found that SDA both minimises the risks of inflicting harm on the participants and also diminishes many potential ethical dilemmas that may have occurred during the data collection process (Alston & Bowles, 2003; Trzesniewski et al., 2011).

3.6 DATA ANALYSIS

The study used both descriptive and inferential statistics and also the parametric paired t-test for data analysis in order to address the research questions and test the hypotheses which had been formulated (See Chapter 1).

3.6.1 Descriptive statistics

Descriptive statistics may be seen as summaries of quantitative data presented in numerical form. This study used descriptive statistics to organise (group) and understand the data which had been collected (Maree, 2016; Thompson, 2009; Bless & Kathuria, 1993). The purpose of these summaries is to include the central tendencies (mean, median, mode), the variance or dispersion (the spread of scores), the standard deviations of the data as well as the measures of shape (skewness and kurtosis) (Maree, 2016; Fisher & Marshall, 2008). In addition, these summaries are also useful in describing what occurred during a study and may warn the researchers about factors that could affect their findings (Thompson, 2009). In this study the median and the mean were used as measures of central tendency since the mean may be used when data is ordinal in nature or in the case of ratio-level variables.

Cohen et al. (2018) highlight that descriptive statistics are not used to make predictions or draw inferences about data but rather to describe the data and determine the distribution of the data (Lune et al., 2010; Teddlie & Tashakkori, 2009). Maree (2016) defines the measurements of central tendency (mode, median, mean) as follows: The mode (Mo) is the most frequently occurring value and may, at times, also be regarded as bimodal or multimodal while the median (Me) is the middle point of the data distribution, thus indicating that 50% of the data is smaller than the median and 50% is greater than the median. The mean ($\bar{x}$) is often the most frequently used measure of location. The measures that are generally used for the dispersion or spread of a distrubition include the range (R), interquartile range (IQR), variance (s^2),and standard deviation (s).

Maree (2016) describes the range (R) as the difference between the greatest and smallest values and the interquartile range (IQR) as the spread of the middle 50% of the data. The variance (s^2) is used to quantify the amount of spread the data shows, whereas the standard deviation (s) is the square root of the variance (Maree, 2016). I made use of box plots (commonly used in quatitative research) during the statistical analysis with the purpose of graphically representing the raw data numerically (See Chapter 4) (Bless & Kathuria, 1993; Maree, 2016).

3.6.2 Inferential statistics

I used inferential statistics to draw inferences about the data. By using the laws of probability, I was able to draw statistical conclusions about the population (7- to 9-year-old learners in two at-risk school-communities) from the sample data (Johnson & Christensen, 2014; Neuman, 2014). When conducting inferential statistical procedures it is important to understand the differences between a sample and a population, and between a statistic and a parameter.

A sample is a subgroup obtained from a population. In this study the sample comprised the 330 Foundation Phase learners who had participated in the original study whereas the population was the entire group, namely, all Foundation Phase learners in South Africa. A statistic is regarded as a numerical characteristic (such as means, proportions, variances and standard deviations) that is drawn from a sample (sample statistics) while a parameter is any numerical characteristic that is drawn from a population, also known as a population parameter (Johnson & Christensen, 2014).

I made use of the sample and statistics in order to make inferences and possible generalisations about similar populations. Another important aspect mentioned by Rachad (2012) is the assumption of random sampling (using samples that represent the population in question). In this study this assumption allowed me to apply the probability theories on which inferential statistics are built. Neuman (2014) confirms that inferential statistics make use of probability theory, thus enabling researchers to test hypotheses, draw inferences from a sample and then apply these inferences to a population. Inferential statistics are also utilised to measure whether the descriptive statistics are as a result of either random factors or a true relationship.

Inferential statistical analysis consists of two key categories (Johnson & Christensen, 2014; Rachad, 2012), namely, (1) estimation (point estimation or interval estimation) and (2) hypotheses testing (null hypothesis and alternative hypothesis). When using point estimation, the researcher uses a single value of the sample statistic, whereas with interval estimation the researcher uses a range of values from the sample statistic in order to generate an estimate of the population parameter (Johnson & Christensen, 2014). When using interval estimation, the researcher produces confidence intervals including confidence limits (the lower limit and upper limit) from the sample, with the likelihood that it may contain the population parameter. The probability that the

confidence interval will include the population parameter is known as the level of confidence. Thus, if we constructed a 95% confidence interval, our sample would have captured the population parameter 95% of the time, thus indicating that the probability is 95% (Johnson & Christensen, 2014).

The second category of inferential statistics, known as hypothesis testing, has to do with how accurately the sample data substantiates a specific null hypothesis. The basic aim of hypotheses testing is to enable the researcher to reject the null hypothesis and accept or support the alternative hypothesis. The following null hypothesis and alternative hypothesis were formulated for the purposes of this study:

H_0: $\mu_{dif} = 0$ (mean population difference prior to and after the intervention is equal to zero)
H_1: $\mu_{dif} \neq 0$ (mean population difference prior to and after the intervention is not equal to zero)

The null hypothesis stated that there was no significant difference (no effect) between the physical fitness of Foundation Phase learners prior to and after the health promotion intervention while the alternative hypothesis stated that there was a significant difference (an effect is present) between the physical fitness of Foundation Phase learners prior to and after the health promotion intervention. Johnson and Christensen (2014) indicate that it is important to understand that hypothesis testing works from the assumption that the null hypothesis is true and that it is only when the results of a study differ significantly from the null hypothesis that the researcher may reject the null hypothesis and provisionally accept the alternative hypothesis.

Finally, researchers take into account the probability value (p-value) that is generated by a computer programme during statistical analysis. The p-value is the probability that the result or observed behaviour will occur purely because of chance factors, given the assumption that the null hypothesis is true (Johnson & Christensen, 2014; Neuman, 2014). Researchers make use of significance levels (alpha level, α), such as 0.05, 0.01, or 0.001, (Neuman, 2014), in order to determine whether they should reject the null hypothesis. In this study, I used a 0.05 significance level. This meant that, if the p-value were less than or equal to the significance level of 0.05 (Durrheim & Painter, 2006), I would reject the null hypothesis (results were statistically significant)

but, if the p-value were greater than the significance level, I would not reject the null hypothesis (results were not statistically significant).

According to the literature, a 5% probability or a 0.05 significance level is commonly used in behavioural and social sciences (Drew et al., 2008). However, it is imperative that researchers are cautious when making inferences about data and, in addition, they should address Type I errors (rejecting a null hypothesis when it is true) and Type II errors (failing to reject a null hypothesis when it is false) (Johnson & Christensen, 2014). Nevertheless, if it is expected that the null hypothesis will be rejected, researchers generally use the research results to support the alternative hypothesis. Thus, inferential statistics give researchers an indication about how confident they may be when making inferences about populations (Neuman, 2014). In addition, inferential statistics may facilitate the generalisation of findings if the criteria for normal distributions are met (Maree, 2016). In testing the hypotheses in this study, I made use of parametric statistics, specifically the paired t-test.

3.6.3 Parametric statistics

For the purpose of this study, I employed parametric statistics for hypotheses testing and, more specifically, the paired t-test. Gorard (2001) states that there are two key purposes in using parametric statistics during data analysis. Firstly, it is generally accepted that parametric tests are usually more powerful (Singh, 2007) than non-parametric tests and, therefore, that they will probably result in greater distinctions between chance fluctuations and genuine patterns, without a Type I error being made (wrongfully rejecting the null hypothesis).

Secondly, there are many different types of parametric tests that are available and easily accessible to researchers (Gorard, 2001). A main assumption underlying parametric statistics is that of normal distribution (Blaikie, 2003). However, when a variable does not present with a normal distribution, researchers may use statistical packages to transform the variables (make them appear more normally distributed) and then apply parametric statistics (Singh, 2007). The transformation of data also decreases any effects that outliers may have (Martin & Bridgmon, 2012).

In addition, parametric statistics further enable the researcher to use sample statistics and make estimations about population parameters (Martin & Bridgmon, 2012).

Nevertheless, there are times when parametric tests are not an appropriate choice because it is not possible to meet certain assumptions or criteria (Gorard, 2001). In such cases, researchers use non-parametric statistics. Singh (2007) indicated that, in numerous instances, parametric and non-parametric tests may present very similar results. In addition, Singh (2007) also pointed out that, for each parametric approach, there is an equal non-parametric approach available.

The paired t-test (parametric test) was used in this study. Once data is ready to be analysed using inferential statistics, Martin and Bridgmon (2012) point out that the hypotheses testing involves the generation of a probability value (p-value), which is then measured against a specifically chosen significance level. If the p-value is smaller or equal to the alpha level (significance level), the null hypothesis is rejected. However, if the p-value is bigger than the alpha level, the alternative hypothesis is tentatively accepted.

The paired t-test falls under the category of two sample parametric tests (Singh, 2007) and is widely used in, as was the case in this study, for matched samples or when determining any effects between pre and post data (Gorard, 2001). The paired t-test is used with normally distributed data, transformed data or in cases where the variables under consideration have approximately similar variances within both samples (Blaikie, 2003), thus providing more reliable and valid results than may otherwise have been the case. Jenkins-Smith et al. (2017) point out that normally distributed data is based on a population where the mean (μ) and variance (σ^2) are known. However, in this study of limited scope, the t distribution was based on the sample statistics as the mean ($\bar{x}$) and the variance (s^2) were used as an estimation of the population's mean and variance. Furthermore, the mean of the t distribution is generally 0 while the variance is conditioned by $n - 1$ degree of freedom (df). Degrees of freedom (df) are described by Jenkins-Smith et al. (2017) and Gorard (2001) as the number of values which are free to differ in any analysis. Accordingly, the paired t-test that was used during this study determined whether the differences between the pre and the post data were 0. This, in turn, meant that the null and alternative hypotheses for the t-test were as follows (Singh, 2007):

H_0: $\mu_{diff} = 0$

H_1: $\mu_{diff} \neq 0$

The results of the statistical analysis, which included descriptive statistics to describe the data; inferential statistics which were used to draw inferences as well as the parametric tests used for hypotheses testing, are discussed in detail in Chapter 4.

3.7 STANDARDS OF RIGOUR

Throughout this study of limited scope, I aimed to obtain reliable and valid evidence from the research instrument and approaches used and from the data analysis and research results (Fallon, 2016). In the research context reliability means that the research should produce consistent results when replicated so as to honestly reflect the perspectives, behaviours and emotions of participants. On the other hand, validity refers to formulating assumptions or hypotheses that are suitable, realistic, justifiable and true (Morling, 2020).

As indicated above, reliability in research involves the consistency of the research instruments used so that researchers are able to generate the same results given similar situations (Creswell, 2014; Field, 2018). In other words, reliability translates into how accurately research may be replicated in other studies using the same instruments. In order to ensure reliability, the instruments should be dependable, consistent and replicable throughout the study (Cohen et al., 2018). In view of the fact that this study formed part of the broader NRF-funded project, I consulted my supervisor and previous papers on the original project to determine the reliability of the data. I obtained information on the data collection process and the purpose and relevance of the data and I also established whether the instruments (NPWB questionnaire) had been used in a consistent manner (Leedy & Ormrod, 2013; Struwig & Stead, 2001).

The coefficient that was used in the original project to measure internal reliability (by calculating the internal consistency) was Cronbach's Alpha (Maree, 2016). Cronbach's Alpha determined the correlation between the items (inter-item correlation) contained in the questionnaire. The values of Cronbach's Alpha range between 0 and 1 (Salkind, 2011). If the value is close to 1, researchers may be fairly confident that the items on the instrument measure the same constructs. Thus, the higher the correlation is, the more reliable the instrument is (Hinton et al., 2004). Maree (2016) provides clear guidelines on how to interpret the results of Cronbach's Alpha, with 0.9 representing high reliability; 0.8 representing moderate reliability; and 0.7 representing low

reliability. Furthermore, the reliability of an instrument gives researchers a reasonably accurate indication of the number of random errors the instrument may hold (Pallant, 2007), and is an essential prerequisite for validity (Gravetter & Forzano, 2018). Consequently, when the reliability of an instrument is ensured, its validity will also improve (Leedy & Ormrod, 2013). Nevertheless, there can be no validity without any reliability (Maree, 2016).

Validity indicates how effectively an instrument, such as the NPWB questionnaire, measures what it is actually supposed to measure (McMillan & Schumacher, 2014). Pallant (2007) and Salkind (2011) highlight that face validity, content validity, construct validity and criterion validity are the major classifications used by researchers during the validation process. Face validity may be defined as the degree to which an instrument appears or seems to be valid. Face validity is possible only through the careful examination of the instrument by experts (Maree, 2016). Content validity refers to the degree to which the instrument measures all the constructs it was supposed to measure. In the original study, a health promotion intervention was implemented in two at-risk schools with the aim of improving learners' nutritional habits, their psychosocial well-being and their physical fitness. It would, therefore, seem that content validity was supported as the questionnaires and instruments used during the data collection process involved several items (content) that effectively measured the above-mentioned constructs, namely, the learners' nutritional habits, their psychosocial well-being and their physical fitness. In addition, the face validity of the original instruments also appeared to be trustworthy. Nevertheless, for the purpose of this study, the focus was only on the items that measured the learners' physical fitness.

The concept of validity may be divided into two categories, namely, internal validity and external validity. It is extremely challenging to attain absolute internal and external validity and, as a result, researchers are often comfortable with a satisfactory level of internal and external validity (Terre Blanche et al., 2006). High internal validity meant that the changes (or effects) that were perceived during the study were, in all likelihood, influenced by the health promotion intervention and not by other factors, such as poverty, malnutrition, illness and/or Socio-Economic Status (Kearney, 2010; Wells et al., 2020; Khan & Bell, 2019; Oldewage-Theron & Egal, 2012). Indirectly high internal validity means lower external validity and vice versa. In view of the fact that internal validity is often higher in controlled experiments (such as in laboratories,

where all factors and variables may be influenced and controlled), the findings of such experiments may not be generalisable to similar populations. However, when external validity is high, this means that the results are generalisable to the population and the findings will be similar in real life situations (Leedy & Ormrod, 2013; Maree, 2016).

There are numerous factors that may threaten internal and external validity and it is vital that researchers are aware of and attempt to minimise such factors (Maree, 2016). However, as this study used secondary data analysis, I had little control over the study's internal and external validity and, thus, I was not able to prevent or address any threats to either the internal validity (historical factors; selection; pretesting; instrumentation; maturation; attrition; testing effect; selection bias; mortality and statistical regression) or the external validity (insufficient realism; ecological validity; demand effect; independent variables; sensitisation and instrumentation) (Maree, 2016; Creswell, 2014). Nevertheless, I made sure that I was aware of the factors that may have influenced the validity and reliability of the study and I addressed these threats as they became apparent.

3.8 ETHICAL CONSIDERATIONS

De Vos et al. (2011) caution researchers about various ethical dilemmas that may arise during research in the behavioural and social sciences. When human beings are the objects of a study, it is essential that certain ethical concerns are taken into account in order to protect all role players. Greener (2011) and Henn et al. (2009), agree on the need to apply ethical guidelines during research, not only to protect the participants, but also to ensure appropriate ethical behaviour on the part of the researcher(s) and to prevent any harm the research may cause. Babbie (2020), together with Somekh and Lewin (2011), indicate that there are general, overlapping ethical considerations that form a guideline for researchers on how to conduct sound and ethical research. Throughout this study, I consistently adhered to these guidelines. In view of the fact that this study formed part of the broader NRF-funded research project, I ensured that I obtained all the information on the ethical considerations which the original study had followed and, in addition, I remained cognisant of the guidelines on how to work ethically while conducting the secondary data analysis (SDA).

I applied for ethical clearance and approval of my study from the Ethics Committee of the Faculty of Education at the University of Pretoria before conducting my research. This approval was obtained by my submitting and defending of the required research proposal. The ethical clearance I obtained (Annexure B) ensured that I adhered to proper ethical standards as set out by the Ethics Committee of the Faculty of Education at the University of Pretoria (Ethics Committee, 2019).

Since the data had previously been collected from the participants by the original NRF-funded research team, no contact between the participants and myself was required for this study. Nevertheless, it had been mandatory for the original research team to apply for ethical clearance from the University of Pretoria and then obtain informed consent from the learners' parents as well as informed assent from the Foundation Phase learners who had participated in the study. Given that I had no direct contact with any of the participants and worked only with the data that had already been captured, further anonymity and privacy was ensured (Leedy & Ormrod, 2013). When using R Core Team (2020) for the statistical analysis, I ensured that all the data was coded with arbitrary numbers in order to maintain the anonymity and confidentiality of the participants (Leedy & Ormrod, 2013).

Throughout the study, I made every effort to do no harm and to protect the privacy of the participants (De Vos et al., 2011). Although secondary data analysis (SDA) reduces the risk of ethical predicaments (Smith & Smith, 2008), I adhered to sound ethical practice by safeguarding the data and reporting on the findings in an accurate and truthful manner (Creswell, 2014). I also ensured that the results and findings of the study did not contain any information that would identify either the participants or the schools that had been involved in the study. Furthermore, I followed appropriate procedures by confirming that the data would be securely stored for at least 15 years at the University of Pretoria and that only members of the research team would have access to the data. In addition, the statistical analysis was conducted by a statistician employed by the University of Pretoria, thus enhancing the reliability and validity of the study's results (De Vos et al., 2011).

3.9 CONCLUSION

This chapter presented the post-positivist paradigmatic perspective and quantitative research methodology used in the study. The chapter also discussed the data analysis

and statistical procedures on which I had relied and explained how data analysis was used to obtain the research results and test the hypotheses. The chapter also explained the importance of validity and reliability in the study as well as the adherence throughout the study to the ethical guidelines applicable to secondary data analysis (SDA).

Chapter 4 discusses the results of the study and the inferential, descriptive and parametric statistical analysis that was used to competently report on the results.

CHAPTER 4: RESULTS OF THE STUDY

4.1 INTRODUCTION

Chapter 3 discussed the post-positivist paradigm that informed the study. It also explained the research process, including the methodology (quantitative research) and sampling methods, used in the study. In addition, it elaborated on the data analysis and statistical procedures used to address the research questions and test the research hypotheses. This was followed by a discussion on the standards of rigour, especially the importance of validity and reliability, upheld during the study. The chapter then concluded with the ethical considerations that are applicable to a secondary data analysis (SDA) research design.

This chapter presents and discusses the results from the data analysis during which the paired t-test was conducted to obtain both descriptive and inferential statistics. The chapter also contains graphical summaries of the results obtained.

4.2 RESULTS OF THE STUDY

This section briefly discusses the results obtained from the NPWB questionnaire, specifically, the sections on physical fitness. Descriptive, inferential and parametric statistical procedures were employed to obtain the results. Each variable is discussed separately as the variables for pre- and post-intervention were analysed individually. It is important to note that only individuals for which there were complete pre- and post-measurements were used for testing. However, I also obtained results pertaining to the proportion of missing values for each variable as I felt this could be an important aspect to consider in relation to the possible limitations of the study.

The NPWB questionnaire indicated that the results of 130 participants were used for analysis purposes in respect of the pre- and post-measurements for the variables height (cm); weight (kg); body mass index (BMI); and sitting height (cm). While there were pre-intervention values for 183 respondents, 7 values were missing (3.68%). There were also post-intervention values for 136 respondents but 54 values were missing (28.42%). In respect of the variables related to skinfold – triceps (mm); skinfold – subscapular (mm); skinfold – calf (mm); and body fat, the results of 128 participants were used for analysis as part of the pre- and post-tests. It emerged that there were

pre-intervention values for 179 respondents but that 11 values were missing (5.79%) while there were 136 post-intervention values with 54 values missing (28.42%). For the variable related to sit ups, the results of 103 participants were analysed both pre- and post-intervention. There were 182 values available for the pre-intervention, with 8 missing values (4.21%), and 108 values available for the post-intervention but with 82 missing values (43.16%). For push ups, the results of 149 participants were analysed pre- and post-intervention. It was found that 183 values were available for the pre-test, with 7 values missing (3.68%) while 155 values available for the post-test, with 35 missing values (18.42%). Finally, in relation to the 3-minute step test (15 second pulse) variable; the data of only 30 participants was analysed pre- and post-intervention while 165 values were available pre intervention, with 25 values missing (13.16%). In addition, 35 values were available for post-intervention, with 155 missing values (81.58%)

For the purposes of the secondary data analysis (SDA) a paired t-test was used to test the hypothesis that the health promotion intervention had had an effect on the physical fitness of Foundation Phase learners in two at-risk school-communities.

4.2.1 Descriptive statistics

This section presents and discusses the descriptive statistics for each variable related to physical fitness and measured on the NPWB questionnaire for the pre- (Table 4.1) and post-intervention (Table 4.2). The results obtained from the descriptive statistical analysis were used to address the following secondary research questions of the study:

- What did the physical fitness profile of Foundation Phase learners in at-risk schools look like prior to the health promotion intervention?
- What did the physical fitness profile of Foundation Phase learners in at-risk schools look like after the health promotion intervention?

Table 4.1: Descriptive statistics of the different variables for the pre-test on the NPWB questionnaire

Variable	n	Minimum	Maximum	Median	Mean	Standard deviation	Inter Quartile Range (IQR)
Height (cm)	130	109	145	127.5	127.86	7.67	10.75
Weight (kg)	130	18.6	52.9	27.25	28.82	7.39	7.8
BMI	130	13.38	30.98	16.18	17.46	3.37	2.91
Sitting height (cm)	130	56.5	74	65	64.85	3.62	5.5
Skinfold – Triceps (mm)	128	6	30	13	13.98	5.24	5
Skinfold – Subscapular (mm)	128	4	31	9.5	10.75	4.82	4
Skinfold – Calf (mm)	128	3	25	12	12.54	5.05	6
Body Fat	128	8.35	39.96	19.74	20.93	6.34	7.32
Sit ups	103	4	50	25	26.37	9.35	11.75
Push ups	149	0	70	26	26.22	11.58	17
3-minute Step Test (15 second pulse)	30	27	140	115.5	109.93	25.15	78

Table 4.2: Descriptive statistics of the different variables for the post-test on the NPWB questionnaire

Variable	n	Minimum	Maximum	Median	Mean	Standard deviation	Inter Quartile Range (IQR)
Height (cm)	130	109	148	129.15	129.00	8.18	12.93
Weight (kg)	130	17.9	53.1	27.8	29.26	7.68	8.05
BMI	130	13.10	30.02	16.43	17.41	3.43	2.82
Sitting height (cm)	130	37.5	77.5	65.1	64.88	4.63	4.95
Skinfold – Triceps (mm)	128	5	36	11	12.52	5.15	6
Skinfold – Subscapular (mm)	128	5	25	8	9.04	3.74	5
Skinfold – Calf (mm)	128	3	28	10	11.38	4.94	7.25
Body Fat	128	8.35	48.04	17.91	19.19	6.47	6.76
Sit ups	103	8	42	23	23.42	6.69	7
Push ups	149	12	90	36	40.31	16.55	21
3-minute Step Test (15 second pulse)	30	16	47	30	31.07	7.52	10

Based on Tables 4.1 and 4.2, the descriptive statistical results obtained from the pre- and post-interventions are discussed in detail in the following section and linked to the secondary research questions mentioned above.

During the statistical analysis process (R Core Team, 2020) the data was tested for normality. It was normalised so that the paired t-test could be utilised. It was, therefore, possible to assume that the data was normally distributed. Mays (2011) recommends that, when the mean and median present values that are very close, researchers should use the mean to describe the centre of the data. When referring to the mean, researchers should always use the standard deviation to describe the spread of the data. I used the 68-95-99.7 rule of standard deviation (Simple Learning Pro, 2019) to explain and draw inferences from the results when the mean was used. It is important to understand that a low standard deviation indicates that the data is closely clustered

around the mean whereas a high standard deviation indicates that the data is dispersed over a wider range of values (Mays, 2011).

The rule on standard deviation specifies that 68% of the population will fall within 1 standard deviation of the mean; 95% within 2 standard deviations of the mean; and 99.7% within 3 standard deviations of the mean (Simple Learning Pro, 2019). However, when there is a significant difference between the mean and the median, Mays (2011) suggests that the researcher should rather use the median to describe the centre of the data and the inter quartile range (IQR) to describe the spread of the data.

When I analysed the learners' heights (cm), it was evident that 109 cm remained the minimum height of some of the learners whereas the maximum height increased from 145 cm (pre-test) to 148 cm (post-test). The average height of the learners for the pre-test was 127.86 cm while the average height post-test was 129.00 cm. Using the 68-95-99.7 rule of standard deviation the following results were obtained: During the pre-test the height of 68% of the learners was between 120.19 cm and 135.53 cm (1 standard deviation); that of 95% of the learners between 112.52 cm and 143.20 cm (2 standard deviations) and that of 99.7% of the learners between 104.85 cm and 150.87 cm (3 standard deviations). On the other hand, according to the post-test, the height of 68% of the learners was between 120.82 cm and 137.17 cm; that of 95% of the learners between 112.65 cm and 145.35 cm and that of 99.7% of the learners between 104.47 cm and 153.52 cm.

With regards to weight (kg), there was a small decrease observed for the minimum weight from 18.6 kg (pre-test) to 17.9 kg (post-test); and a slight increase in weight for the maximum weight from 52.9 kg (pre-test) to 53.1 kg (post-test). The average weight of the learners for the pre-test was 28.82 kg and 29.26 kg for the post-test. During the pre-test 68% of the learners weighed between 21.43 kg and 36.21 kg; 95% between 14.05 kg and 43.59 kg and 99.7% between 6.66 kg and 50.98 kg. On the other hand, for the post-test, 68% of the learners weighed between 21.57 kg and 36.94 kg; 95% between 13.89 kg and 44.62 kg and 99.7% between 6.21 kg and 52.30 kg. From the analysis it was clear that the maximum weights of the learners both pre- and post-test could be considered as upper outliers and did not fall within the boundaries of the normal distribution.

The following results were obtained in respect of the body mass index (BMI) of the learners. There was a small decrease in the minimum BMI from the pre-test (13.38) to the post-test (13.10), as well as in the maximum BMI from the pre-test (30.98) to the post-test (30.02). The average BMI of the learners was 17.46 for the pre-test and 17.41 for the post-test. Using the rule of standard deviation, the pre-test results showed that 68% of the learners had a BMI of between 14.09 and 20.83; 95% had a BMI of between 10.72 and 24.21 and 99.7% had a BMI of between 7.35 and 27.58. For the post-test it was established that 68% of the learners had a BMI of between 13.98 and 20.84; 95% had a BMI of between 10.55 and 24.27 and 99.7% had a BMI of between 7.11 and 27.71. The analysis also confirmed that both the maximums for the pre-test (30.98) and the post-test (30.02) were considered to be upper outliers that fell within about 0.15% of the sample only.

When analysing the learners' sitting height (cm), the results showed a decrease in the minimal sitting height from 56.5 cm (pre-test) to 37.5 cm (post-test), and an increase in sitting height from a maximum of 74 cm (pre-test) to 77.5 cm (post-test). The average sitting height for the learners was 64.85 cm for the pre-test and 64.88 for the post-test. The pre-test indicated that 68% of the learners had a sitting height of between 61.23 cm and 68.47 cm; 95% of the learners had a sitting height of between 57.61 cm and 72.08 cm; and 99.7% of the learners had a sitting height of between 53.99 cm and 75.70 cm. On the other hand, for the post-test, the results showed that 68% of the learners had a sitting height of between 60.25 cm and 69.50 cm; 95% had a sitting height of between 55.62 cm and 74.13 cm; and 99.7% had a sitting height of between 51.00 cm and 78.75 cm. Based on the analysis it was concluded that the minimum sitting height for the post-test could be considered a lower outlier which fell within 0.15% of the sample only.

When focusing on the triceps skinfold (mm) of the learners, the results showed that there was a slight decrease in the minimum score from the pre-test (6 mm) to the post-test (5 mm) but an increase in the maximum score from the pre-test (30 mm) to the post-test (36mm). The average skinfold of the learners' triceps was 13.98mm for the pre-test and 12.52 mm for the post-test. The standard deviation rule indicated that, for the pre-test, 68% of the learners had a triceps skinfold of between 8.75 mm and 19.22 mm; 95% were between 3.51 mm and 24.46 mm; and 99.7% were between 0 mm and 29.69 mm. The results from the post-test showed that 68% of the learners had a triceps

skinfold of between 7.37 mm and 17.67 mm; 95% of the learners had a triceps skinfold of between 2.02 mm and 22.82 mm; and 99.7% of the learners had a triceps skinfold of between 0 mm and 27.97 mm. It was also clear that the maximum scores on both the pre- and post-tests could be considered to be upper outliers which did not fall within the normal distribution of the sample.

The subscapular skinfold measurement (mm) showed that there was a small increase in the minimum score from 4 mm (pre-test) to 5 mm (post-test), and a slight decrease in the maximum score from 31 mm (pre-test) to 25 mm (post-test). The average subscapular skinfold of the learners on the pre-test was 10.75mm and 9.04mm on the post-test. The results from the pre-test showed that 68% of the learners had a subscapular skinfold of between 5.93 mm and 15.57 mm; 95% had a subscapular skinfold of between 1.12 mm and 20.39 mm; and 99.7% had a subscapular skinfold of between 0 mm and 25.20 mm. On the other hand, the results from the post-test showed that 68% of the learners had a subscapular skinfold of between 5.30 mm and 12.78 mm; 95% of the learners had a subscapular skinfold of between 1.57 mm and 16.51 mm; and 99.7% had a subscapular skinfold of between 0 mm and 20.25 mm. It was clear from the analysis that the maximum subscapular skinfold scores from both the pre- and the post-tests could be considered as upper outliers which fell within 0.15% of the sample only.

While examining the skinfold measurement of the learners' calves (mm), the results showed that the minimum score of 3 mm remained the same on both the pre- and post-tests. However, there was a slight increase in the maximum scores from 25 mm (pre-test) to 28 mm (post-test). The average skinfold measurement for the learners' calves was 12.54 mm on the pre-test and 11.38 mm on the post-test. The results from the pre-test showed that 68% of learners had a calf skinfold of between 7.49 mm and 17.59 mm; 95% had a calf skinfold of between 2.43 mm and 22.65 mm; and 99.7% had a calf skinfold of between 0 mm and 27.70 mm. The results from the post-test showed that 68% of the learners had a calf skinfold of between 6.44 mm and 16.33 mm; 95% had a calf skinfold of between 1.50 mm and 21.27 mm; and 99.7% had a calf skinfold of between 0 mm and 26.22 mm. For the post-test it was also evident that the maximum score of 28 mm could be considered as an upper outlier as it fell within 0.15% of the sample only.

The body fat measurement showed the same minimum score of 8.35 for both the pre- and the post-tests while the maximum score increased from 39.96 (pre-test) to 48.04 (post-test). The average body fat of the learners during the pre-test was 20.93 and 19.19 for the post-test. Using the standard deviation rule, the results for the pre-test showed that 68% of the learners had a body fat of between 14.58 and 27.27; 95% had a body fat of between 8.24 and 33.61; and 99.7% had a body fat of between 1.90 and 39.95. On the other hand, the results from the post-test showed that 68% of learners had a body fat of between 12.72 and 25.66; 95% had a body fat of between 6.26 and 32.13; and 99.7% had a body fat of between 0 and 38.60. It was also apparent from the analysis that the maximum body fat score for both the pre- and post-tests could be considered to be upper outliers, which fell within 0.15% of the sample only.

While investigating the number of sit ups the learners were able to do before and after the intervention, the results showed that there was a slight increase in the minimum score of 4 (pre-test) to 8 (post-test), and a slight decrease in the maximum score of 50 (pre-test) to 42 (post-test). The average number of sit ups the learners were able to complete during the pre-test was 26.37, as compared to 23.42 during the post-test. The results for the pre-test indicated that 68% of learners completed between 17.02 and 35.72 sit ups; 95% completed between 7.66 and 45.08 sit ups; and 99.7% completed between 0 and 54.43 sit ups. For the post-test, it was found that 68% of the learners were able to complete between 16.73 and 30.11 sit ups; 95% were able to complete between 10.04 and 36.80 sit ups; and 99.7% were able to complete between 3.35 and 43.49 sit ups.

In relation to the number of push ups measured, the minimum score showed an increase from 0 (pre-test) to 12 (post-test) in the number of push ups the learners were able to complete as well as an increase in the maximum score from 70 (pre-test) to 90 (post-test). The learners were able to complete an average number of 26.22 push ups during the pre-test as compared to 40.31 during the post-test. The results from the pre-test showed that 68% of the learners were able to complete between 14.65 and 37.80 push ups; 95% were able to complete between 3.07 and 49.37 push ups; and 99.7% were able to complete between 0 and 60.95 push ups while the results from the post-test showed that 68% of the learners were able to complete between 23.76 and 56.86 push ups; 95% were able to complete between 7.21 and 73.41 push ups and 99.7% were able to complete between 0 and 89.97 push ups. It was also clear

from the analysis that the maximum scores for both the pre- and post-tests could be considered to be upper outliers as they fell within 0.15% of the sample only.

Finally, the results for the 3-minute step test (15 second pulse) indicated a decrease in the minimum score from 27 (pre-test) to 16 (post-test), as well as a significant decrease in the maximum score from 140 (pre-test) to 47 (post-test). The average number of steps during the pre-test was 109.93 but 31.07 only for the post-test. The results from the pre-test showed that 68% of the learners reached between 84.78 and 135.09 steps; 95% reached between 59.63 and 160.24 steps; and 99.7% reached between 34.48 and 185.39 steps. When comparing the results of the post-test, it was found that 68% of the learners were able to reach between 23.55 and 38.59 steps; 95% were able to reach between 16.03 and 46.11 steps; and 99.7% were able to reach between 8.51 and 53.63 steps. It was clear from the analysis that the minimum score for the pre-test fell within 0.15% of the sample only and could, therefore, be considered to be a lower outlier.

4.2.2 Inferential statistics

This section presents and discusses the inferential statistics that were applied to each variable related to physical fitness for the pre- and post-interventions (Table 4.3). The results obtained from the inferential statistical analysis were then used to address the following secondary research questions of the study:

- Which areas of physical fitness (if any) were affected by the health promotion intervention?

The following hypotheses, which were formulated to establish whether there was a significant difference prior to and after the intervention, assisted me to address the research questions:

H_0: $\mu_{dif} = 0$ (There was no significant difference between the physical fitness of Foundation Phase learners prior to and after the intervention)

H_a: $\mu_{dif} \neq 0$ (There was a significant difference between the physical fitness of Foundation Phase learners prior to and after the intervention)

As previously mentioned in Chapter 3, the paired t-test was used for the data analysis and underpinned by the assumption of normality. As illustrated in Table 4.3, the null

hypothesis should be rejected when the p-value (probability-value) is smaller than or equal to the significance level of 0.05. This, in turn, would mean that there was a significant difference between the physical fitness of Foundation Phase learners prior to and after the health promotion intervention. Conversely, the null hypothesis should not be rejected when the p-value is larger than the 0.05 significance level. This, in turn, would mean that there was no significant difference between the physical fitness of Foundation Phase learners prior to and after the health promotion intervention.

Table 4.3: Inferential statistical analysis and p-values for the different variables on the NPWB questionnaire

Variable	p-value (2-sided)	Significance level (α)	Conclusion
Height (cm)	0.392	0.05	Do not reject H_0
Weight (kg)	0.749	0.05	Do not reject H_0
BMI	0.966	0.05	Do not reject H_0
Sitting height (cm)	0.255	0.05	Do not reject H_0
Skinfold – Triceps (mm)	0.543	0.05	Do not reject H_0
Skinfold – Sub-scapular (mm)	0.480	0.05	Do not reject H_0
Skinfold – Calf (mm)	0.485	0.05	Do not reject H_0
Body Fat	0.382	0.05	Do not reject H_0
Sit ups	0.051	0.05	Do not reject H_0
Push ups	0.660	0.05	Do not reject H_0
3-minute Step Test (15 second pulse)	0.0001	0.05	Reject H_0

As shown in Table 4.3, the null hypothesis could not be rejected on the basis of the two-sided p-value for the variables of height; weight; BMI; sitting height; skinfold triceps; skinfold subscapular; skinfold calf; body fat; sit ups; and push ups. Thus, no significant difference was found for any of these variables prior to and after the intervention. However, the null hypothesis was rejected on the basis of the two-sided p-value for the 3-minute step test variable thus indicating that a significant difference was found between the 3-minute step test prior to and after the intervention.

4.2.3 Results of the NPWB questionnaire

This section discusses each variable pertaining to physical fitness that was measured by the NPWB questionnaire (Figures 4.1 to 4.11). I specify whether or not the probability value obtained for each variable indicated a significant difference prior to and after the health promotion intervention, and also include the hypothesis that proved to be true based on each result.

The following null hypothesis and alternative hypothesis were used for the paired t-test:

H_0: $\mu_{diff} = 0$ (no significant difference)

H_1: $\mu_{diff} \neq 0$ (significant difference)

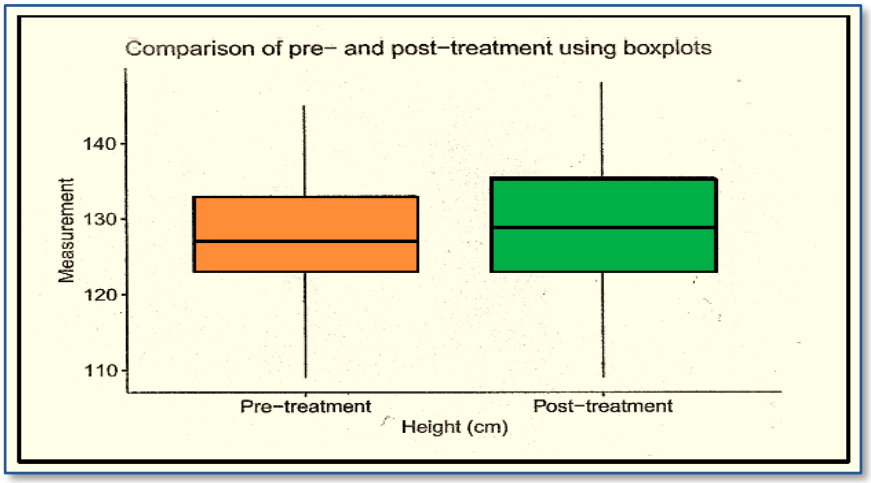


Figure 4.1: Pre- and post-measurements for height on the NPWB questionnaire

The height variable resulted in a 0.392 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' height prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

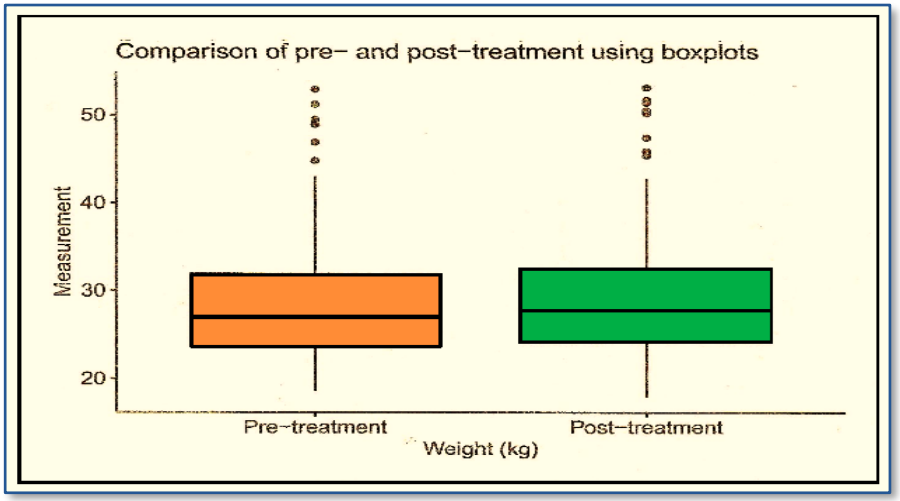


Figure 4.2: Pre- and post-measurements for weight on the NPWB questionnaire

The weight variable resulted in a 0.749 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' weight prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

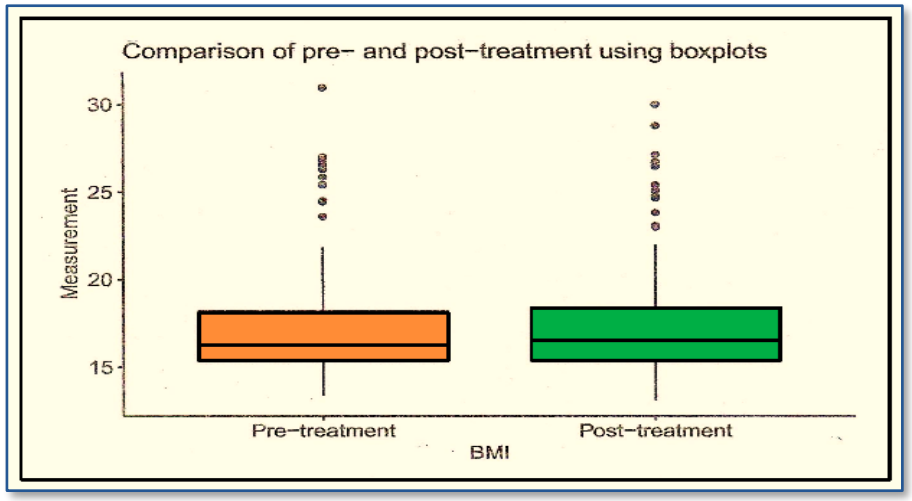


Figure 4.3: Pre- and post-measurements for body mass index (BMI) on the NPWB questionnaire

The body mass index (BMI) variable resulted in a 0.966 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' BMI prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

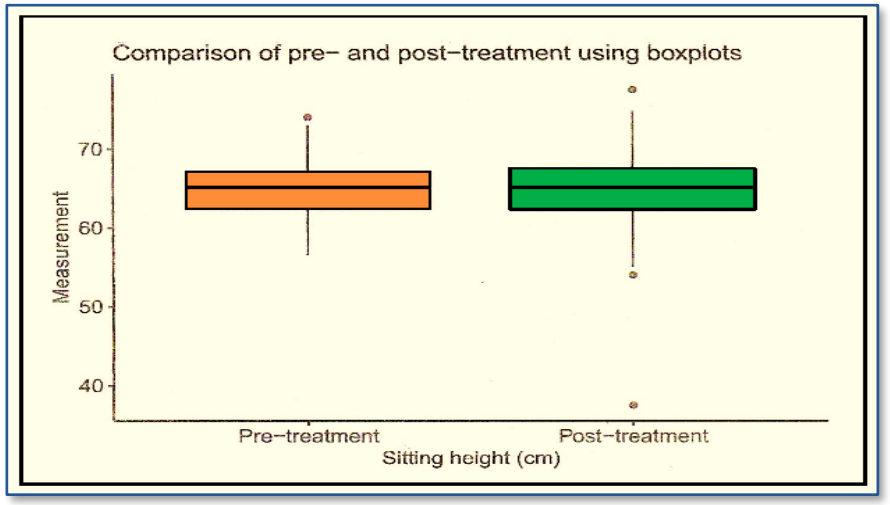


Figure 4.4: Pre- and post-measurements for sitting height on the NPWB questionnaire

The sitting height variable resulted in a 0.255 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was there was no significant difference in the learners' sitting height prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

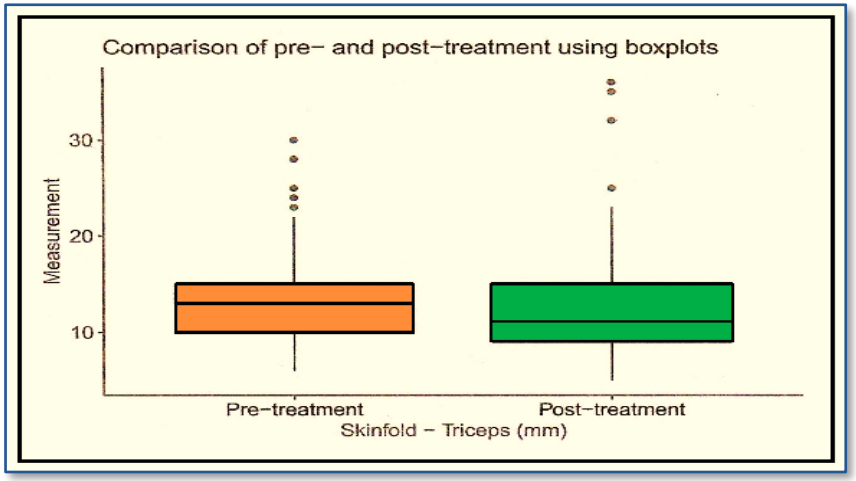


Figure 4.5: Pre- and post-measurements for skinfold (triceps) on the NPWB questionnaire

The triceps skinfold variable resulted in a 0.543 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' triceps skinfold prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

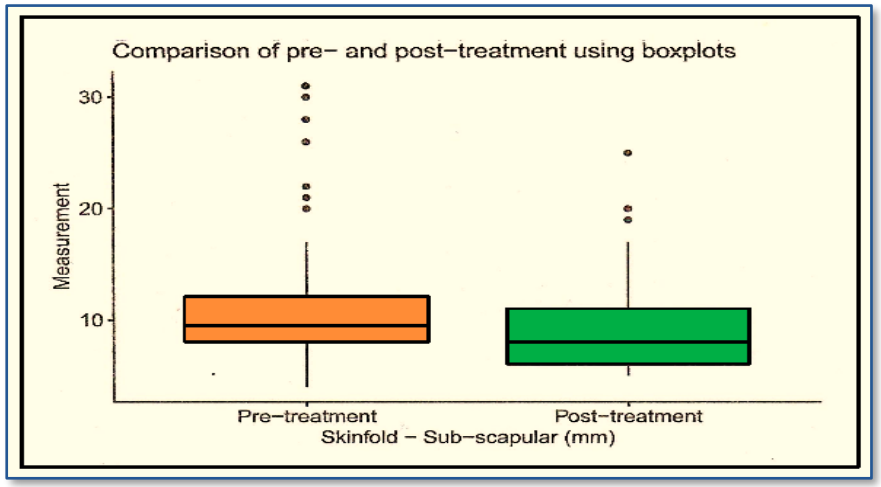


Figure 4.6: Pre- and post-measurements for skinfold (subscapular) on the NPWB questionnaire

The subscapular skinfold variable resulted in a 0.48 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' subscapular skinfold prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

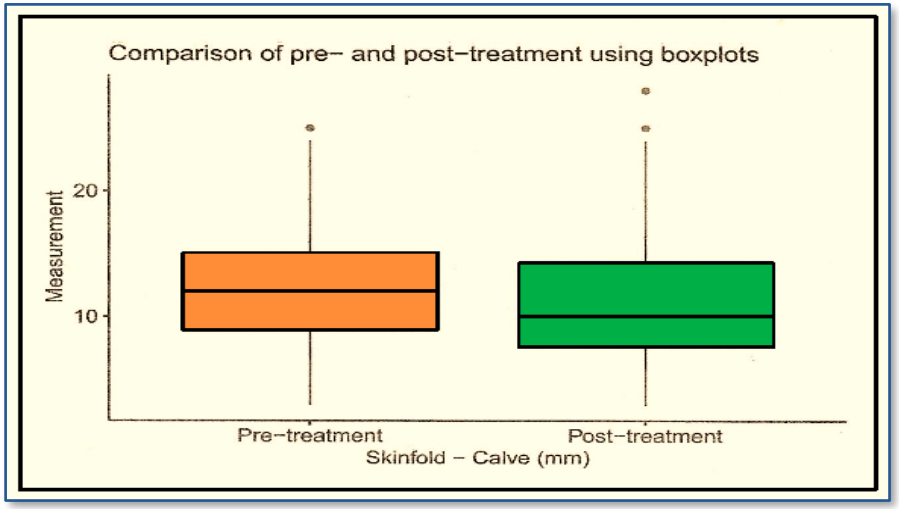


Figure 4.7: Pre- and post-measurements for skinfold (calf) on the NPWB questionnaire

The calf skinfold variable resulted in a 0.485 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' calf skinfold prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

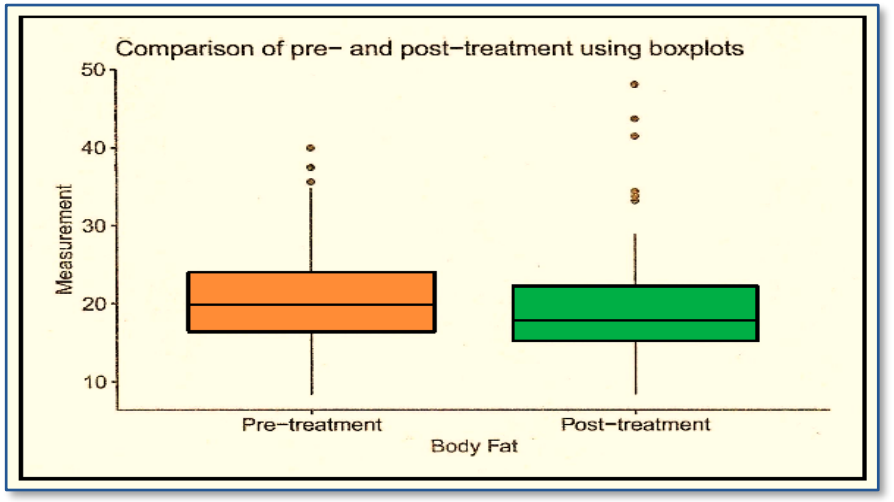


Figure 4.8: Pre- and post-measurements for body fat on the NPWB questionnaire

The body fat variable resulted in a 0.382 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the learners' body fat prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

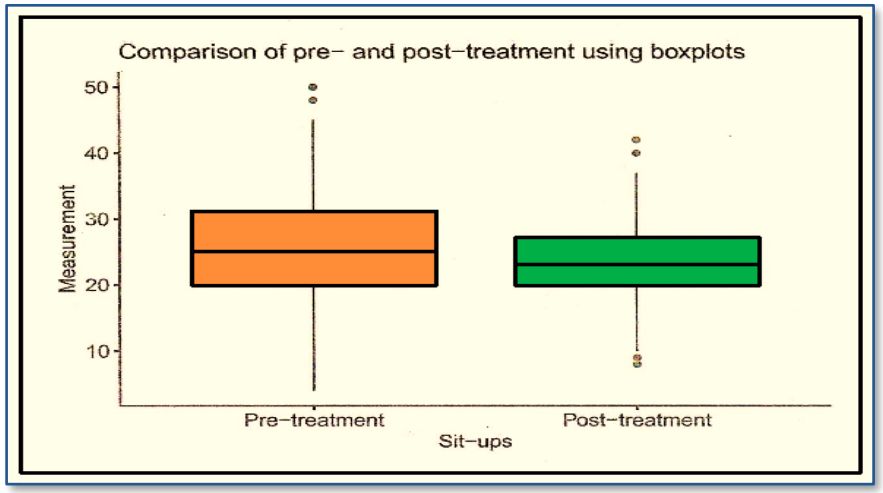


Figure 4.9: Pre- and post-measurements for sit ups on the NPWB questionnaire

The sit ups variable resulted in a 0.051 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the number of sit ups that learners were able to complete prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

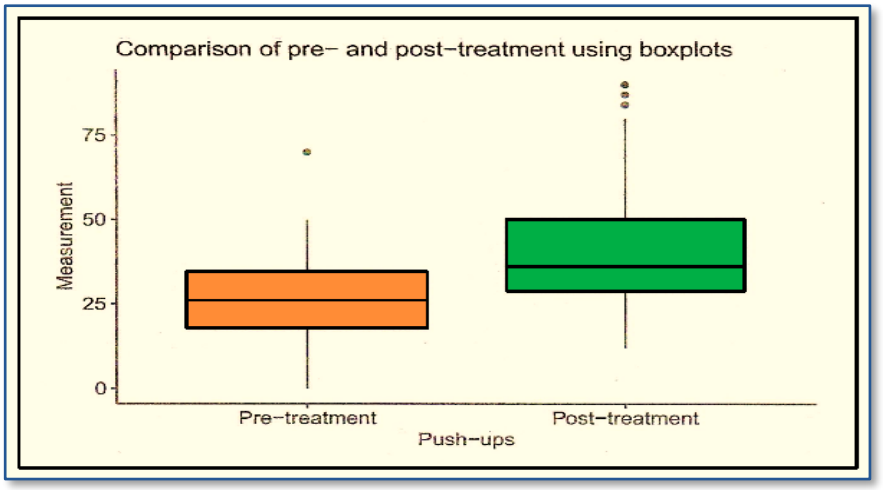


Figure 4.10: Pre- and post-measurements for push ups on the NPWB questionnaire

The push ups variable resulted in a 0.66 p-value which was greater than the 0.05 significance level. Accordingly, the null hypothesis could not be rejected, thus indicating that there was no significant difference in the number of push ups that learners were able to complete prior to and after the intervention. Consequently, the applicable hypothesis was H_0: $\mu_{diff} = 0$ (no significant difference).

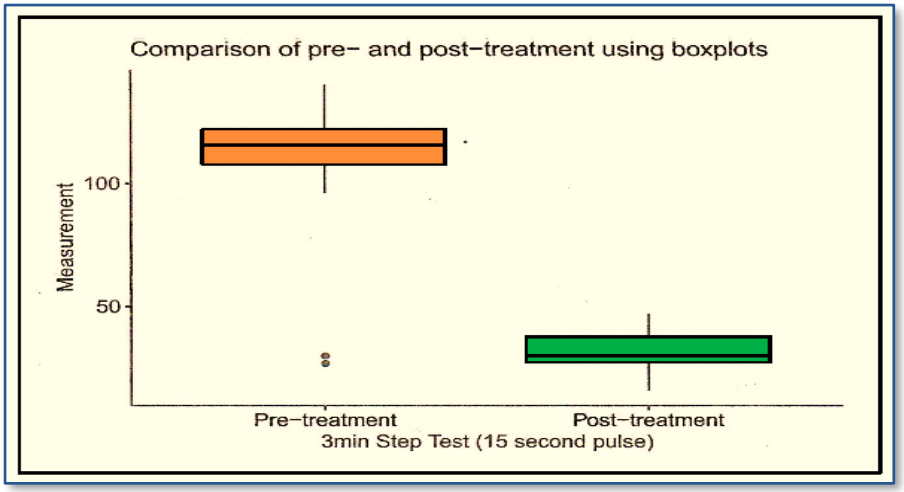


Figure 4.11: Pre- and post-measurements for the 3-minute step test on the NPWB questionnaire

The 3-minute step test variable resulted in a p-value that was smaller than 0.0001, which was less than the 0.05 significance level. Accordingly, the null hypothesis could be rejected, thus indicating that there was a significant difference in the number of steps that learners were able to complete prior to and after the intervention. Consequently, the applicable hypothesis was H_1: $\mu_{diff} \neq 0$ (significant difference).

In view of results that were obtained, it was clear that there was no significant difference in or effect on the physical fitness of Foundation Phase learners before and after the implementation of a health promotion intervention. The only exception was the 3-minute step test which showed a significant difference.

4.3 CONCLUSION

This chapter discussed the results obtained from the data analysis. The chapter reported on the descriptive statistics that were used to describe the data as well as the inferential statistics that were used to draw inferences. Illustrations, tables and figures were used to graphically represent the results that had been obtained. I relied on all the results that the paired t-test provided in order to conclude whether or not the health promotion intervention had had an effect on the physical fitness of Foundation Phase learners in at-risk school-communities.

The next chapter presents the conclusions that were drawn based on the results and findings of the study. The chapter also refers to existing literature in order to review any information that either supported or challenged the results of the study. The research questions are addressed and the potential contributions of the study discussed. Finally, the chapter reflects on the limitations of the study and provides recommendations in relation to training, practice and future research.

CHAPTER 5: FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

The purpose of the study was to determine the effect (if any) which the health promotion intervention had had on the physical fitness of 330 Foundation Phase learners in two at-risk school-communities by conducting a secondary data analysis (SDA).

To this end, I provided a brief overview of the rationale behind and purpose of the study in Chapter 1. I discussed the background to the study and clarified key concepts which were frequently referred to throughout the study. I concisely explained several aspects of the research process, including the paradigmatic perspective which underpinned the study, the sampling methods used and the data analysis that was conducted.

In Chapter 2 I discussed existing literature on global and local health promotion interventions. I focused on the physical development of Foundation Phase learners and clearly specified the difference between physical fitness and physical activity. In addition, I elaborated on the health-related values of physical fitness and I also discussed possible factors that could affect the physical fitness levels of learners. I highlighted possible solutions to address learner inactivity. Finally, I considered several findings from previous health promotion interventions which have been implemented in South Africa.

In Chapter 3 I present a detailed account of the research process that I followed, including the paradigmatic perspectives that informed the study and the data analysis procedures that were used throughout the study. In addition, I discussed the standards of rigour upheld and briefly indicated the ethical considerations that are applicable to secondary data analysis (SDA).

In Chapter 4 I presented the results from the statistical analysis in order to answer the research questions and test the research hypotheses. I also included illustrations, tables and figures to graphically represent the results that had been obtained.

Finally, in this chapter, I interpret the study results and refer to relevant literature that either supports or contradicts the study findings. While addressing the research questions I suggest conclusions to the study based on the research hypotheses. I also discuss potential contributions and possible limitations of the study. Finally, I conclude the chapter with recommendations for training, practice and future research.

5.2 FINDINGS AND CONCLUSIONS

The focus in this section is on addressing the research questions by interpreting the study results and discussing possible explanations for the findings. In addition, conclusions are drawn based on the research hypotheses by integrating the study findings with existing literature.

5.2.1 Secondary research question 1

> *What did the physical fitness profile of Foundation Phase learners in at-risk schools look like prior to the health promotion intervention?*

In short, the learners' results from the pre-test, as discussed in Chapter 4, indicated the following in terms of their physical fitness profiles. On average it was found that the Foundation Phase learners were approximately 127.86 cm tall and weighed about 28.82 kg with an average body mass index (BMI) of 17.46 and a body fat percentage of 20.93. Their average sitting height was 64.85 cm. Prior to the intervention, the learners had an average triceps skinfold of 13.98 mm; a subscapular skinfold of 10.75 mm and a calf skinfold of 12.54 mm. Finally, the learners were able to complete an average of 26.37 sit ups and 26.22 push ups prior to the intervention; and were also able to complete 109.93 steps during the 3-minute step test.

According to Children's Wisconsin (2021), the average height for learners between 6 and 10 years of age should fall within 106.68 cm and 149.86 cm while their average weight should be between 16.33 kg and 61.68 kg (Children's Wisconsin, 2021). The results of the pre-test indicated that all the learners who participated in the study fell within this normally accepted height and weight range. Truter et al. (2010) also confirm that learners with an average weight may present better cardiovascular fitness, endurance and aerobic capacity and also demonstrate greater muscle strength as compared to other learners of the same age. However, Armstrong et al. (2011) argue that learners from low Socio-Economic Status are usually shorter and lighter than

learners of a higher Socio-Economic Status. Several studies conducted throughout South Africa have found that many learners in at-risk communities are underweight and stunted (Klingberg et al., 2019; Moselakgomo et al., 2014). Shisana et al. (2014) and Domville et al. (2019) stress the fact that at least 14% of all South African learners, including learners from diverse Socio-Economic Statuses or different ethnicities (Armstrong et al., 2017), are often overweight or obese. Furthermore, Armstrong et al. (2017) declare that learners who are underweight or stunted generally perform the worst on physical fitness tests as malnutrition causes complications in the development of the skeletal muscles which are vital for physical performance.

According to Tanita (2020), body mass index (BMI) scores that fall under 18.5 may indicate that a person is underweight; scores of between 18.5 and 25 are deemed to indicate normal BMI, scores of between 25 and 30 are considered to indicate excessive weight (overweight) while higher than 30 indicates obesity. The results from the pre-test indicated that the average learner's BMI fell in the underweight category. This result corresponds with worldwide findings of both the UNDP (2016) and Wells et al. (2020) to the effect that nearly 50 million learners are underweight and over 159 million learners are stunted. Moselakgomo et al. (2014) also substantiate these findings by stating that learners with below average BMI, which may also be true for this study, as well as learners with above average BMI generally perform worse on tests of physical fitness as compared to learners with average BMI. Furthermore, Tanita (2020) highlights that body fat plays a vital role in maintaining body temperature and protecting the joints and internal organs of learners. Conversely, too much body fat or even too little body fat may have a detrimental effect on a learner's health. It is, therefore, important to note that an acceptable percentage of body fat, which differs in respect of gender, is necessary for the healthy development and growth of young learners (Fryar et al., 2018).

It has been found that body fat percentages that range between 15 and 29 are normal for females, whereas body fat percentages that range between 14 and 22 are normal for males (Barbosa et al., 2018; Amusa et al., 2011). When considering the skinfold measurements of the learners' triceps, subscapular and calves, it was imperative to recognise that these measurements are generally used to determine the learners' body composition, specifically their body fat percentages (Rauner et al., 2013; Barbosa et al., 2018). Bearing this in mind, the results from the pre-test confirmed that

the participants in this study, no matter their gender, fell within the accepted range of essential body fat (20.93) prior to the intervention.

A possible explanation for the learners' below average BMI but normal body fat percentages may be malnutrition. As Klingberg et al. (2019) and Amusa et al. (2011) corroborate, learners nowadays tend to consume foods and drinks which contain high fat and high sugar. Consequently, the learners in at-risk communities are often underweight due to unhealthy eating habits and malnutrition (Misselhorn & Hendriks, 2017; Monyeki et al., 2005) although they may have excess body fat due to their unhealthy food consumption practices and sedentary lifestyles (Reardon et al., 2021). A lower weight and greater body fat percentage may also indicate little muscle mass. Muscle mass is necessary for sound performance on physical fitness tests. In addition, Khan and Bell (2019) and Mészáros et al. (2008) declare that, in the main, learners who suffer from malnutrition and poor physical fitness tend to struggle more with physical fitness activities relating to speed, endurance and strength as compared to their healthier counterparts. Another possible explanation may be due to skinfold measurement error. Kuriyan (2018) mentions that accuracy and precision are extremely important when reporting on body composition. Accordingly, it is vital that measures of body fat are performed by experts as untrained individuals may make mistakes (Kuriyan, 2018).

Finally, the learners' performance on the sit ups, push ups, and 3-minute step tests involved physical fitness components such as cardio-respiratory capacity, muscle strength, motor ability, endurance, agility, flexibility, muscle resistance, body composition and speed (Yuksel et al., 2020; Martínez-Vizcaíno & Sánchez-López, 2008; Rauner et al., 2013; IOM, 2012a). Although gender differences were not observed during this study, existing literature indicates that the physical development (Louw & Louw, 2014; Scheffler & Hermanussen, 2018) of males tends to improve their speed and muscle strength whereas, in females, it tends to improve their balance and flexibility (Popovic et al., 2021; Amusa et al., 2011; Malina et al., 2004; Tanaka et al., 2018). It is, therefore, possible that the results obtained from the physical fitness tests may have been influenced by different gender abilities which may, in turn, have resulted in questionable findings.

5.2.2 Secondary research question 2

What did the physical fitness profile of Foundation Phase learners in at-risk schools look like after the health promotion intervention?

The results obtained from the Foundation Phase learners in relation to their physical fitness profiles and following the health promotion intervention (as presented in Chapter 4) may be summarised as follows: The average height of the learners increased to 129.00 cm while their average weight increased to 29.26 kg. After the intervention, the learners presented, on average, a very similar body mass Index (BMI) of 17.41 and a slightly lower body fat percentage of 19.19. The learners also demonstrated a similar average sitting height of 64.88cm. During the post-test, it was found that the learners showed a slight decrease in their triceps skinfold (12.52 mm); a slight decrease in their subscapular skinfold (9.04 mm) as well as a slight decrease in their calf skinfold (11.38 mm). On average, the learners were able to complete fewer sit ups than before the intervention, namely, an average of 23.42. However, the learners were able to complete more push ups after the intervention, namely, an average of 40.31. Finally, a significant decrease was found in relation to the 3- minute step test, with the learners being able to complete only 31.07 steps on average.

According to existing literature, Foundation Phase learners (between the ages of 6 and 12 years), are considered to fall within the middle childhood category (Louw & Louw, 2014). During this phase learners show rapid arm and leg growth but also present an overall slower growth rate as compared to their early childhood and adolescent years. This was, in fact, observed during the interpretation of the post-tests results (Langley et al., 2021; Sigelman & Rider, 2018; Louw & Louw, 2014). Boyd and Bee (2015), Kuther (2018) and Sigelman and Rider (2018) confirm that, in the main, Foundation Phase learners grow approximately 5.08 cm to 7.62 cm in height and gain about 2.72 kg of weight annually. This was confirmed during the post-test as there was a slight overall increase in both the height and weight of the learners which may, in turn, have been because of the normal and expected growth rates mentioned above. It is also important to take into account the fact that the health promotion intervention implemented during the original NRF-funded project involved 3 sessions per week for a period of six weeks only. It is, therefore, possible that the results and findings from the secondary data analysis (SDA) performed in this study only reflected the effect of

the six-week health promotion intervention on the physical fitness of the Foundation Phase learners.

The findings furthermore indicated that, following the health promotion intervention, the body mass index (BMI) of the Foundation Phase learners remained below average while their body fat percentages remained within the normal range. A possible reason for this may have been that malnutrition in underweight learners may impact negatively on the structural, metabolic and functional development of the skeletal muscles which are important for a satisfactory performance on tests of physical fitness (Armstrong et al., 2017). However, the slight decreases found in relation to the learners' triceps skinfold, subscapular skinfold and calf skinfold may have indicated a possible improvement in their physical fitness (Rauner et al., 2013; Barbosa et al., 2018). It must, nevertheless, be pointed out that the differences found prior to and following the health promotion intervention were not statistically significant.

In addition, it was found that, as compared to before the health promotion intervention, the Foundation Phase learners completed fewer sit ups and steps on the 3-minute step test following the health promotion intervention. This may, in turn, have indicated a possible decline in the learners' physical fitness. Vaquero-Solís et al. (2020), Council on Sports Medicine Fitness (2008) and Committee on Sports Medicine Fitness (2001) confirm that learners may improve their muscle strength, endurance, cardio-respiratory capacity, motor ability, agility, flexibility, muscle resistance, body composition and speed when health promotion interventions include opportunities to increase the duration, amount and intensity of physical exercises (Cook et al., 2019).

In view of the fact that the broader NRF-funded project aimed to facilitate change by focusing on the nutrition, psychosocial well-being and physical fitness of Foundation Phase learners in at-risk community contexts, possible explanations of finding no effect may include the fact that the six-week duration of the health promotion intervention was too short and also that the intervention did not include the required number of sessions or the intensities required to improve the learners' physical fitness. Nevertheless, it was found that the learners were able to complete more push ups following the health promotion intervention which may have indicated slight improvements in their upper body strength. Vaquero-Solís et al. (2020) agree that suitable and developmentally appropriate resistance training during health promotion

interventions may improve learners' muscle strength, endurance, performance and overall well-being (Faigenbaum et al., 2009; Khan & Bell, 2019).

5.2.3 Secondary research question 3

Which areas of physical fitness (if any) were affected by the health promotion intervention?

The findings of the study indicated that there were no significant differences in the height, weight, body mass index (BMI), sitting height, triceps skinfold, subscapular skinfold, calf skinfold or body fat of the learners nor were there any significant differences in the number of sit ups and push ups the learners completed prior to and after their participation in the health promotion intervention. However, there was a significant difference found in the 3-minute step test with the Foundation Phase learners showing a significant decrease in the number of steps they were able to achieve following the health promotion intervention. Possible explanations for this finding may include the small sample size (n=30) that included results for both the pre- and post-tests as the statistical analysis found that there were missing values for 13.16% of the learners for the pre-test and missing values for 81.58% of the learners for the post-test on the 3-minute step test. In view of the fact that there was no overall significant difference found prior to and following the intervention, additional explanations may include learner lack of interest and/or effort and recurrent absences from school due to factors related to poverty, illness and Socio-Economic Status (Kearney, 2010; Wells et al., 2020; Khan & Bell, 2019).

Singh et al. (2017), Allen et al. (2018) and De Groot et al. (2017) all validate these explanations when they highlight that several Foundation Phase learners in at-risk communities in South Africa are frequently absent from school because of communicable diseases such as HIV/AIDS; non-communicable diseases, for example, cardiovascular disease, hypertension, diabetes, obesity and coronary heart disease; transport problems and/or challenging commutes to and from school; physical inactivity and malnutrition. Relevant literature further confirmed that malnutrition and inadequate physical fitness are the primary causes of the worldwide burden of diseases which are especially prevalent in South Africa (Kearney, 2010; Wells et al., 2020; Demaio & Branca, 2018; Kruger et al., 2005; Khan & Bell, 2019).

It is also possible that the learners who took part in this study may have been more sedentary during the health promotion intervention than initially suspected, especially in view of the fact that Fernandez-Jimenez et al. (2018), Vaquero-Solís et al. (2020), Gómez et al. (2004) and Carver et al. (2008) all indicate that learners from at-risk communities are prone to be inactive and also to participate in destructive behaviours such as smoking, alcohol abuse and the consumption of unhealthy food (Frantz, 2006; Douglas et al., 2018). Furthermore, in the main, learners of a low Socio-Economic Status tend to present with inadequate physical fitness levels because the parks, neighbourhoods and other playground areas where they should be physically active are not considered to be safe (Fernandez-Jimenez et al., 2018; Carver et al., 2008; Cradock et al., 2005; Douglas et al., 2018) or there are inadequate training facilities (Klingberg et al., 2019; Gordon-Larsen et al., 2006; Lopez, 2011).

Therefore, the overall findings of this study of limited scope showed no significant differences in the physical fitness of Foundation Phase learners in at-risk school-communities after their participation in the six-week health promotion intervention. Mészáros et al. (2008) and Khan and Bell (2019) support the conclusion drawn that, in the main, learners from at-risk school-communities are exposed to malnutrition and sedentary lifestyle practices which may, in turn, impact adversely on their health, their physical fitness levels and their overall well-being (Yuksel et al., 2020; Martínez-Vizcaíno & Sánchez-López, 2008; Rauner et al., 2013; IOM, 2012a). Fang et al. (2017) furthermore substantiate that sufficient moderate-to-vigorous physical exercise during the implementation of a health promotion intervention is necessary in order to improve the physical fitness and overall well-being of Foundation Phase learners.

Another possible explanation for the finding that there were no significant differences in the learners' physical fitness, prior to and after the health promotion intervention, may be because the physical activities previously implemented had not involved sufficient amounts of the high intensity exercises expected during moderate-to-vigorous activities (Barbosa et al., 2018; Domville et al., 2019; Fang et al., 2017; Hills et al., 2015), but, instead, they had involved low-to-moderate physical activities of inadequate duration (Moselakgomo et al., 2014; Klingberg et al., 2019).

5.2.4 Primary research question

What was the effect of a health promotion intervention on Foundation Phase learners' physical fitness in two at-risk school-community contexts?

It was evident from the study results that the health promotion intervention had had no significant effect on the physical fitness of Foundation Phase learners in two at-risk schools in Pretoria, Gauteng. A possible explanation for this may be that the implementation, specifically in terms of physical fitness, was unsuccessful. When linking the findings of this study of limited scope to the bio-ecological model of human development (Bronfenbrenner, 1986), it becomes apparent that factors in the various systems (microsystem, mesosystem, exosystem, macrosystem, chronosystem) in which the Foundation Phase learners function may have influenced their physical fitness levels.

Schools are considered to form part of the Foundation Phase learners' microsystems and are ideal settings for the implementation of health promotion interventions. Nevertheless, despite the fact that schools are ideal settings for the improvement of learner physical fitness and overall well-being, it is important to recognise that parental support and afterschool physical fitness programmes involving their mesosystems are also necessary. According to Bronfenbrenner (1994; 1979; 1986), all the systems in which learners function may affect changes in their physical fitness. I, therefore, argue that the inclusion of all role players in the community is vital to the successful implementation and sustainability of health promotion interventions (De Meij et al., 2011; Fernandez-Jimenez et al., 2018; Burns et al., 2017; Hills et al., 2015). It is possible that there was not sufficient emphasis on this during the original, broader, NRF-funded project.

Furthermore, it has been found that factors related to poverty, malnutrition and inactivity (Armstrong, 2017; Khan & Bell; 2019; Mészáros et al., 2008) in the various systems (Bronfenbrenner, 1986) may impact on the Foundation Phase learners' physical fitness. Similarly, limited resources, limited time and inadequate facilities in at-risk school-communities often hinder the implementation and effectiveness of health promotion interventions. This, in turn, should be comprehensively addressed by the Department of Basic Education (De Villiers et al., 2015). In relation to the exosystem, physical education (PE) in South African schools does not include

sufficient time for the improvement of the Foundation Phase learners' physical fitness as 90 minutes per week only are allocated to physical education under the life skills subject (DBE, 2011), as compared to the recommended daily duration of 60 minutes of moderate-to-vigorous physical activity (Strong et al., 2005; Martínez-Vizcaíno & Sánchez-López, 2008; Burns et al., 2017). In this regard, I argue that all decisions affecting schools, government officials and the Department of Basic Education, (DBE), as well as school policies and relevant legislation, within the context of the exosystem are crucial to the implementation and sustainability of health promotion interventions in South African schools.

With reference to the macrosystem, the beliefs, perceptions and attitudes (Bronfenbrenner, 1979) relating to the Foundation Phase learners' physical fitness of every role player may also affect change. Teachers have indicated that physical education in at-risk school-communities is challenging because the teachers do not have access to adequate facilities and resources; they are not properly trained in physical fitness and sport; the curricula are demanding and there are time constraints. Consequently, they struggle to encourage their learners to participate in physical activities (Van Deventer, 2009; 2012; Klingberg et al., 2019; Vaquero-Solís et al., 2020; Roux & Sakala, 2020; Domville et al., 2019; Armstrong et al., 2011; Cook et al., 2019; Du Toit et al., 2007). In view of the fact that no qualitative data on the various role players' perceptions, attitudes and opinions relating to physical fitness was included in the secondary data analysis (SDA), we can only speculate based on existing literature, the aspects within the South African context and within the various systems (Bronfenbrenner, 1979; 1986) that may have hindered the successful implementation of the health promotion intervention, specifically in relation to the learners' physical fitness.

Furthermore, the chronosystem (Bronfenbrenner, 1994) supports the possibility that changes in the learners' environment, either during or after the implementation of the health promotion intervention, may have affected the results pertaining to the learners' physical fitness. A further chronosystem influence may be that of malnutrition. Klingberg et al. (2019) and Armstrong et al. (2011) confirm that, as compared to their more fortunate counterparts, South African learners of a low Socio-Economic Status tend to achieve poorer results on tests of physical fitness because nutrition-rich food options are not easily available. The criteria for the schools that participated in the

broader NRF-funded project included the need for the schools to be located in at-risk communities; they had to form part of the national feeding scheme and they had to provide at least one meal per day to its learners. Literature substantiates the claim that many learners from at-risk communities have to walk long distances every day to and from school while they often have little or almost no healthy food to eat or clean water to drink (Sigelman & Rider, 2018; Cook et al., 2019; Armstrong et al., 2011). This may, in turn, explain why there was no improvement in the physical fitness of these learners after the health promotion intervention. In addition, poverty contributes to malnutrition and inactivity which are considered to be major causes of non-communicable diseases (Oldewage-Theron & Egal, 2012; Kearney, 2010).

Finally, the development and implementation of unsuitable health-related school policies and ineffectual health promotion interventions may also be the reason why there was found to be no effect on the Foundation Phase learners' physical fitness. In light of the impact which each system may have on the implementation of health promotion interventions and the improvement of learners' physical fitness, I agree that changes in one part of the learners' system may result in changes in other parts of their system (Bronfenbrenner, 1994; 1979; 1986). Burns et al. (2017), Joens-Matre et al. (2008), Fernandez-Jimenez et al. (2018), Domville et al. (2019), Resaland et al. (2011), Hills et al. (2015), Cook et al. (2019) and De Villiers et al. (2015) verify that health promotion interventions may, potentially, improve learners' physical fitness and overall well-being when all relevant systems are involved in order to address aspects such as (1) physical education; (2) support and collaboration of all participants and role players; (3) comprehensive education in physical fitness, nutrition, health risks and diseases related to inactivity; (4) duration, intensity and quantity of physical activities before, during and after school; (5) access to adequate facilities and resources; (6) financial support; (7) and trained teachers.

Accordingly, I conclude that changes in the above-mentioned aspects, which involve all systems in the Foundation Phase learners' environment, may result in both positive changes in terms of the effective implementation of health promotion interventions in South Africa as well as an improvement in the physical fitness and overall well-being of Foundation Phase learners.

5.3 POTENTIAL CONTRIBUTIONS OF THE STUDY

Based on the findings of this study of limited scope suggestions were made to adapt the development and implementation of health promotion interventions in at-risk school-communities by linking the findings of this study with relevant literature on physical fitness. Moreover, the study explained the importance of implementing health promotion interventions that focus on adequate physical fitness and healthy nutrition in order to decrease the worldwide burden of non-communicable diseases, and, specifically, in the South African context. The study also elaborated on the potential challenges faced when implementing health promotion interventions in at-risk school-communities and provided possible solutions to address the problem of the low levels of physical fitness of Foundation Phase learners.

It is anticipated that the results and findings of this study will contribute to the potential adaptation of health promotion interventions which may, in turn, potentially assist all role players (teachers, parents, schools) in at-risk communities to effectively implement strategies and policies to improve the physical fitness and overall well-being of Foundation Phase learners. In addition, the study contributed to existing literature on health promotion interventions in the South African context while also emphasising the importance of support, collaboration and reinforcement of physical fitness on the part of all stakeholders in the school-community, including the Department of Basic Education. The study provided insights into the challenges that people in at-risk communities face and deepened the understanding of aspects such as poverty, inactivity and malnutrition, all of which impact adversely on the physical fitness and overall well-being of Foundation Phase learners.

In view of the fact that this study formed part of the broader NRF-funded project, it contributed to the collaborated work of implementing health promotion interventions that aim to improve the physical fitness of learners. Furthermore, the study contributed to the inclusion of all systems (microsystem, mesosystem, exosystem, macrosystem, chronosystem) that, both directly and indirectly, affect change within learners in terms of the development and implementation of health promotion interventions in at-risk communities. Finally, it was concluded that the development and implementation of health promotion interventions aimed at decreasing the double burden of inactivity and

malnutrition may be effective when the duration, quantity and intensity of health promotion interventions are significantly increased.

5.4 CHALLENGES AND POSSIBLE LIMITATIONS OF THE STUDY

By means of cautious reflection, I was able to identify possible challenges to and limitations of this study of limited scope. The first limitation was the nature and extent of the data used. I had conducted a secondary data analysis (SDA) and, therefore, I had no control over the measures which were taken to gather and capture the requisite data. Furthermore, I was also not able to obtain additional data to further explore the effect of the health promotion intervention on the physical fitness of Foundation Phase learners in at-risk communities.

As a result of the fact that this study formed part of the broader NRF-funded project, I had no control over the participants who had been chosen to participate in the study while I also had limited knowledge on the challenges that these participants faced. In addition, due to fact that this study involved a secondary data analysis (SDA), I had no influence over either the development of the health promotion intervention or the aspects which should have been considered or included. Furthermore, I was not able to observe the participants or oversee the implementation and facilitation of the health promotion intervention.

The scope of my study was also limited as only certain aspects of the quantitative data on the learners' physical fitness was available. Moreover, I had no qualitative data on any of the role players' perceptions, attitudes, behaviours and opinions with regards to physical fitness in at-risk school-communities, including those of the participants. It is possible that quantitative data, together with qualitative data, may have potentially provided a truer and more precise indication of the learners' physical fitness.

Furthermore, there is the issue of generalisability. The limited scope of this study meant that it is possible that the results and findings may not be totally reliable and valid and, as a result, are not relatable (generalisable) to similar at-risk school-community contexts in South Africa. In addition, there was a dispute over when and where the pre- and post-tests were conducted. It is possible that completing the tests on different days of the week, at different times of the day and/or in different environments may have influenced the reliability and validity of the results. This may

possibly have led to a type II error in terms of which I failed to reject the null hypothesis when it was actually false.

5.5 RECOMMENDATIONS

Based on the findings of the study the following sub-sections discuss recommendations for training, practice and future research when implementing health promotion interventions in at-risk school-communities.

5.5.1 Recommendations for training

In light of the study findings, I recommend that educational psychologists, counsellors and social workers, together with the University of Pretoria, include all role players (learners, parents, teachers, schools, communities) when developing and implementing health promotion interventions in South Africa. It has been found that the support and collaboration of the learners, parents and teachers may enhance the effective implementation and sustainability of health promotion interventions in at-risk school-communities. I, therefore, recommend that students and health professionals in educational psychology, counselling and social work be trained in the factors that affect people living in at-risk communities and also that training should specifically include aspects such as critical thinking, problem solving and solution finding in relation to health promotion interventions in at-risk school-communities.

Furthermore, it is advised that students in training should be equipped with adequate knowledge in quantitative, qualitative and mixed methods research and also that they gain a profound knowledge and understanding of the applicability and effectiveness of health promotion interventions in various South African contexts. I, therefore, suggest that training should include aspects relating to the diversity, multi-culturalism, language, gender and Socio-Economic Status of South African learners when health promotion interventions are developed and implemented. It is also important that the instruments, measures and tests that are used to obtain data for research purposes is standardised for the South African context. It is for this reason that I recommend that the training of students (educational psychologists, counsellors, social workers) at the University of Pretoria should equip them with the skills required to develop standardised tests which are appropriate for use in South Africa.

Finally, I recommend that all health professionals, parents, teachers and key members of the community receive adequate education on the health benefits of improved learner physical fitness and also that they be trained on the effective implementation of sustainable health promotion interventions.

5.5.2 Recommendations for practice

I recommend that all systems (microsystem, mesosystem, exosystem, macrosystem, chronosystem) involving learners are included in the implementation of health promotion interventions that aim to improve the physical fitness of Foundation Phase learners. I, therefore, suggest that all role players be properly trained in the long-term health benefits of sustainable health promotion interventions in South African schools. In addition, l also recommend that this study be implemented in similar at-risk school-communities so that the results and findings of such studies may be compared, and appropriate strategies be put in place to improve the effectiveness of health promotion interventions.

It is important that educational psychologists and other health professionals emphasise the difference between physical fitness and physical activity and that they aim to include the recommended amounts of daily physical exercise in health promotion interventions. I suggest that similar studies ensure that learners complete at least 60 minutes of moderate-to-vigorous physical activity every day while also exploring the possible effects of malnutrition in at-risk communities. For health promotion interventions to impact positively on the physical fitness of Foundation Phase learners, I suggest that the duration, quantity and intensity of all physical activities be increased and that the health promotion interventions be implemented over a longer period of time as compared to the intervention which formed the basis of this study.

Schools are ideal settings in which to promote change in terms of the learners' physical fitness and overall well-being. I, therefore, recommend that all role players, especially the teachers, be encouraged to promote the physical fitness of learners. It is also recommended that the Department of Basic Education review and increase the time allocated to physical education in the life skills curriculum. In addition, I also suggest that the Department of Basic Education provide sufficient funding for schools in at-risk

communities to enable these schools to provide adequate resources and facilities to improve the physical fitness of learners.

Finally, I recommend that other researchers in South Africa make use of quantitative, as well as qualitative data, when implementing health promotion interventions so that a more accurate reflection of the physical fitness and overall well-being of South African learners may be achieved. It is also recommended that health promotion interventions explore and report on the effects of poverty, malnutrition, non-communicable diseases, Socio-Economic Status and inactivity on the physical fitness levels of Foundation Phase learners in at-risk school-communities.

5.5.3 Recommendations for future research

Based on the results and findings of this study of limited scope, I make the following recommendations for future research:

- Participatory studies that explore the physical fitness and overall well-being of other grades in at-risk school-communities .
- Participatory studies that explore the physical fitness of Foundation Phase learners in wealthy school-communities in South Africa.
- Follow-up studies on teachers' perceptions, attitudes and confidence in relation to teaching physical education, coaching sport and promoting physical fitness in at-risk school-communities.
- Exploratory studies on effective ways in which to include all role players in the development and implementation of health promotion interventions in at-risk school-communities.
- Exploratory studies on appropriate strategies for sustaining health promotion interventions in at-risk school-communities.
- Comparative research on similar at-risk school-communities in South Africa, similar to those that participated in this study.
- Follow-up studies in which both quantitative and qualitative data is utilised to determine the effects of health promotion interventions on the physical fitness of Foundation Phase learners.
- Exploratory studies on the aspects that affect the physical fitness of learners in at-risk school-communities.

5.6 CONCLUDING COMMENTS

Throughout this study of limited scope I aimed to determine the effect of the previously implemented health promotion intervention on the physical fitness of Foundation Phase learners in two at-risk schools in Pretoria, Gauteng. Based on the results and findings of this study it was concluded that there was no significant effect on the learners' physical fitness prior to and after the implementation of the health promotion intervention. The secondary data analysis (SDA) which I conducted enabled me to analyse the quantitative data previously gathered by the broader NRF-funded project although I merely included the data that involved physical fitness.

It was found that the support, collaboration and assistance of all role players in at-risk communities are vital to the successful implementation and sustainability of health promotion interventions in South African schools. Nevertheless, it is important that future research ensures that learners form at-risk school-communities perform the recommended daily amount of physical activity by increasing the duration, quantity and intensity of physical exercises during health promotion interventions. It was also found that inadequate physical fitness and malnutrition are the primary causes of non-communicable diseases. Accordingly, the effects of factors such as malnutrition, poverty and Socio-Economic Status should also be taken into account.

In addition, existing literature clearly indicates that schools are ideal settings for the implementation of health promotion interventions. I, therefore, made several recommendations regarding health promotion interventions in relation to training, practice and future research. It is essential that schools are equipped with adequate resources and facilities and that teachers are properly trained in order to effectively improve the physical fitness of Foundation Phase learners. The findings of the study highlighted the importance of support and guidance from the Department of Basic Education in improving the physical fitness and overall well-being of learners in South Africa.

In conclusion, there are many possible explanations for the reason(s) why there was no effect on the physical fitness of the participating learners after the health promotion intervention and I recommend that these reasons are further explored in future research.

LIST OF REFERENCES

Ahmed, Y., Macdonald, H., Reed, K.; Naylor, P. J., Lui-Ambrose, T., & McKay, H. (2007). School-based physical activity does not compromise children's academic performance. *Medicine and Science in Sport and* Exercise, 39, 371-376.

Allen, C. W., Diamond-Myrsten, S., & Rollins, L. K. (2018). School absenteeism in children and adolescents. *American family physician, 98*(12), 738-744.

Alston, M., & Bowles, W. (2003). *Research for social workers: An introduction to methods* (2nd ed.). Routledge.

Amusa, L. O., Goon, D. T., Amey, A. K., & Toriola, A. L. (2011). Health-related physical fitness among rural primary school children in Tshannda, South Africa. *Scientific Research and Essays, 6*(22), 4665-4680.

Armstrong, M. E., Lambert, E. V., & Lambert, M. I. (2011). Physical fitness of South African primary school children, 6 to 13 years of age: Discovery vitality health of the nation study. *Perceptual and motor skills, 113*(3), 999-1016.

Armstrong, M. E. G., Lambert, M. I., & Lambert, E. V. (2017). Relationships between different nutritional anthropometric statuses and health-related fitness of South African primary school children. *Annals of human biology, 44*(3), 208-213.

Babbie, E. R. (2016). *The basics of social research*. Cengage Learning.

Babbie, E. R. (2020). *The practice of social research*. Cengage learning.

Barbosa, T. C., Souza, J., & Morbeck, M. (2018). Relationship between motor performance and body composition in Brazilian school children. *Development, 11*, 16.

Beets, M. W., Beighle, A., Erwin, H. E., & Huberty, J. L. (2009). After-school program impact on physical activity and fitness: a meta-analysis. *American journal of preventive medicine*, *36*(6), 527-537.

Björklund, K., Liski, A., Samposalo, H., Lindblom, J., Hella, J., Huhtinen, H., Ojala, T., Alasuvanto, P., Koskinen, H., Kiviruusu, O., Hemminki, E., Punamäki, R., Sund, R., Solantaus, T., & Santalahti, P. (2014). “Together at school”-a school-based intervention program to promote socio-emotional skills and mental health in children: study protocol for a cluster randomized controlled trial. *BMC public health*, *14*(1), 1042.

Blaikie, N. (2003). *Analyzing Quantitative Data: From Description to Explanation*. SAGE Publications.

Blankenship, B. T. (2017). *The psychology of teaching physical education: From theory to practice.* Routledge.

Bless, C., & Kathuria, R. (1993). *Fundamentals of social statistics: an African perspective*. Juta.

Boreham, C., & Riddoch, C. (2001). The physical activity, fitness and health of children. *Journal of sports sciences*, *19*(12), 915-929.

Boslaugh, S. (2007). *Secondary data sources for public health: A practical guide*. Cambridge University Press.

Botha, F., Booysen, F., & Wouters, E. (2018). Satisfaction with family life in South Africa: The role of socioeconomic status. *Journal of happiness studies, 19*(8), 2339-2372.

Boyd, D. & Bee, H. (2015). *Lifespan Development*. (7th Ed.). Pearson Education Limited.

Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American psychologist*, *32*(7), 513-531.

Bronfenbrenner, U. (1979). *The Ecology of Human Development: Experiments by nature and design.* Cambridge, MA: Harvard University Press.

Bronfenbrenner, U. (1986). Ecology of the family as a context for human development: Research perspectives. *Journal of Developmental Psychology, 22*(6), 723–742.

Bronfenbrenner, U. (1994). Ecological models of human development. In *International Encyclopaedia of Education*. (2nd Ed.). Vol.3. Oxford: Elsevier.

Bronfenbrenner, U. (2005). The Bioecological Theory of Human Development. In U. Bronfenbrenner (Ed.). *Making human beings human. Bioecological Perspectives on Human development* (p.3-15). Thousand Oaks: SAGE Publications.

Bronfenbrenner, U., & Crouter, A.C. (1983). The evolution of environmental models in developmental research. In P.H. Mussen (Ed.). *Handbook of child psychology* (4th Ed.). p. 357-414. Toronto: John Wiley & Sons.

Bruner, C. (2017). ACE, place, race, and poverty: Building hope for children. *Academic pediatrics, 17*(7), S123-S129.

Burns, N., & Grove, S. K. (2005). *The practice of nursing research: Conduct, critique and utilization* (5th ed.). Elsevier Saunders.

Burns, R. D., Fu, Y., Fang, Y., Hannon, J. C., & Brusseau, T. A. (2017). Effect of a 12-week physical activity program on gross motor skills in children. *Perceptual and Motor Skills, 124*(6), 1121-1133.

Carnethon, M. R., Gulati, M., & Greenland, P. (2005). Prevalence and cardiovascular disease correlates of low cardiorespiratory fitness in adolescents and adults. *Journal of the American Medical Association. 294*(23), 2981–2988.

Carver, A., Timperio, A., & Crawford, D. (2008). Playing it safe: The influence of neighbourhood safety on children"s physical activity - A review. *Health & Place, 14*, 217-227.

Cassar, S., Salmon, J., Timperio, A., Naylor, P. J., Van Nassau, F., Ayala, A. M. C., & Koorts, H. (2019). Adoption, implementation and sustainability of school-based physical activity and sedentary behaviour interventions in real-world settings: a systematic review. *International Journal of Behavioral Nutrition and Physical Activity, 16*(1), 1-13.

Castelli, D. M., Hillman, C. H., Buck, S. M., & Erwin, H. E. (2007). Physical fitness and academic achievement in third- and fifth-grade students. *Journal of Sport and Exercise Psychology, 29*, 239-252.

Cheatum, B. A., & Hammond, A. A. (2000). *Physical activities for improving children's behaviour: A guide to sensory motor development.* Champaign, IL: Human Kinetics.

Chen, W., Hammond-Bennett, A., Hypnar, A., & Mason, S. (2018). Health-related physical fitness and physical activity in elementary school students. *BMC Public Health, 18*(1), 1-12.

Cheng, H. G. & Phillips, M. R. (2014). Secondary analysis of existing data: opportunities and implementation. *Shanghai Archives of Psychiatry, 26*(6), 371-375.

Children's Wisconsin. (2021). *Normal growth* https://childrenswi.org/medical-care/adolescent-health-and-medicine/issues-and-concerns/adolescent-growth-and-development/normal-growth

Chomitz, V. R., Slining, M. M., McGowan, R. J., Mitchell, S. E., Dawson, G. F., & Hacker, K. A. (2009). Is there a relationship between physical fitness and academic achievement? Positive results from public school children in the northeastern United States. *Journal of School Health, 79*(1), 30-37.

Clark, A. M. (1998). The qualitative-quantitative debate: moving from positivism and confrontation to post-positivism and reconciliation. *Journal of advanced Nursing, 27*, 1242-1249.

Coe, D. P., Pivarnik, J. M., Womack, C. J., Reeves, M. J., & Malina, R. M. (2006). Effect of physical education and activity levels on academic achievement in children. *Medicine and Science in Sport & Exercise, 38*, 1515-1519.

Cohen, L., Manion, L., & Morrison, K. (2018). *Research Methods in Education* (8th ed.). Routledge: Taylor & Francis Group.

Committee on Sports Medicine Fitness. (2001). Strength training by children and adolescents. *Pediatrics, 107*(6), 1470–1472.

Cook, C. J., Howard, S. J., Scerif, G., Twine, R., Kahn, K., Norris, S. A., & Draper, C. E. (2019). Associations of physical activity and gross motor skills with executive function in preschool children from low-income South African settings. *Developmental science, 22*(5), e12820.

Council on Sports Medicine Fitness. (2008). Strength training by children and adolescents. *Pediatrics, 121*(4), 835–840.

Coyer, S. M. & Gallo, A. M. (2005). Secondary analysis of data. *Journal of Pediatric Health Care, 19*(1), 60-63.

Cradock, A. L., Kawachi, I., Colditz, G. A., Hannon, C., Melly, S. J., Wiecha, J. L., & Gortmaker, S.L. (2005). Playground safety and access in Boston neighbourhoods. *American Journal of Preventive Medicine, 28*(4), 357–363.

Creswell, J. W. (2014). *Research Design: Qualitative, Quantitative, and Mixed Methods Approaches*. California: Sage Publications.

Creswell J. W. & Creswell J. D. (2018). *Research design: qualitative, quantitative and mixed methods approaches*. (5th ed.). SAGE Publication.

Dapp, L. C., Gashaj, V., & Roebers, C. M. (2021). Physical activity and motor skills in children: A differentiated approach. *Psychology of Sport and Exercise, 54*, 101916.

Davids, K.; Button, K. & Bennet, S. (2008). *Dynamics of skill acquisition: A constraints-led approach*. Champaign, IL: Human Kinetics.

DBE (Department of Basic Education). (2011). *Curriculum and Assessment Policy Statement (CAPS), Lifeskills*, Final Draft. Pretoria: Department of Basic Education.

De Groot, R., Van Dijk, M., Savelberg, H., Van Acker, F., & Kirschner, P. (2017). Physical activity and school absenteeism due to illness in adolescents. *Journal of school health*, *87*(9), 658-664.

De Jager, M. (2009). *Baby gym: Brain and body gym for babies*. Welgemoed, CPT: Metz Press.

DelGiudice, M. (2018). Middle childhood: An evolutionary-developmental synthesis. *Handbook of life course health development*, 95-107.

Demaio, A. R., & Branca, F. (2018). Decade of action on nutrition: our window to act on the double burden of malnutrition*. BMJ global health, 3*(1), e000492.

De Meij, J. S., Chinapaw, M. J., van Stralen, M. M., van der Wal, M. F., van Dieren, L., & van Mechelen, W. (2011). Effectiveness of JUMP-in, a Dutch primary school-based community intervention aimed at the promotion of physical activity. *British Journal of Sports Medicine, 45*(13), 1052-1057.

De Villiers, A., Steyn, N. P., Draper, C. E., Fourie, J. M., Barkhuizen, G., Lombard, C. J., Dalais, L., Abrahams, Z., & Lambert, E.V. (2012). "HealthKick": Formative assessment of the health environment in low-resource primary schools in the Western Cape Province of South Africa. *BMC Public Health, 12*(794), 1-11.

De Villiers, A., Steyn, N. P., Draper, C. E., Hill, J., Dalais, L., Fourie, J., Lombard, C., Barkhuizen, G., & Lambert, E. V. (2015). Implementation of the HealthKick intervention in primary schools in low-income settings in the Western Cape Province, South Africa: a process evaluation. *BMC Public Health, 15*(1), 818.

De Vos, A. S., Strydom, H., Fouche, C. B., & Delport, C. S. (2011). *Research at Grass Roots: For the social sciences and human service professions* (4th ed.). Van Schaik Publishers.

Domville, M. S., Watson, P. M., Richardson, D. J., & Graves, L. E. (2019). Educator perspectives on factors influencing children's school-based physical activity. *Health promotion international, 34*(5), 931-940.

Donald, D., Lazarus, S., & Lolwana, P. (2010). *Educational Psychology in Social Context*. Oxford University Press.

Douglas, J. A., Briones, M. D., Bauer, E. Z., Trujillo, M., Lopez, M., & Subica, A. M. (2018). Social and environmental determinants of physical activity in urban parks: Testing a neighborhood disorder model. *Preventive medicine, 109*, 119-124.

Draper, C. E., Tomaz, S. A., Stone, M., Hinkley, T., Jones, R. A., Louw, J., Twine, R., Kahn, K., & Norris, S.A. (2017). Developing intervention strategies to optimise body composition in early childhood in South Africa. *BioMed research international*, 2017.Van Schaik Publishers.

Drew, C. J., Hardman, M. L., & Hosp, J. L. (2008). *Designing and conducting research in education*. SAGE Publications.

Drew, J. M., Mullins, M. R., & Osmond, J. (2009). Post-positivist Epistemology. *Retrieved* October 10, from admin502awiki: http://admin502awiki.pbworks.com/f/Post+positivist.doc

Dukhi, N. (2020). Global prevalence of malnutrition: evidence from literature. In *Malnutrition*. IntechOpen.

Durrheim, K., & Painter, D. (2006). Collecting quantitative data: Sampling and measuring. In M. Terre Blanche, K. Durrheim & D. Painter (Eds.), *Research in practice: Applied methods for social sciences* (pp. 131-159). University of Cape Town Press.

Du Toit, D., Van Der Merwe, N., & Rossouw, J. P. (2007). Return of physical education to the curriculum: Problems and challenges facing schools in South African communities. *African Journal for Physical Health Education, Recreation and Dance*, *13*(3), 241-253.

Dwyer, T., Sallis, J.F., Blizzard, L., Lazarus, R., & Dean, K. (2001). Relation of academic performance to physical activity and fitness in children. *Pediatric Exercise Science, 13*, 225-237.

Eisenmann, J. C. (2003). Secular trends in variables associated with the metabolic syndrome of North American children and adolescents: A review and synthesis. *American Journal of Human Biology*, *15*(6), 786–794.

Eisenmann, J. C. (2007). Aerobic fitness, fatness and the metabolic syndrome in children and adolescents. *Acta Paediatrica*, *96*(12), 1723–1729.

Emokpae, M. A., & Odungide, E. E. (2020). Childhood Malnutrition: a Potential Risk of Metabolic Diseases in Adulthood. *Journal of Basic and Applied Medical Sciences (JBAMS)*, *1*(1).

Erasmus, J. (2009). Attention Deficit Hyperactivity Disorder – The medical perspective. In A. Decaires-Wagner & H. Picton (Eds.), *Teaching and ADHD in the Southern African classroom* (pp.2-10). Northlands, JHB: Macmillan South Africa (Pty) Ltd.

Erwin, H., Beighle, A., Carson, R. L., & Castelli, D. M. (2013). Comprehensive school-based physical activity promotion: A review. *Quest*, *65*(4), 412-428.

Ethics Committee. (2019). University of Pretoria Code of Ethics for Research. Faculty of Education, University of Pretoria. https://www.up.ac.za/media/shared/6/files/rt-429-99-university-of-pretoria-code-of-ethics-for-research.zp158366.pdf

Faigenbaum, A. D., Kraemer, W. J., Blimkie, C. J., Jeffreys, I., Micheli, L. J., Nitka, M., & Rowland, T. W. (2009). Youth resistance training: Updated position statement paper from the National Strength and Conditioning Association. *Journal of Strength and Conditioning Research, 23*(5), 60–79.

Fallon, M. (2016). *Writing up quantitative research in the social and behavioral sciences*. Sense Publishers.

Fang, H., Quan, M., Zhou, T., Sun, S., Zhang, J., Zhang, H., Cao, Z., Zhao, G., Wang, R., & Chen, P. (2017). Relationship between physical activity and physical fitness in preschool children: a cross-sectional study. *BioMed research international*, 2017.

Fernandez-Jimenez, R., Al-Kazaz, M., Jaslow, R., Carvajal, I., & Fuster, V. (2018). Children present a window of opportunity for promoting health: JACC review topic of the week. *Journal of the American College of Cardiology, 72*(25), 3310-3319.

Fernández-Jiménez, R., Briceño, G., Céspedes, J., Vargas, S., Guijarro, J., Baxter, J., Hunn, M., Santos-Beneit, G., Rodríguez, C., Céspedes, M. P., Bagiella, E., Moreno, Z., Carvajal, I., & Fuster, V. (2020). Sustainability of and adherence to preschool health promotion among children 9 to 13 years old. *Journal of the American College of Cardiology*, *75*(13), 1565-1578.

Fetters, M. D., Curry, L. A., & Creswell, J. W. (2013). Achieving integration in mixed methods designs—principles and practices. *Health services research*.

Field, A. (2018). *Discovering Statistics Using IBM SPSS Statistics.* (5th ed.). SAGE Publications Ltd.

Field, T., Diego, M., & Sanders, C. E. (2001). Exercise is positively related to adolescents" relationship and academics. *Adolescence, 36*,105-110.

Fisher, M. J., & Marshall, A. P. (2008). Understanding descriptive statistics. *Australian Critical Care, 22*(2), 93-97. doi:10.1016/j.aucc.2008.11.003

Francis, D., & Webster, E. (2019). Poverty and inequality in South Africa: critical reflections. *Development Southern Africa, 36*(6), 788-802.

Frantz, J. M. (2006). Physical inactivity as one of the chronic disease risk factors among high school learners in public schools in a local community in South Africa. *South African Journal for Research in Sport, Physical Education and Recreation*, *28*(2), 73-80.

Fryar, C. D., Carroll, M. D., & Ogden, C. L. (2018). Prevalence of overweight, obesity, and severe obesity among children and adolescents aged 2–19 years: United States, 1963–1965 through 2015–2016. *NCHS health E-stats*.

Furragia, P., Petrisor, B. A., Farrokhyar, F., & Bhandari, M. (2010). Research questions, hypotheses and objectives. *Canadian Journal of Surgery*, 278-281.

Gallahue, D. L., & Donnely, F. C. (2003). *Developmental Physical Education for all children* (4th ed.). Champaign, IL: Human Kinetics.

Gallahue, D. L. & Ozmun, J. C. (2006). *Understanding motor development: Infants, children, adolescents, adults* (6th ed.). Boston, MA: McGraw-Hill.

Geiger, J. M., & Schelbe, L. (2021). Child Development and Well-Being. In *The Handbook on Child Welfare Practice* (pp. 55-81). Springer.

Going, S., Hingle, M., & Farr, J. (2012). Body composition. In *Modern Nutrition in Health and Disease: Eleventh Edition* (pp. 635-648). Wolters Kluwer Health Adis (ESP).

Gómez, J. E., Johnson, B. A., Selva, M., & Sallis, J. F. (2004). Violent crime and outdoor physical activity among inner-city youth. *Preventive Medicine*, *39*(5), 876-881.

Goodwin, J. (2012). *Secondary Data Analysis*. SAGE.

Gorard, S. (2001). *Quantitative methods in educational research: The role of numbers made easy.* A&C Black.

Gordon-Larsen, P., Nelson, M. C., Page, P., & Popkin, B. M. (2006). Inequality in the built environment underlies key health disparities in physical activity and obesity. *Pediatrics, 117*(2), 417-424.

Gravetter, F. J., & Forzano, L. A. B. (2018). *Research methods for the behavioral sciences.* Cengage Learning.

Greener, I. (2011). *Designing social research: A guide for the bewildered*. Sage Publications.

Greenhoot, A. F., & Dowsett, C. J. (2012). Secondary Data Analysis: An important tool for addressing developmental questions. *Journal of Cognition and Development, 13*(1), 2-18.

Haywood, K. M., & Getchell, N. (2009). *Life span motor development* (5th ed.). Champaign, IL: Human Kinetics.

Henderson, K. A. (2011). Research Reflection. *Leisure Sciences, 33*, 341-346.

Henn, M., Weinstein, M., & Foard, N. (2009). *A critical introduction to socialresearch*. (2nd ed.). Sage Publications.

Hills, A. P., Dengel, D. R., & Lubans, D. R. (2015). Supporting public health priorities: recommendations for physical education and physical activity promotion in schools. *Progress in cardiovascular diseases*, *57*(4), 368-374.

Hinton, P. R., Brownlow, C., McMurray, I., & Cozens, B. (2004). *SPSS Explained*. Routledge Taylor & Francis Groups.

Holborn, L., & Eddy, G. (2011). First steps to healing the South African family. A research paper by the South African Institute of Race Relations.

Hughes, M., & Tucker, W. (2018). Poverty as an adverse childhood experience. *North Carolina medical journal, 79*(2), 124-126.

IOM. (Institute of Medicine). (2012a). *Accelerating progress in obesity prevention: Solving the weight of the nation*. Washington, DC: The National Academies Press.

IOM. (Institute of Medicine). (2012b). *Fitness measures and health outcomes in youth*. Washington, DC: The National Academies Press.

Janssen, I., & LeBlanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *International journal of behavioral nutrition and physical activity, 7*(1), 40.

Janz, K. F., Dawson, J. D., & Mahoney, L. T. (2000). Tracking physical fitness and physical activity from childhood to adolescence: the Muscatine study. *Medicine and science in sports and exercise, 32*(7), 1250-1257.

Jenkins-Smith, H. C., Ripberger, J. T., Copeland, G., Nowlin, M. C., Hughes, T., Fister, A. L., & Wehde, W. (2017). *Quantitative research methods for political science, public policy and public administration (With Applications in R).* University Libraries.

Joens-Matre, R. R., Welk, G. J., Calabro, M. A., Russell, D. W., Nicklay, E., & Hensley, L. D. (2008). Rural–urban differences in physical activity, physical fitness, and overweight prevalence of children. *The Journal of rural health*, *24*(1), 49-54.

Johnson, R. B., & Christensen, L. (2014). *Educational research: Quantitative, Qualitative, and Mixed Approaches*. (5th ed.). SAGE Publications.

Johnson, B. & Gray, R. (2010). A history of philosophical and theoretical issues for mixed methods research. *SAGE handbook of mixed methods in social and behavioral research* (pp. 69-94). SAGE Publications Ltd.

Joubert, I., Hartell, C., & Lombard, K. (2016). *Navorsing: 'n Gids vir die beginnernavorser.* Van Schaik Uitgewers.

Kade, A. G. (2020). *Physical activity, physical fitness, sedentary behaviour and screen time profiles of primary school children in a school within the Makana Municipality, Eastern Cape, South Africa.* (Doctoral dissertation, Rhodes University).

Kearney, J. (2010). Food consumption trends and drivers. *PhilosophicalTransactions of The Royal Society B*, 2793-2807.

Keeley, T. J., & Fox, K. R. (2009). The impact of physical activity and fitness on academic achievement and cognitive performance in children. *International Review of Sport and Exercise Psychology, 2*(2), 198-214.

Keenan, T., & Evans, S. (2010). An Introduction to Child Development (2nd ed.). SAGE Publications.

Khan, M., & Bell, R. (2019). Effects of a School Based Intervention on Children's Physical Activity and Healthy Eating: A Mixed-Methods Study. *International journal of environmental research and public health, 16*(22), 4320.

Kiecolt, K. J., & Nathan, L. E. (2011). *Secondary analysis of survey data.* SAGE Publications.

Kim, T. K. (2015). T test as a parametric statistic. *Korean journal of anesthesiology*, *68*(6), 540.

Kim, H. Y. P., Frongillo, E. A., Han, S. S., Oh, S. Y., Kim, W. K., Jang, Y. A., Won, H. S., Lee, H. S., & Kim, S. H. (2003). Academic performance of Korean children is associated with dietary behaviours and physical status. *Asia Pacific Journal of Clinical Nutrition, 12*, 186-192.

Kim, B., Ku, M., Kiyoji, T., Isobe, T., Sakae, T., & Oh, S. (2020). Cardiorespiratory fitness is strongly linked to metabolic syndrome among physical fitness components: a retrospective cross-sectional study. *Journal of Physiological Anthropology, 39*(1), 1-9.

Klingberg, S., Draper, C. E., Micklesfield, L. K., Benjamin-Neelon, S. E., & van Sluijs, E. M. (2019). Childhood obesity prevention in Africa: a systematic review of intervention effectiveness and implementation. *International journal of environmental research and public health, 16*(7), 1212.

Korb, K. A. (2015). *Bronfenbrenner's Ecological systems theory*. University of Jos. Retrieved from https://pdfslide.net/documents/bronfenbrenners-ecological-systems-theory-dr-k-a-korb-university-of-jos.html

Kriemler, S., Zahner, L., Schindler, C., Meyer, U., Hartmann, T., Hebestreit, H., Brunner-La Rocca, H. P., van Mechelen, W., & Puder, J. J. (2010). Effect of school based physical activity programme (KISS) on fitness and adiposity in primary schoolchildren: cluster randomised controlled trial. British Medical Journal, *340*, c785.

Krishnan, V. (2010). *Early child development: A conceptual model*. Paper presented at the early Childhood Council Annual Conference, Christchurch.

Kruger, H. S., Puoane, T., Senekal, M., & Van Der Merwe, M. T. (2005). Obesity in South Africa: challenges for government and health professionals. *Public health nutrition*, *8*(5), 491-500.

Kumar, R. (2019). *Research methodology: A step-by-step guide for beginners*. (5th ed.) Sage Publications Limited.

Kupolati, M. D., MacIntyre, U. E., & Gericke, G. J. (2014). School-based nutrition education: Features and challenges for success. *Nutrition & Food Science*, *44*(6), 520-535. doi:10.1108/nfs-01-2014-0001

Kuriyan, R. (2018). Body composition techniques. *The Indian journal of medical research*, *148*(5), 648.

Kuther, T. L. (2018). Lifespan development: Lives in context. SAGE Publications.

Lally, M. & Valentine-French, S. (2019). *Lifespan development: A Psychological Perspective* (2nd Ed.). USA: Creative Commons.

Landsberg, E., Kruger, D., & Swart, E. (Eds.). (2011). *Addressing Barriers to Learning: A South African Perspective* (2nd ed.). Van Schaik Publishers.

Langley, H. A., Barksdale, S., Barnes, B. A., Child, C. H., Roberts, M. T., & Ramos, M. B. (2021). Normal Development: What Is Actually Normal?. *Developmental Psychopathology*, 35-57.

Leavy, P. (2017). *Research design: Quantitative, Qualitative, Mixed Methods, Arts Based, and Community-Based Participatory Research approaches*. The Guilford Press.

Leedy. P. D., & Ormrod, J. E. (2013). *Practical research: Planning and design* (10th ed.). Prentice Hall.

Lomofsky, L., & Lazarus, S. (2001). South Africa: First steps in the development of an inclusive education system. *Cambridge Journal of Education, 31*(3), 303-317.

Lopez, R. (2011). The potential of safe, secure and accessible playgrounds to increase children"s physical activity. *Active Living Research*, 1-8. San Diego, CA: Robert Wood Johnson Foundation.

Louw, D., & Louw, A. (2014). *Child and Adolescent development* (2nd ed.). Psychology Publications.

Lune, H., Oumar, E. S., & Koppel, R. (Eds.). (2010). *Perspectives in social research methods and analysis: A reader for sociology.* Thousand Oaks: SAGE Publications.

Magano, M. D. (2016). *Inaugral lecture: The home environment and the self-concepts of adolescents: A wellness perspective* [PowerPoint slides]. Retrieved from http://uir.unisa.ac.za/bitstream/handle/10500/22320/WELLNESS%20AS%20A%20SALIENT%20COMPONENT%20OF%20HUMAN%20DEVELOPMENT%20Inaugural%20lecture%20of%20Prof%20MD%20Magano%202%20August%202016.pdf?sequence=1

Mahar, M. T., Murphy, S. K., Rowe, D. A., Shields, A. T., & Raedke, T. D. (2006). Effects of a classroom-based programme on physical activity and on-task behaviour. *Medicine and Science in Sports and Exercise, 38*(12), 2086-2094.

Mahmudiono, T., Segalita, C., & Rosenkranz, R. R. (2019). Socio-ecological model of correlates of double burden of malnutrition in developing countries: A narrative review. *International journal of environmental research and public health*, 16(19), 3730.

Malina, R. M. Bouchard, C., & Bar-Or, O. (2004). *Growth, maturation, and physical activity*. (2nd Ed.). Human Kinetics.

Maree, J. G. (2012). *Complete your thesis or dissertation successfully: Practical guidelines* (1st ed.). Juta & company Ltd.

Maree, K. (Ed.). (2016). *First steps in research* (2nd ed.). Van Schaik Publishers.

Marker, A. M., Steele, R. G., & Noser, A. E. (2018). Physical activity and health-related quality of life in children and adolescents: A systematic review and meta-analysis. *Health Psychology, 37*(10), 893-903.

Martin, W. E., & Bridgmon, K. D. (2012). *Quantitative and statistical research methods: From hypothesis to results*. John Wiley & Sons.

Martínez-Vizcaíno, V., & Sánchez-López, M. (2008). Relationship between physical activity and physical fitness in children and adolescents. *Revista espanola de cardiologia, 61*(2), 108-111.

Mays, S. (2011). *Mean vs Median* [Video]. Youtube. https://www.youtube.com/watch?v=2PrgB_O1T0U

McMillan, J., & Schumacher, S. (2014). *Research in Education: Evidence-Based Inquiry* (7th ed.). Pearson Education Limited.

Meredith, M. D., & Welk, G. J. (2007). *Fitnessgram/Activitygram test administration manual* (4th ed.). Champaign, IL: Human Kinetics.

Mertler, C. A. (2018). *Introduction to Educational Research.* (2nd ed.). Sage Publications.

Mészáros, Z., Mészáros, J., Szmodis, B.M., Pampakas, P., Osváth, P., & Völgyi, E. (2008). Primary school child development: Issues of socioeconomic status. *Kinesiology, 40*(2), 153-161.

Misselhorn, A., & Hendriks, S. L. (2017). A systematic review of sub-national food insecurity research in South Africa: Missed opportunities for policy insights. *PLoS ONE, 12*(8), 1-32.

Monyeki, M. A., Koppes, L. L. J., Kemper, H. C. G., Monyeki, K. D., Toriola, A. L., Pienaar, A. E., & Twisk, J. W. R. (2005). Body composition and physical fitness of undernourished South African rural primary school children. *European journal of clinical nutrition, 59*(7), 877-883.

Mora-Gonzalez, J., Esteban-Cornejo, I., Cadenas-Sanchez, C., Migueles, J. H., Molina-Garcia, P., Rodriguez-Ayllon, M., Henriksson, P., Pontifex, M. B., Catena, A., & Ortega, F. B. (2019). Physical fitness, physical activity, and the executive function in children with overweight and obesity. *The Journal of pediatrics*, 208, 50-56.

Morgan, B., & Sklar, R. H. (2012). *Complete your thesis or dissertation successfully: Practical guidelines.* Juta & Company Ltd.

Morling, B. (2020*). Research methods in psychology: Evaluating a world of information.* (4th ed.). WW Norton & Company.

Moselakgomo, V. K., Monyeki, M. A., & Toriola, A. L. (2014). Physical activity, body composition and physical fitness status of primary school children in Mpumalanga and Limpopo provinces of South Africa: physical activity. *African Journal for Physical Health Education, Recreation and Dance, 20*(21), 343-356.

Mouton, J. (2001). *How to succeed in your master's and doctoral studies: A South African guide and resource book.* Van Schaik Publishers.

Müller-Bloch, C., & Kranz, J. (2015). A framework for rigorously identifying research gaps in qualitative literature reviews. *Thirty Sixth International Conference on Information Systems, Fort Worth 2015*.

Naidoo, R., & Coopoo, Y. (2012). The impact of a primary school physical activity intervention in KwaZulu-Natal, South Africa. *African Journal for Physical Health Education, Recreation and Dance*, *18*(1), 75-85.

Naidoo, R., Coopoo, Y., Lambert, E. V., & Draper, C. (2009). Impact of a primary school-based nutrition and physical activity intervention on learners in KwaZulu-Natal, South Africa: a pilot study. *South African Journal of Sports Medicine*, *21*(1) 7-12.

Nelson, M. C., & Gordon-Larson, P. (2006). Physical activity and sedentary behaviour patterns are associated with selected adolescent health risk behaviours. *Pediatrics, 117*, 1281-1290.

Neuman, W. L. (2014) S*ocial Research Methods: Qualitative and Quantitative Approaches.* (7th ed.). Pearson Education Limited.

Ogden, C. L., & Flegal, K. M. (2011). Smoothed percentage body fat percentiles for US children and adolescents, 1999–2004. *National Health Statistics Report*, (43), 1–7.

Oldewage-Theron, W. H., & Egal, A. (2012). Impact of nutrition education on nutritionknowledge of public school educators in South Africa: A pilot study. *Health SA Gesondheid, 17*(1), 1-8. http://dx.doi.org/10.4102/hsag.v17i1.602

Oldewage-Theron, W. H., & Slabbert, T. J. (2008). Impact of food and nutrition interventions on poverty in an informal settlement in the Vaal Region of South Africa. *Nutrition Society, 67*, 91-97.

O'Leary, Z. (2021). *The essential guide to doing your research project*. Sage.

Omodan, B. I., & Ige, O. A. (2021). Managing diversity in schools: The place of democratic education and ubuntuism in South Africa.

Pallant, J. (2007). *SPSS Survival Manual: A step by step guide to data analysis using the SPSS program*. (3rd ed.). Open University Press.

Park, J. H., Moon, J. H., Kim, H. J., Kong, M. H., & Oh, Y. H. (2020). Sedentary lifestyle: Overview of updated evidence of potential health risks. *Korean journal of family medicine, 41*(6), 365.

Pate, R. R., Wang, C. Y., Dowda, M., Farrell, S. W., & O'Neill, J. R. (2006). Cardiorespiratory fitness levels among US youth 12 to 19 years of age: Findings from the 1999–2002 National Health and Nutrition Examination Survey. *Archives of Pediatrics & Adolescent Medicine; 160*(10), 1005-1012.

Pebley, A. R., & Sastry, N. (2018). *Neighborhoods, poverty, and children's well-being* (pp. 182-195). Routledge.

Phillips, D. C., & Burbules, N. C. (2000). *Postpositivism and educational research*. Rowman and Littlefield.

Piek, J. P., Straker, L. M., Jensen, L., Dender, A., Barret, N. C., McLaren, S., Roberts, C.; Reid,C., Rooney, R., Packer, T., Bradbury, G., & Elsley, S. (2010). Rationale, design and methods for a randomised and controlled trial to evaluate "Animal Fun" – A programme designed to enhance physical and mental health in young children. *Paediatrics, 10*, 78-87.

Pienaar, A. E. (2009). Kinderkinetics: An investment in the total well-being of children. *South African Journal for Research in Sport Physical Education and Recreation, 31*(1), 49-67.

Pienaar, A. E. (2012). *Motoriese ontwikkeling, groei, motoriese agterstande, die asessering en intervensie daarvan: 'n Handleiding vir nagraadse studente in Kinderkinetika* (5th ed). Potchefstroom: Xerox.

Popkin, B. M., Corvalan, C., & Grummer-Strawn, L. M. (2020). Dynamics of the double burden of malnutrition and the changing nutrition reality. *The Lancet, 395*(10217), 65-74.

Popovic, S., Sarmento, H., Demetriou, Y., & Marques, A. (2021). Monitoring and Promoting Physical Activity and Physical Fitness in Children*. Frontiers in Public Health, 9.*

Popper, K. R. (2002). *The logic of Scientific Discovery*. Routledge Classics.

Proper, K. I., Koning, M., Van der Beek, A. J., Hildebrandt, V. H., Bosscher, R. J., &van Mechelen, W. (2003). The effectiveness of worksite physical activity programs on physical activity, physical fitness, and health. *Clinical journal of sport medicine*, *13*(2), 106-117.

Pruzan, P. (2016). Research Methodology: The aims, practices and ethics of science. Springer International Publishing.

R Core Team (2020). *R: A language and environment for statistical computing*. R Foundation for Statistical Computing, URL. https://www.R-project.org/.

Rachad, A. (2012). *Interpreting quantitative data with IBM SPSS Statistics*. (2nd ed.). Sage Publications, Inc.

Ramlo, S. E. & Newman, I. (2011). Q Methodology and its position in the Mixed-Methods Continuum. *The International Journal of Q Methodology, 34*(3), 172-191.

Rauner, A., Mess, F., & Woll, A. (2013). The relationship between physical activity, physical fitness and overweight in adolescents: a systematic review of studies published in or after 2000. *BMC pediatrics, 13*(1), 19.

Reardon, T., Tschirley, D., Liverpool-Tasie, L. S. O., Awokuse, T., Fanzo, J., Minten, B., Vos, R., Dolislager, M., Sauer, C., Dhar, R., Vargas, C., Lartey, A., Raza, A., & Popkin, B. M. (2021). The processed food revolution in African food systems and the double burden of malnutrition. *Global food security*, 28, 100466.

Reed, K. E., Warburton, D. E., Macdonald, H. M., Naylor, P. J., & McKay, H. A. (2008). Action Schools! BC: a school-based physical activity intervention designed to decrease cardiovascular disease risk factors in children. *Preventive medicine*, *46*(6), 525-531.

Resnik, D. B. (2018). *The ethics of research with human subjects: Protecting people, advancing science, promoting trust.* (Vol. 74). Springer International Publishing.

Resaland, G. K., Andersen, L. B., Mamen, A., & Anderssen, S. A. (2011). Effects of a 2-year school-based daily physical activity intervention on cardiorespiratory fitness: the Sogndal school-intervention study. *Scandinavian journal of medicine & science in sports*, *21*(2), 302-309.

Rosenberg, A. L., Greenfield, M. V. H., & Dimick, J. B. (2006). Secondary data analysis: Using existing data to answer clinical questions. In J. T. Wei (Ed.), *Clinical Research Methods for the Surgeons*. Humana Press.

Roux, C. J., & Sakala, M. (2020). Physical education in rural primary schools of Limpopo and Mpumalanga provinces, South Africa: teachers' perspectives. *African Journal for Physical Activity and Health Sciences (AJPHES)*, *26*(1), 128-142.

Rowland, T.W. (2005). Children's exercise physiology. *Champaign*. IL: Human Kinetics Publishers.

Ryan, A. B. (2006). Post-positivist approaches to research. *Researching and writing your thesis: a guide for postgraduate students* (pp. 12-26).

Salkind, N. J. (2010). *Encyclopedia of Research Design* (Vol. 3). SAGE Publications.

Salkind, N.J. (2011). *Encyclopedia of Research Design, Volume 1*. Sage Publications.

Sallis, J. F., Prochaska, J. J., & Taylor, W. C. (2000). A review of correlates of physical activity of children and adolescents. *Medicine and science in sports and exercise*, *32*(5), 963-975.

Scheffler, C., & Hermanussen, M. (2018). Growth in childhood and adolescence. *The International Encyclopedia of Biological Anthropology*, 1-11.

Schmidt, S. K., Reinboth, M. S., Resaland, G. K., & Bratland-Sanda, S. (2020). Changes in physical activity, physical fitness and well-being following a school-based health promotion program in a Norwegian region with a poor public health profile: a non-randomized controlled study in early adolescents. *International journal of environmental research and public health*, 17(3), 896.

Schoenfeld, A. H. (2008). *Research methods in mathematics education*. University of California, 476-519.

Shaffer. D. R., & Kipp, K. (2010). Developmental Psychology: *Childhood and Adolescence*. Australia: Cengage Learning.

Shisana, O., Labadarios, D., Rehle, T., Simbayi, l., Zuma, K., Dhansay, A., Reddy, P., Parker, W., Hoosani, E., Naidoo, P., Hongoro, C., Mchiza, Z., Steyn, N. P., Dwane, N., Makoae, M., Maluleke, T., Ramlagan, S., Zungu, N., Evans, M., … SANHANES-1 Team (2014). *South African National Health and Nutrition Examination Survey* (SANHANES-1): 2014 Edition. HSRC Press.

Sigelman, C. K., & Rider, E. A. (2018). *Life-Span Human Development* (9th ed.). Cengage Learning.

Silva, D. A. S., Chaput, J. P., Katzmarzyk, P. T., Fogelholm, M., Hu, G., Maher, C., Olds, T., Onywera, V., Sarmiento, O. L., Standage, M., Tudor-Locke, C., & Tremblay, M. S. (2018). Physical education classes, physical activity, and sedentary behavior in children. *Medicine & Science in Sports & Exercise*, 50(5), 995-1004.

Silverman, M. N., & Deuster, P. A. (2014). Biological mechanisms underlying the role of physical fitness in health and resilience. *Interface Focus, 4*, 1-12.

Simple Learning Pro. (2019). *The normal distribution and the 68-95-99.7 rule (5.2)* [Video]. Youtube. https://www.youtube.com/watch?v=mtbJbDwqWLE

Singh, K. (2007). *Quantitative Social Research Methods*. SAGE Publications.

Singh, A., Bassi, S., Nazar, G. P., Saluja, K., Park, M., Kinra, S., & Arora, M. (2017). Impact of school policies on non-communicable disease risk factors–a systematic review. *BMC public health, 17*(1), 1-19.

Smith, A. K., Ayanian, J. Z., Covinsky, K. E., Landon, B. E., McCarthy, E. P., Wee, C. C., & Steinman, M. A. (2011). Conducting high-value secondary dataset analysis: an introductory guide and resources. *Journal of general internal medicine, 26*(8), 920-929.

Smith, E., & Smith Jr, J. (2008). *Using secondary data in educational and social research*. McGraw-Hill Education (UK).

Somekh, B., & Lewin, C. (Eds.). (2011). *Theory and methods in social research*. Sage.

Sparling, P. B., Owen, N., Lambert, E. V., & Haskell, W. L. (2000). Promoting physical activity: the new imperative for public health. *Health EducationResearch, 15*(3), 367-376.

Stewart, R. W., & Kamins, M. A. (2011). *Secondary research*. SAGE Publications Ltd.

Steyn, N. P., de Villiers, A., Gwebushe, N., Draper, C. E., Hill, J., de Waal, M., Dalais, L., Abrahams, Z., Lombard, C., & Lambert, E. V. (2015). Did HealthKick, a randomised controlled trial primary school nutrition intervention improve dietary quality of children in low-income settings in South Africa? *BMC Public Health, 15*, 1-11.

Strong, W. B., Malina, R. M., Bumke, C. J., Daniels, S. R., Dishman, R. K., Gutin, B., Hergenroeder, A. C., Must, A., Nixon, P. A., Pivarnik, J. M., Rowland, T., Trost, S., & Trudeau, F. (2005). Evidence based physical activity for school-age youth. *The Journal of Pediatrics, 146*, 732-737.

Struwig, F. W., & Stead, G. B. (2001). *Planning, designing and reporting research*. Pearson Education.

Tanaka, C., Tanaka, M., & Tanaka, S. (2018). Objectively evaluated physical activity and sedentary time in primary school children by gender, grade and types of physical education lessons. *BMC Public Health, 18*(1), 1-10.

Taras, H. (2005). Physical activity and student performance at school. *Journal of School Health*, *75*(6), 214-218.

Tanita. (2020). *Understanding your measurements*. https://tanita.eu/help-guides/understanding-your-measurements/

Teddlie, C., & Tashakkori, A. (2009). *Foundations of mixed methods research: Integrating quantitative and qualitative approaches in the social and behavioural sciences.* (pp. 256-257). SAGE Publications.

Tekin, A. K., & Kotaman, H. (2013). The epistemological perspectives on action research. *Journal of Education and Social Research, 3*(1), 81-91. doi: 10.5901/jesr.2013.v3n1p81

Terre Blanche, M., Durrheim, K., & Painter, D. (Eds.). (2006). *Research in Practice: Applied methods for social sciences.* University of Cape Town Press (Pty) Ltd.

Thompson, C.B. (2009). Descriptive data analysis. *Air medical journal, 28*(2), 56-59. doi:10.1016/j.amj.2008.12.001

Tian, H., Du Toit, D., & Toriola, A. L. (2017). The effects of an enhanced quality Physical Education programme on the physical activity levels of Grade 7 learners in Potchefstroom, South Africa. *Physical Education and Sport Pedagogy, 22*(1), 35-50.

Tomporowski, P.D. (2003). Cognitive and behavioural responses to acute exercise in youths: A review. *Pediatric Exercise Science, 15*, 348-359.

Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research and applications, 5*, 147-158.

Tortolero, S. R., Bartholomew, L. K., Tyrrell, S., Abramson, S. L., Sockrider, M. M., Markham, C. M., Whitehead, L. W., & Parcel, G. S. (2002). Environmental Allergens and Irritants in Schools: A Focus on Asthma. *Journal of School health, 72*(1), 33-38.

Trost, S. G. (2007). Active education: Physical Education, physical activity and academic performance. *Active Living Research*, San Diego, CA: Robert Wood Johnson Foundation.

Truter, L., Pienaar, A. E., & Du Toit, D. (2010). Relationships between overweight, obesity and physical fitness of nine-to twelve-year-old South African children. *South African Family Practice, 52*(3), 227-233.

Trzesniewski, K. H., Donnellan, M. B. & Lucas, R. E., (Eds). (2011). *Secondary data analysis: An introduction for psychologists*. American Psychological Association.

Tudge, J. R. H., Mokrova, I., Hatfield, B. E., & Karnik, R.B. (2009). Uses and misuses of Bronfenbrenner's Bioecological theory of Human Development. *Journal of Family Theory & Review*, *1*, 198-210.

Turbeville, A., Aber, J. L., Weinberg, S. L., Richter, L., & van Heerden, A. (2019). The relationship between multidimensional economic well-being and children's mental health, physical health, and executive function development in South Africa. *Developmental science, 22*(5), e12846.

United Nations. *The Millennium Development Goals Report*. (2015). Retrieved from http://www.un.org/millenniumgoals/pdf/mdgReport2015pdf

United Nations Development Programme (UNDP). 2016. *Youth as partners for the implementation of the SDGs*. United Nations: Bureau for Policy and Programme Support.

Van den Broucke, S., Jooste, H., Tlali, M., Moodley, V., Van Zyl, G., Nyamwaya, D., & Tang, K. C. (2010). Strengthening the capacity for health promotion in South Africa through international collaboration. *Global health promotion*, *17*(2), 6-16.

Van Deventer, K. J. (2009). Perspectives of teachers on the implementation of Life Orientation in Grades R-11 from selected Western Cape schools. *South African Journal of Education, 29*, 127-145.

Van Deventer, K. J. (2012). School Physical Education in four South African provinces: A survey. *South African Journal for Research in Sport, Physical Education and Recreation, 34*(1), 153-166.

Van Deventer, K. J., Fourie, W., Van Gent, M., & Africa, E. (2010). Life Orientation in Grades R-12: Teachers' perspectives in selected Eastern Cape, Freestate, North West and Western Cape schools. *Unpublished research report*. Stellenbosch: Stellenbosch University.

Vanhees, L., Lefevre, J., Philippaerts, R., Martens, M., Huygens, W., Troosters, T., & Beunen, G. (2005). How to assess physical activity? How to assess physical fitness?. *European Journal of Cardiovascular Prevention & Rehabilitation*, *12*(2), 102-114.

Vaquero-Solís, M., Gallego, D. I., Tapia-Serrano, M. Á., Pulido, J. J., & Sánchez-Miguel, P. A. (2020). School-based physical activity interventions in children and adolescents: A systematic review. *International journal of environmental research and public health, 17*(3), 999.

Vartanian, T. P. (2011). *Secondary data analysis.* Oxford University Press.

Wait, J. (2005). Psychosocial theory. In J. Wait, J. Meyer. & H. Loxton (Eds.), *Human development: A psychological approach* (pp.13-29). Parow East, CPT: Ebony Books.

Walter, C. M. (2011). In-school physical activity patterns of primary school learners from disadvantaged schools in South Africa: health and lifestyle. *African Journal for Physical Health Education, Recreation and Dance*, *17*(2), 780-789.

Wechsler, H., Devereaux, R. S., Davis, M., & Collins, J. (2000). Using the school environment to promote physical activity and healthy eating. *Preventive medicine*, *31*(2), S121-S137.

Wells, J. C., Sawaya, A. L., Wibaek, R., Mwangome, M., Poullas, M. S., Yajnik, C. S., & Demaio, A. (2020). The double burden of malnutrition: aetiological pathways and consequences for health. *The Lancet, 395*(10217), 75-88.

Wilson, M., & Gochyyev, P. (2013). Psychometrics. In *Handbook of quantitative methods for educational research* (pp. 1-30). Brill Sense.

World Health Organization (WHO). (1986). *The Ottawa Charter for Health Promotion.* Geneva: WHO.

Yuksel, H. S., Şahin, F. N., Maksimovic, N., Drid, P., & Bianco, A. (2020). School-based intervention programs for preventing obesity and promoting physical activity and fitness: A systematic review*. International journal of environmental research and public health, 17*(1), 347.

APPENDIX A: NPWB QUESTIONNAIRE

BIOGRAPHICAL INFORMATION OF LEARNER

Subject number:

Initials: INT Name: NAME Surname: SURNAME

Age: AGE Date of birth: DD MM YEAR Gender: M Male F Female

The NPWB Questionnaire:

Nutritional habits

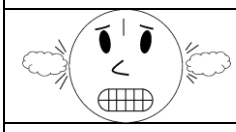
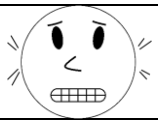
I like junk food					
My current diet mainly consists of healthy meals					
I eat at least three healthy meals per day					
I like junk food more than I like a healthy meal					
I eat a healthy breakfast					
I eat unsalted food					
When I snack, I choose fruits, vegetables, low-fat yogurt, or cheese					
I include foods with fibre, such as fruits, vegetables, whole grain products, and beans in my diet					
I avoid foods that contain large amounts of honey and sugar					

Physical activity

I spend my free time indoors					
I spend my free time with peers/friends					
I watch television during my free time					
I participate in some kind of sport during my free time					
I play computerized/board games during my free time					
I spend my free time outdoors walking long distances					
I spend my free time sleeping					
I spend my free time reading					
It is hard for me to walk more than one block					
It is hard for me to run					
It is hard for me to do sport activities or exercise					
It is hard for me to lift something heavy					
It is hard for me to take a bath or shower by myself					
It is hard for me to do chores around the house					
I often hurt or ache					

I do not have much energy					
It is hard to keep up when I play with other kids					

How many times per week do you exercise?				
6-7 days per week	3-5 days per week	1-2 days per week	Few times per month	Less than once a month

How hard do you exercise?				
				
High intensity	Average to high intensity	Average/ moderate	Average to low intensity	Light intensity

How long do you exercise at a time?			
More than 30 minutes	20-30 minutes	10-20 minutes	Less than 10 minutes

Well-being

I feel calm most of the time					
I am satisfied with my life					
I feel cheerful most of the time					
I feel at peace most of the time					
I often feel afraid or scared					
I often feel sad or blue					
I feel angry most of the time					
I have trouble sleeping					
I often worry about what will happen to me					
It is hard to pay attention in class					
I often forget things					
I lack self-confidence most of the time					

BIOGRAPHICAL INFORMATION OF LEARNER

Subject number:

Initials: INT Name: NAME Surname: SURNAME

Age: AGE Date of birth: DD MM YEAR Gender: M Male F Female

INDOOR TESTING

Height and Weight for BMI and Maturity offset

Height:	cm	Weight:	kg	Sitting height:	cm

Skinfolds for body fat%

Triceps:	mm	Sub-scapular:	mm	Calve:	mm

Visual Skills and Coordination

Egg-carton catch:	sec	Hand-Wall Toss:	#

Balance and Flexibility

	LEFT LEG	RIGHT LEG		
Stork balance test:	sec	sec	Sit and Reach:	cm

Blood Pressure

Systolic BP:	mmHg	Diastolic BP:	mmHg

OUTDOOR TESTING

Strength and Endurance

Sit-ups:	#	Push-ups	#	Ball throw:	m

Standing long jump	m	3min Step Test	Pulse/15 sec

Flexed-arm hang test	sec

Speed and Agility

	SPLIT 1	SPLIT 2	SPLIT 3	SPLIT 4	SPLIT 5	TOTAL
50m Shuttle run:	sec	sec	sec	sec	sec	sec

	10M SPLIT	30M SPLIT	TOTAL
50m Sprint:	sec	sec	sec

APPENDIX B: ETHICAL CLEARANCE FROM THE ETHICS COMMITTEE OF THE FACULTY OF EDUCATION AT THE UNIVERSITY OF PRETORIA

UNIVERSITEIT VAN PRETORIA
UNIVERSITY OF PRETORIA
YUNIBESITHI YA PRETORIA

Faculty of Education

Ethics Committee

16 July 2019

Ms Michelle Meyer

Dear Ms Meyer

REFERENCE: UP 12/09/02 Botha 19-001

This letter serves to confirm that your application was carefully considered by the Faculty of Education Ethics Committee. The final decision of the Ethics Committee is that your application has been **approved** and you may now start with your data collection. The decision covers the entire research process and not only the days that data will be collected. The approval is valid for two years for a Masters and three for Doctorate.

The approval by the Ethics Committee is subject to the following conditions being met:

1. The research will be conducted as stipulated on the application form submitted to the Ethics Committee with the supporting documents.
2. Proof of how you adhered to the Department of Basic Education (DBE) policy for research must be submitted where relevant.
3. In the event that the research protocol changed for whatever reason the Ethics Committee must be notified thereof by submitting an amendment to the application (Section E), together with all the supporting documentation that will be used for data collection namely; questionnaires, interview schedules and observation schedules, for further approval before data can be collected. Non-compliance implies that the Committee's approval is null and void. The changes may include the following but are not limited to:
    - Change of investigator,
    - Research methods any other aspect therefore and,
    - Participants
    - Sites

The Ethics Committee of the Faculty of Education does not accept any liability for research misconduct, of whatsoever nature, committed by the researcher(s) in the implementation of the approved protocol.

Upon completion of your research you will need to submit the following documentations to the Ethics Committee for your Clearance Certificate:

- Integrated Declaration Form (Form D08),
- Initial Ethics Approval letter and,
- Approval of Title.

Please quote the reference number **UP 12/09/02 Botha 19-001** in any communication with the Ethics Committee.

Best wishes

Prof Liesel Ebersöhn
Chair: Ethics Committee
Faculty of Education

APPENDIX C: RESULTS OBTAINED FROM THE DEPARTMENT OF STATISTICS

1 Introduction

This report studies the distribution of data obtained from children who have undergone some intervention. We analyze the following variable before (pre-) and after (post-) the intervention:

- Height (cm)
- Weight (kg)
- BMI
- Sitting height (cm)
- Skinfold - Tricep (mm)
- Skinfold - Sub-scapular (mm)
- Skinfold - Calve (mm)
- Body fat
- Sit-ups (#)
- Push-ups (#)
- 3 minute step test (15 second pulse)

The variables Age and Gender were not analyzed, as these variables would not be effected by any intervention.

2 Analytics Results

The focus of the study is to determine whether a significant change occurred in the variables of interest after the intervention. We thus utilize a paired t-test to investigate whether there is any evidence of the mean values of these variables being different before (pre-) and after (pro-) the intervention. Recall that the null and alternative hypothesis for the t-test is as follows:

$$H_0 : \mu_{diff} = 0$$
$$H_1 : \mu_{diff} \neq 0$$

where $\mu_{diff} = E[X_{post} - X_{pre}]$.

Note that an assumption of the paired t-test is the assumption of normality. We thus normalize the observations for each variable using a suitable transformation technique chosen by the `bestNormalize` package. Normalization was conducted due to the fact that a great deal of information regarding the observations is lost when using non-parametric methods, this is because these methods all rely on converting the observations to ranks, which disregards the variance observed in the observations. The variables presented here have large variances and we thought it prudent to preserve this information.

For further details please see the following link: Using the bestNormalize Package.

It is, however, still possible to conduct non-parametric tests on these variables. To this end, a popular non-parametric test to compare outcomes between two independent groups, the Wilcoxon Rank Sum Test, is used to test whether two samples are likely to derive from the same population (i.e., that the two populations have the same shape). The null and alternative hypothesis for this test is as follows:

H_0 : The two populations are equal.
H_1 : The two populations are not equal.

This test is often performed as a two-sided test and thus the research hypothesis indicates that the populations are not equal as opposed to specifying directionality. The procedure for the test involves pooling the observations from the two samples into one combined sample, keeping track of which sample each observation comes from, and then ranking lowest to highest from 1 to $n_1 + n_2$, respectively.

2.1 Height (cm)

Proportion of missing values for pre intervention: 3.68%.

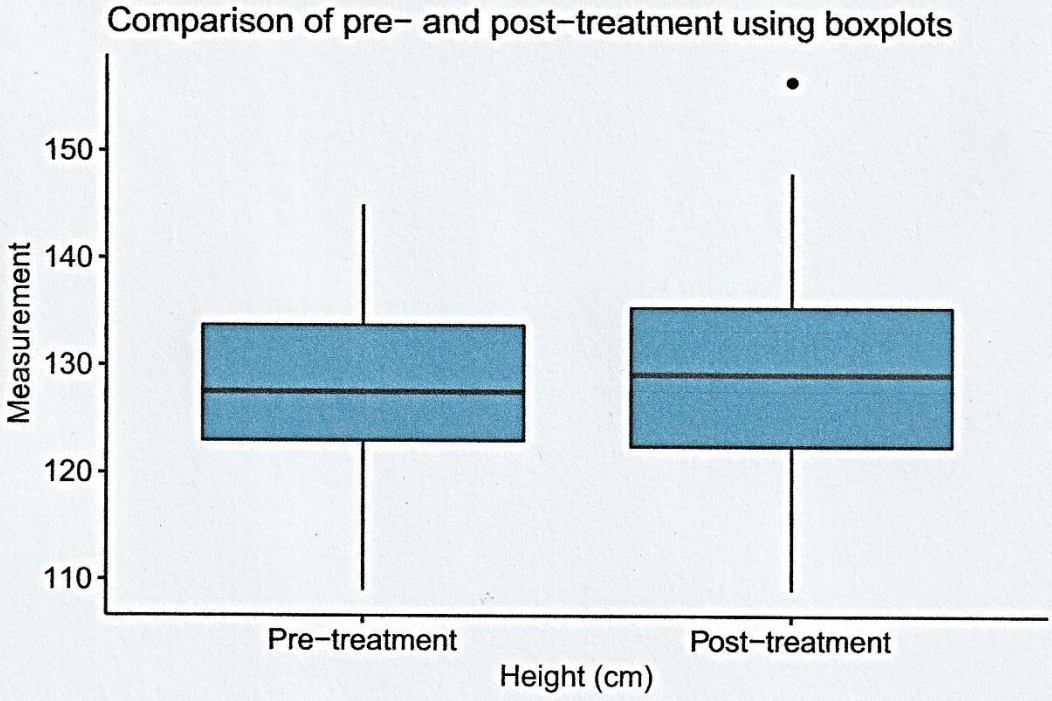
Proportion of missing values for post intervention: 28.42%.

Table 1: Summary statistics of pre-treatment: Height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
183	7	109	145	127.5	128.057	7.582	10.75

Table 2: Summary statistics of post-treatment: Height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	109	156.5	129.15	129.032	8.457	12.925



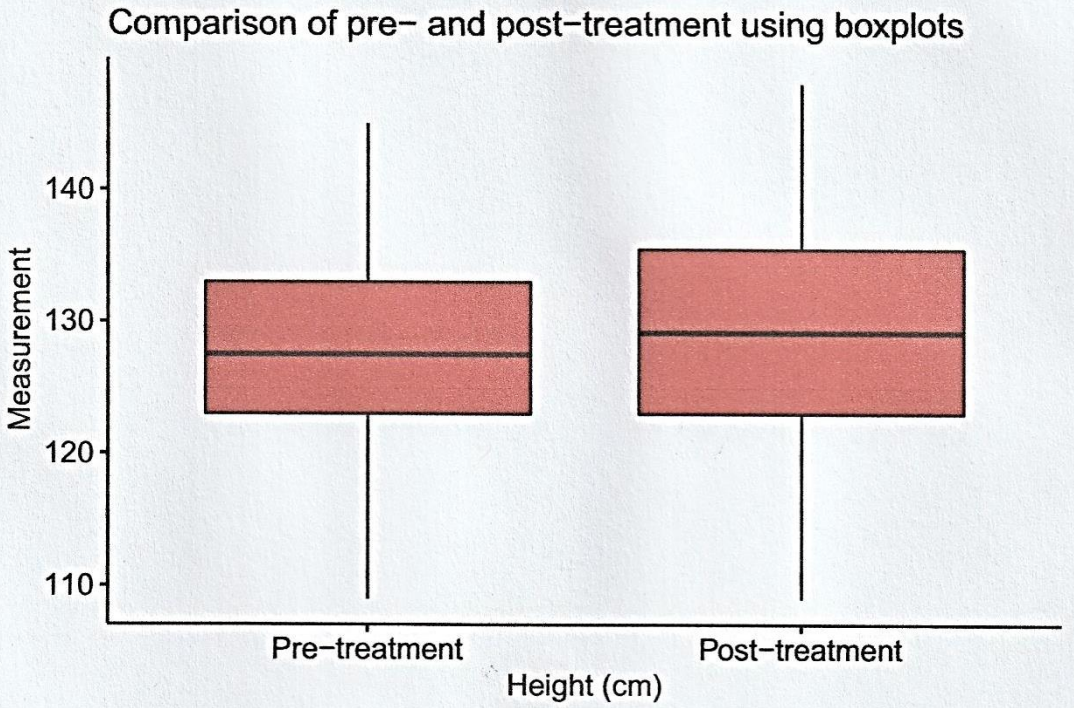
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 3: Summary statistics of pre-treatment: Height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	109	145	127.5	127.858	7.669	10.75

Table 4: Summary statistics of post-treatment: Height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	109	148	129.15	128.997	8.175	12.925



p-value for t-test = 0.392.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Height (cm) is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.316.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that there is not sufficient evidence to conclude that the population between pre and post treatment for Height (cm)differ.

2.2 Weight (kg)

Proportion of missing values for pre intervention: 3.68%.

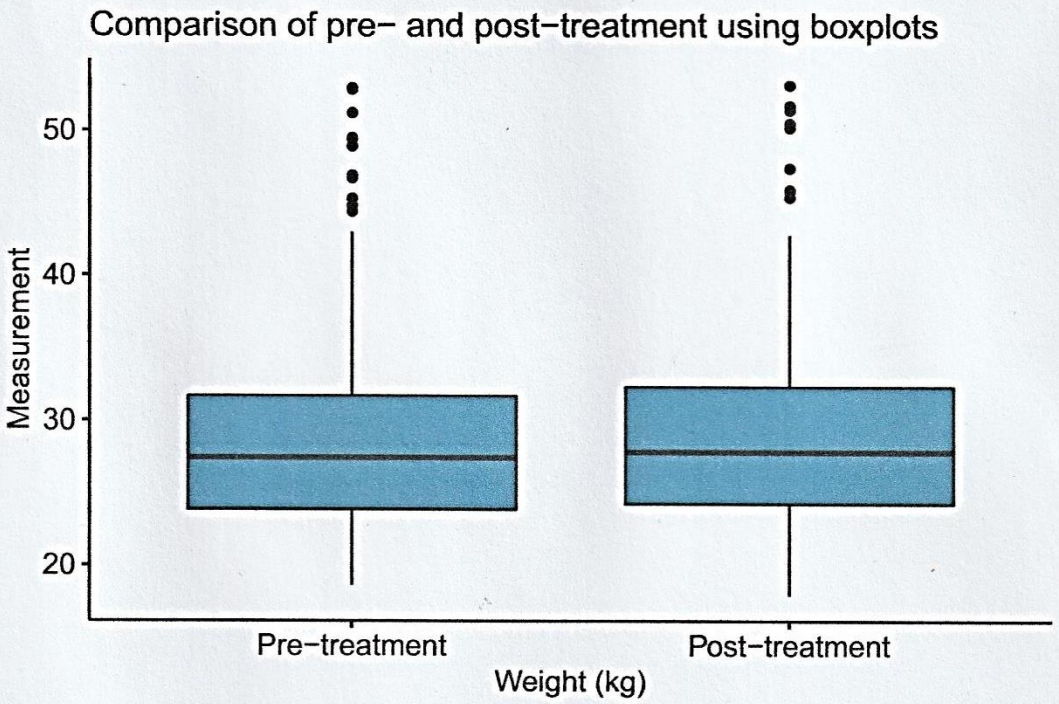
Proportion of missing values for post intervention: 28.42%.

Table 5: Summary statistics of pre-treatment: Weight (kg)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
183	7	18.6	52.9	27.4	28.847	7.309	7.8

Table 6: Summary statistics of post-treatment: Weight (kg)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	17.9	53.1	27.8	29.218	7.573	8.05



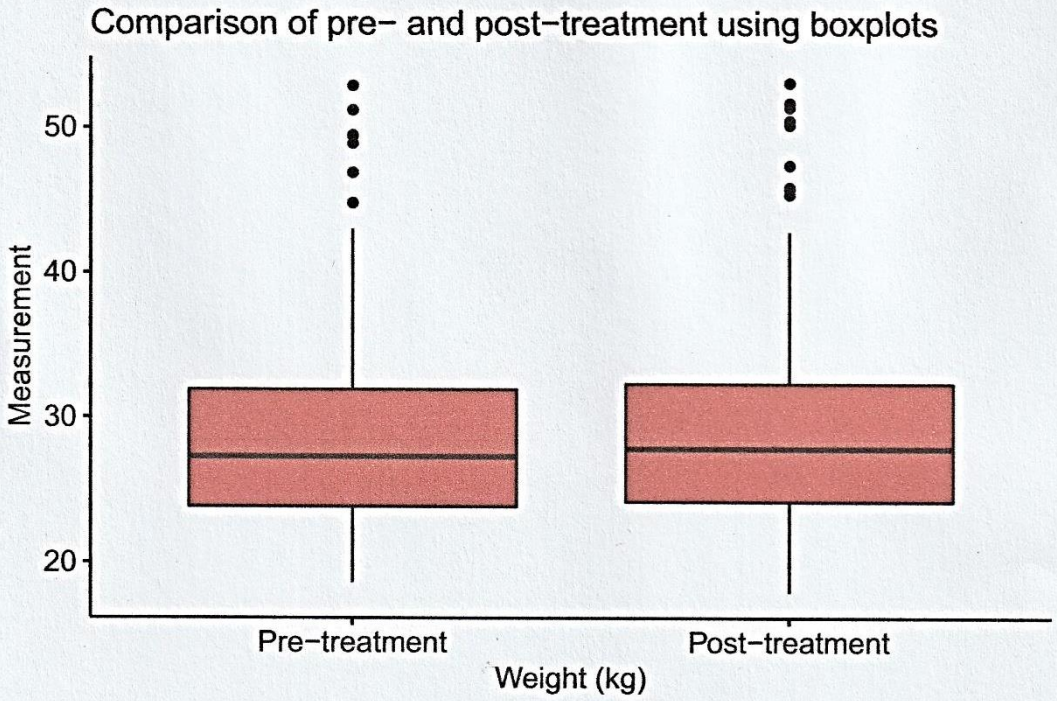
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 7: Summary statistics of pre-treatment: Weight (kg)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	18.6	52.9	27.25	28.82	7.386	7.8

Table 8: Summary statistics of post-treatment: Weight (kg)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	17.9	53.1	27.8	29.255	7.682	8.05



p-value for t-test = 0.749.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Weight (kg) is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.62.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that there is not sufficient evidence to conclude that the population between pre and post treatment for Weight (kg)differ.

2.3 BMI

Proportion of missing values for pre intervention: 3.68%.

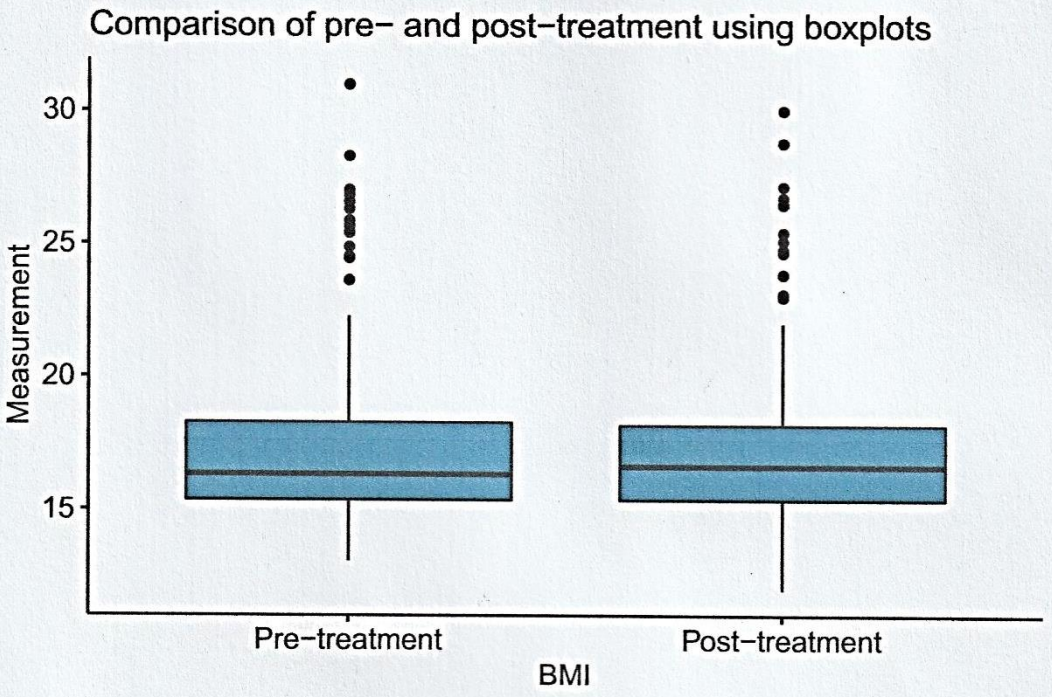
Proportion of missing values for post intervention: 28.42%.

Table 9: Summary statistics of pre-treatment: BMI

n	NA_count	Min	Max	Median	Mean	stdev	IQR
183	7	13.056	30.982	16.326	17.418	3.258	2.911

Table 10: Summary statistics of post-treatment: BMI

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	11.963	30.02	16.617	17.395	3.41	2.816



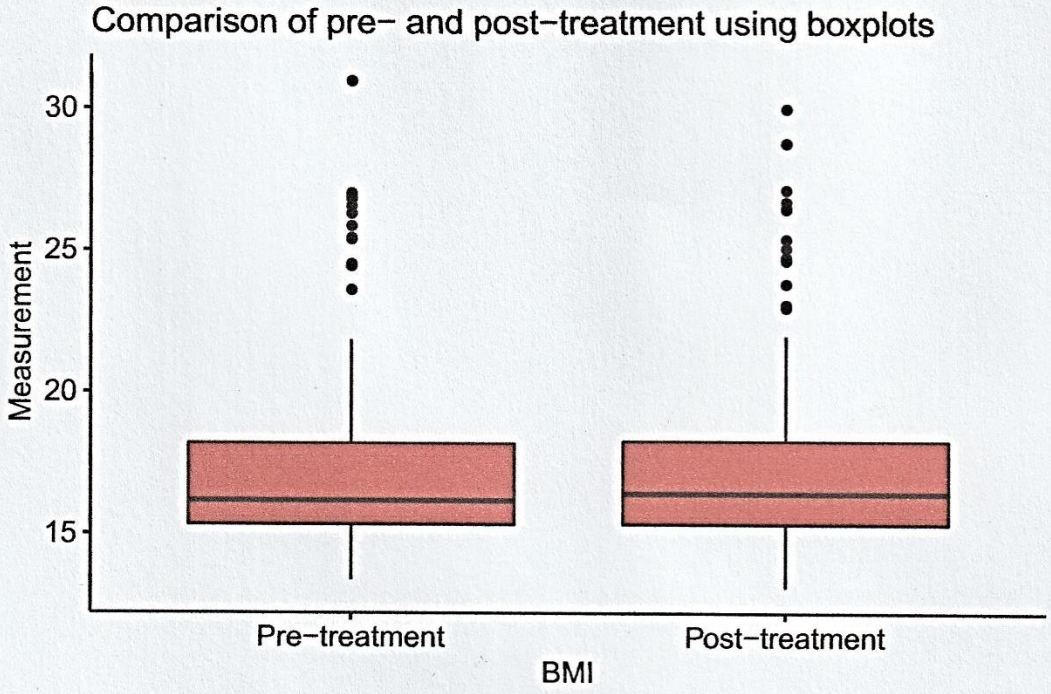
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 11: Summary statistics of pre-treatment: BMI

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	13.377	30.982	16.182	17.463	3.371	2.911

Table 12: Summary statistics of post-treatment: BMI

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	13.104	30.02	16.428	17.409	3.432	2.816



p-value for t-test = 0.966.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for BMI is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.931.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that there is not sufficient evidence to conclude that the population between pre and post treatment for BMIdiffer.

2.4 Sitting height (cm)

Proportion of missing values for pre intervention: 3.68%.

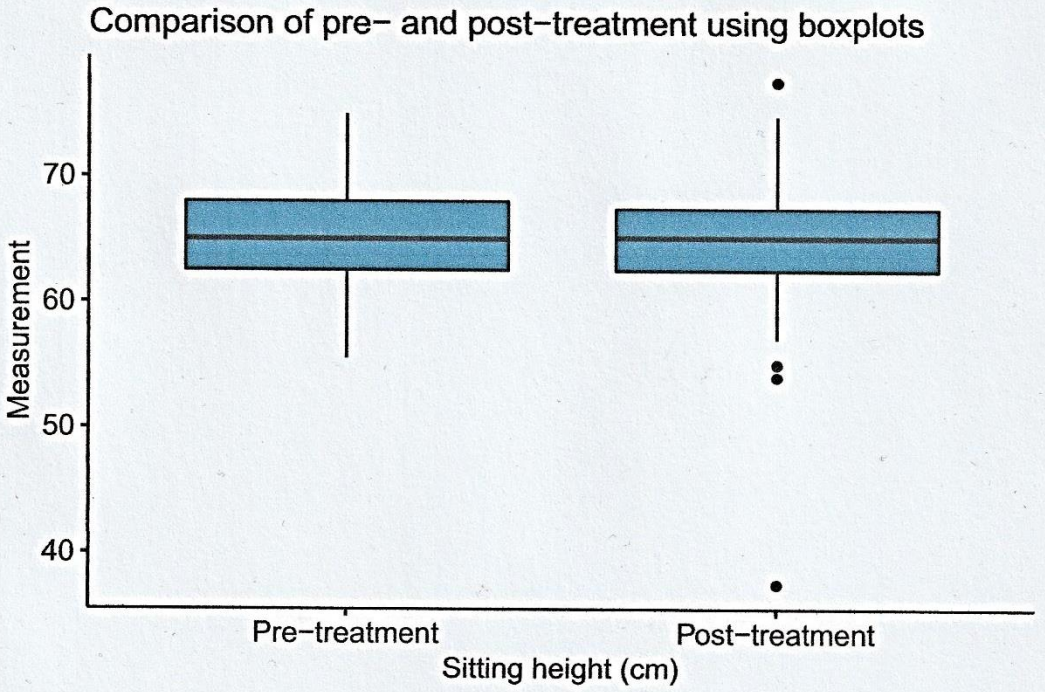
Proportion of missing values for post intervention: 28.42%.

Table 13: Summary statistics of pre-treatment: Sitting height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
183	7	55.5	75	65	65.083	3.806	5.5

Table 14: Summary statistics of post-treatment: Sitting height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	37.5	77.5	65.1	64.907	4.573	4.95



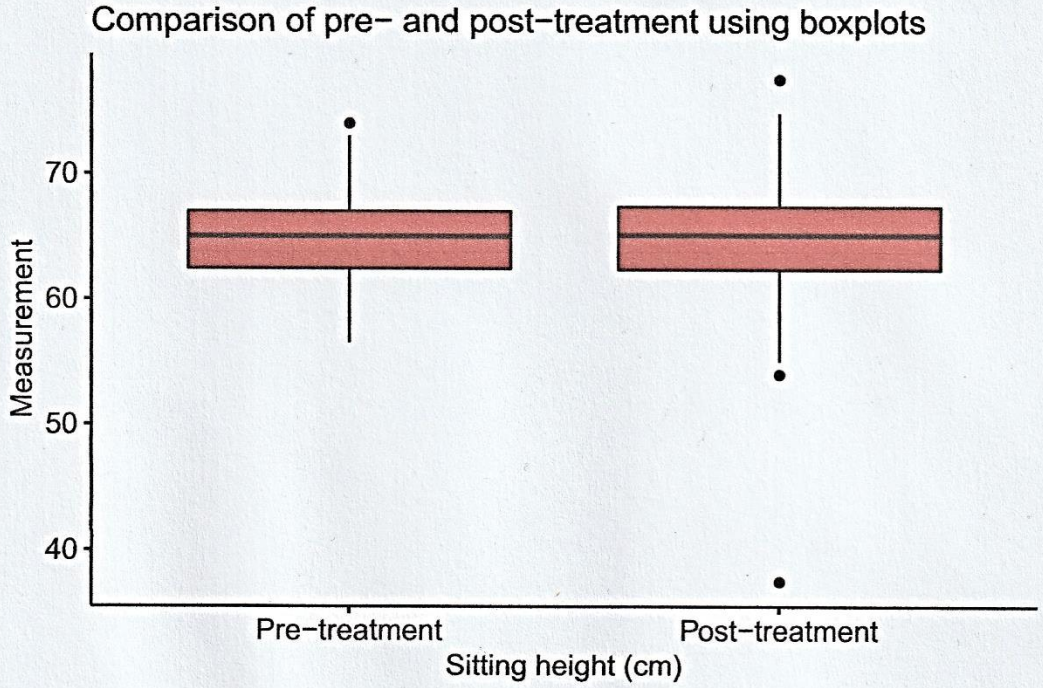
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 15: Summary statistics of pre-treatment: Sitting height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	56.5	74	65	64.847	3.618	5.5

Table 16: Summary statistics of post-treatment: Sitting height (cm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
130	0	37.5	77.5	65.1	64.876	4.626	4.95



p-value for t-test = 0.255.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Sitting height (cm) is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.99.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that there is not sufficient evidence to conclude that the population between pre and post treatment for Sitting height (cm)differ.

2.5 Skinfold - Triceps (mm)

Proportion of missing values for pre intervention: 5.79%.

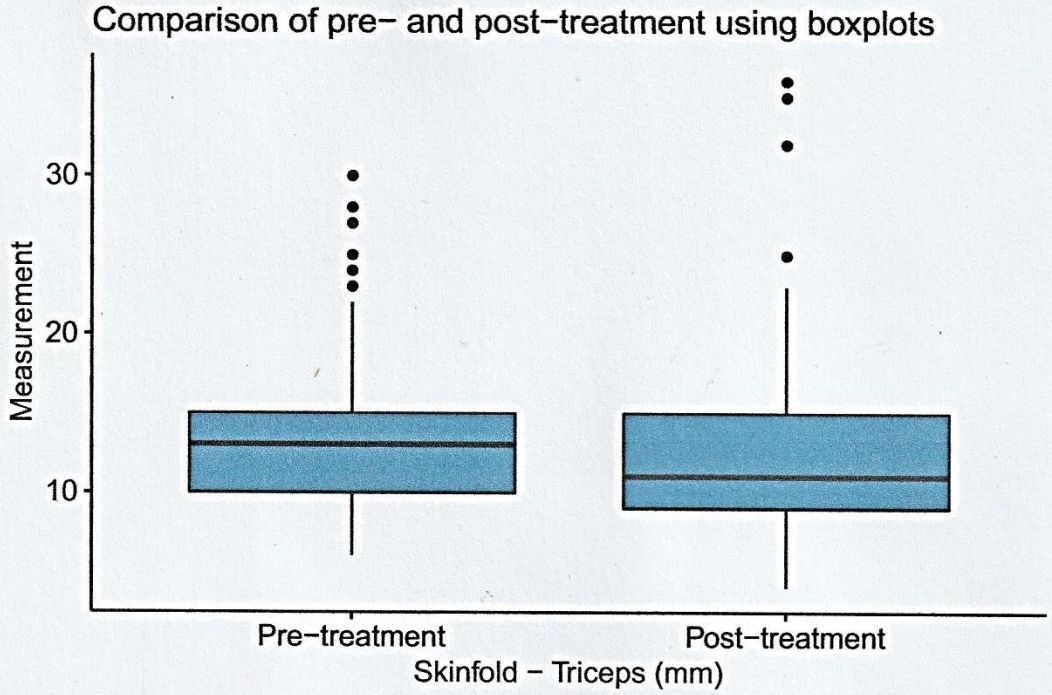
Proportion of missing values for post intervention: 28.42%.

Table 17: Summary statistics of pre-treatment: Skinfold - Triceps (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
179	11	6	30	13	13.559	5.017	5

Table 18: Summary statistics of post-treatment: Skinfold - Triceps (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	4	36	11	12.412	5.103	6



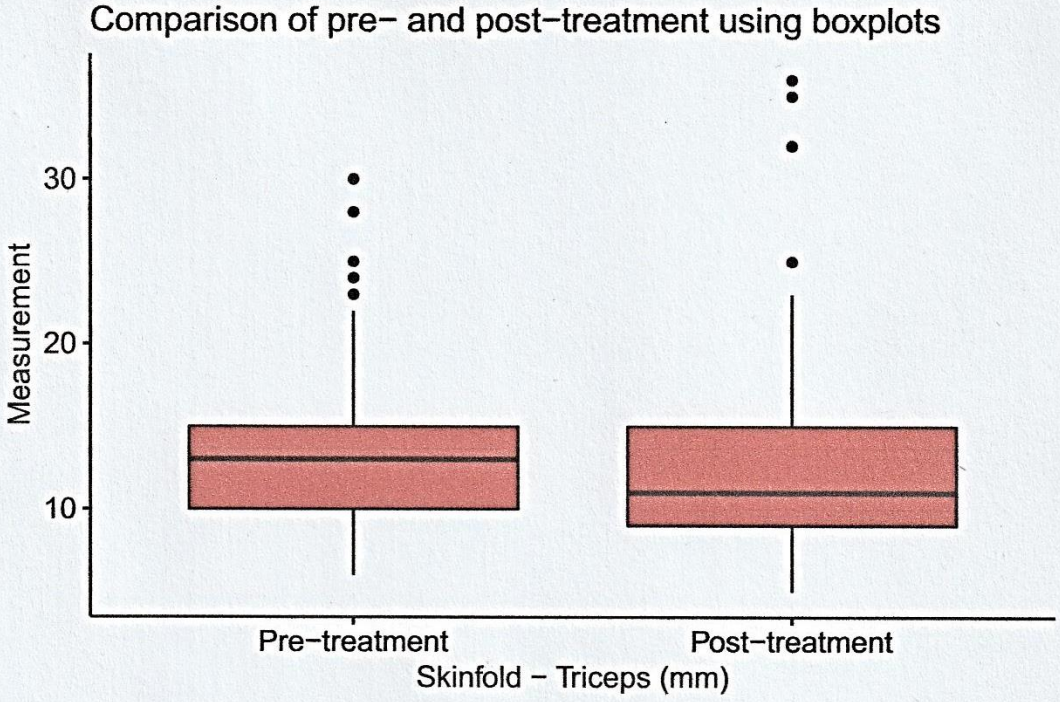
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 19: Summary statistics of pre-treatment: Skinfold - Triceps (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	6	30	13	13.984	5.236	5

Table 20: Summary statistics of post-treatment: Skinfold - Triceps (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	5	36	11	12.516	5.151	6



p-value for t-test = 0.543.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Skinfold - Triceps (mm) is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.02.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that there is statistically significant evidence to show that the populations of pre treatment Skinfold - Triceps (mm) are not equal as compared to the post treatment for Skinfold - Triceps (mm) .

2.6 Skinfold - Sub-scapular (mm)

Proportion of missing values for pre intervention: 5.79%.

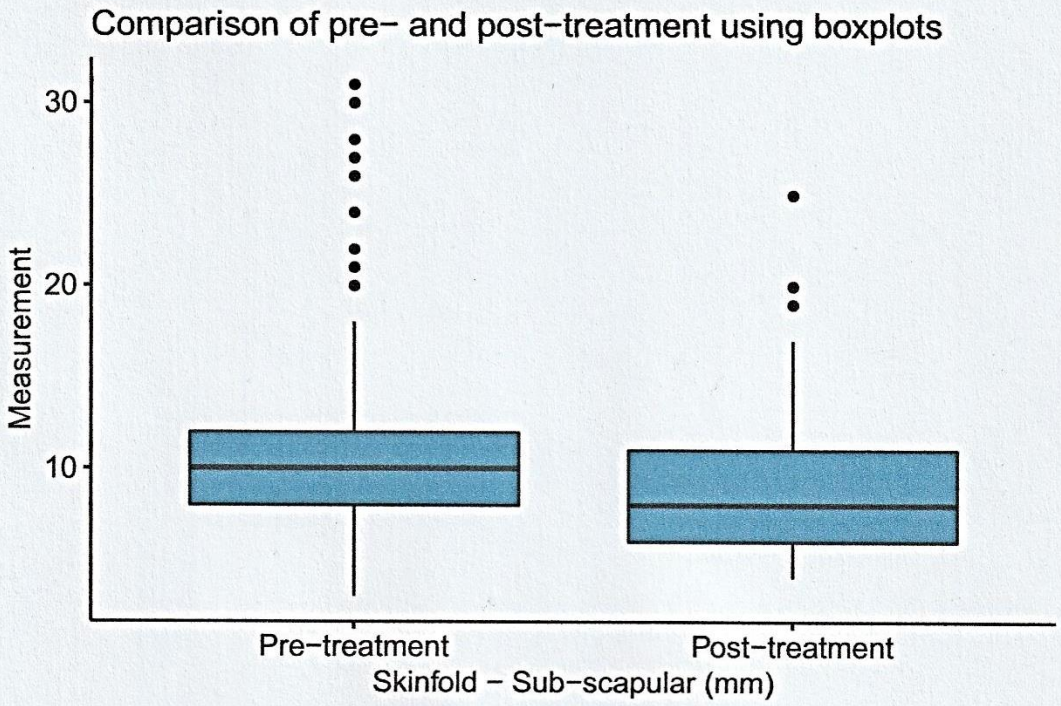
Proportion of missing values for post intervention: 28.42%.

Table 21: Summary statistics of pre-treatment: Skinfold - Sub-scapular (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
179	11	3	31	10	10.894	4.714	4

Table 22: Summary statistics of post-treatment: Skinfold - Sub-scapular (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	4	25	8	8.934	3.712	5



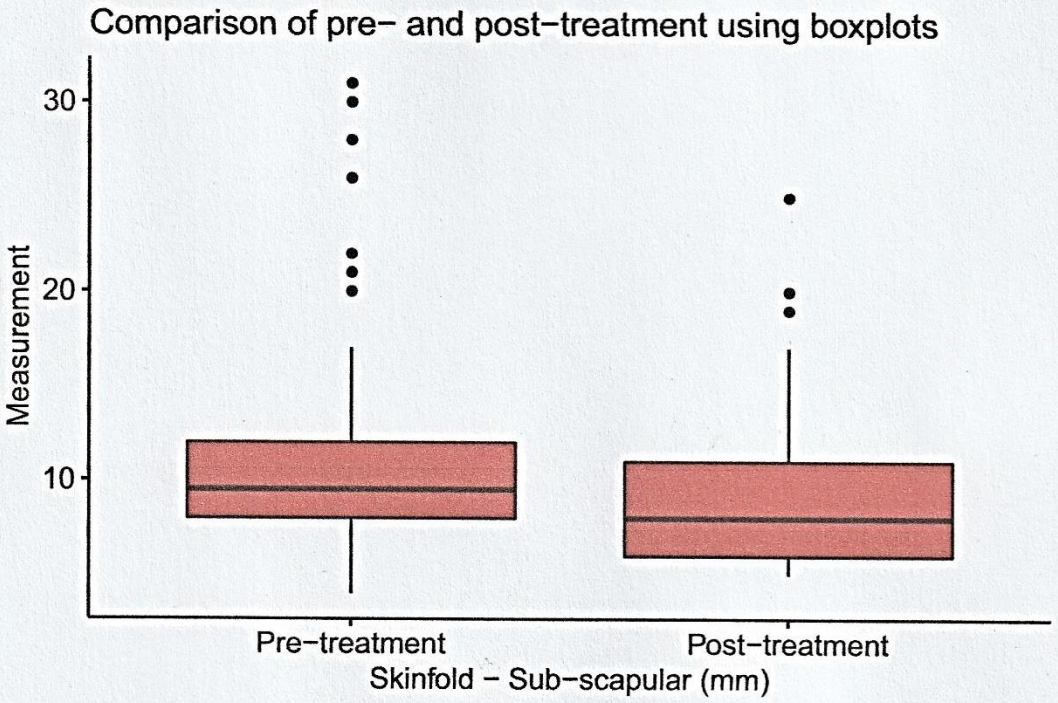
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 23: Summary statistics of pre-treatment: Skinfold - Sub-scapular (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	4	31	9.5	10.751	4.817	4

Table 24: Summary statistics of post-treatment: Skinfold - Sub-scapular (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	5	25	8	9.039	3.736	5



p-value for t-test = 0.48.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Skinfold - Sub-scapular (mm) is not significantly different from zero.

p-value for Wilcoxon Rank Sum test < 0.0001.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that there is statistically significant evidence to show that the populations of pre treatment Skinfold - Sub-scapular (mm) are not equal as compared to the post treatment for Skinfold - Sub-scapular (mm) .

2.7 Skinfold - Calve (mm)

Proportion of missing values for pre intervention: 5.79%.

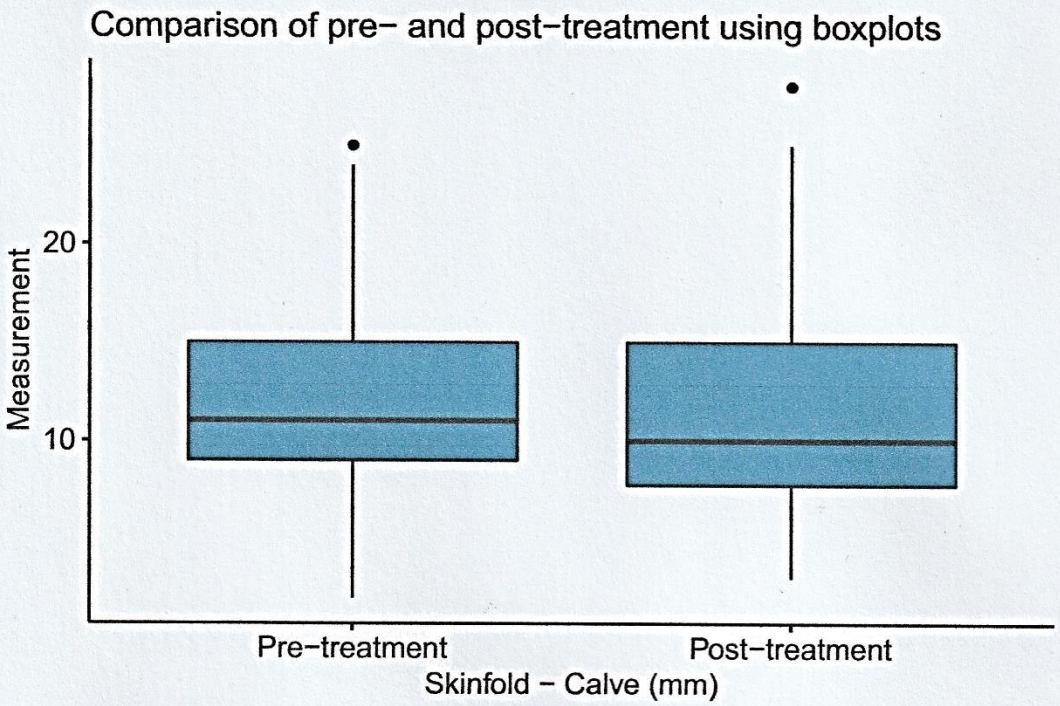
Proportion of missing values for post intervention: 28.42%.

Table 25: Summary statistics of pre-treatment: Skinfold - Calve (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
179	11	2	25	11	12.084	4.824	6

Table 26: Summary statistics of post-treatment: Skinfold - Calve (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	3	28	10	11.331	4.931	7.25



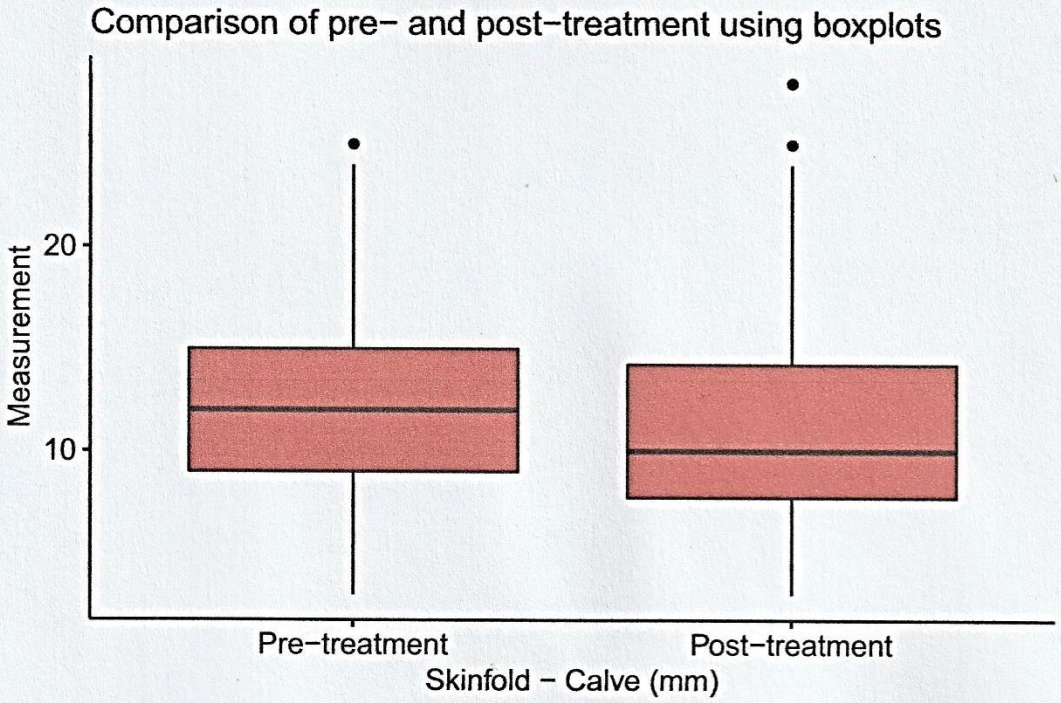
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 27: Summary statistics of pre-treatment: Skinfold - Calve (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	3	25	12	12.539	5.054	6

Table 28: Summary statistics of post-treatment: Skinfold - Calve (mm)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	3	28	10	11.383	4.944	7.25



p-value for t-test = 0.485.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Skinfold - Calve (mm) is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.085.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that there is not sufficient evidence to conclude that the population between pre and post treatment for Skinfold - Calve (mm)differ.

2.8 Body Fat

Proportion of missing values for pre intervention: 5.79%.

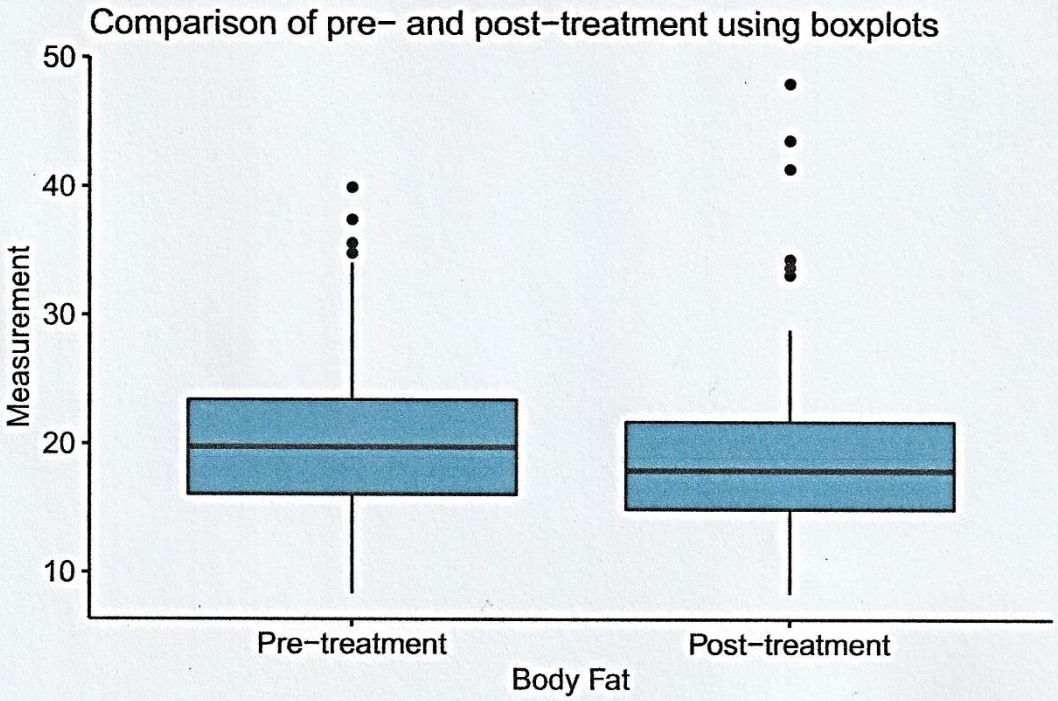
Proportion of missing values for post intervention: 28.42%.

Table 29: Summary statistics of pre-treatment: Body Fat

n	NA_count	Min	Max	Median	Mean	stdev	IQR
179	11	8.35	39.955	19.74	20.322	6.112	7.32

Table 30: Summary statistics of post-treatment: Body Fat

n	NA_count	Min	Max	Median	Mean	stdev	IQR
136	54	8.35	48.04	17.91	19.068	6.428	6.758



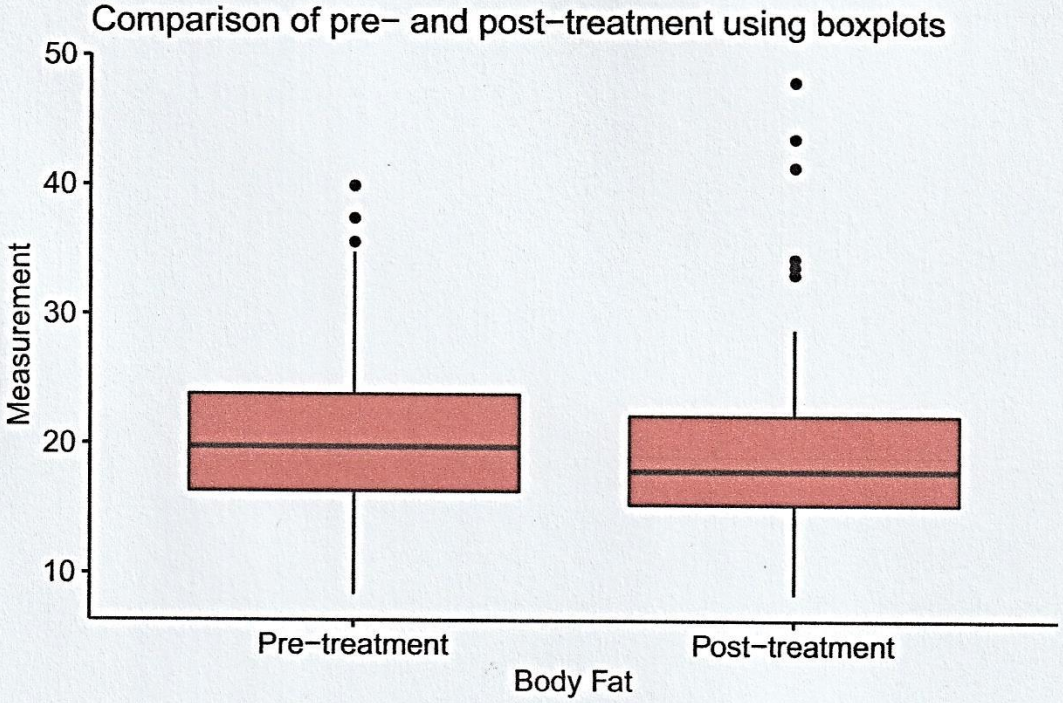
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 31: Summary statistics of pre-treatment: Body Fat

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	8.35	39.955	19.74	20.925	6.341	7.32

Table 32: Summary statistics of post-treatment: Body Fat

n	NA_count	Min	Max	Median	Mean	stdev	IQR
128	0	8.35	48.04	17.91	19.192	6.468	6.758



p-value for t-test = 0.382.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Body Fat is not significantly different from zero.

p-value for Wilcoxon Rank Sum test = 0.021.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that there is statistically significant evidence to show that the populations of pre treatment Body Fat are not equal as compared to the post treatment for Body Fat .

2.9 Sit-ups

Proportion of missing values for pre intervention: 4.21%.

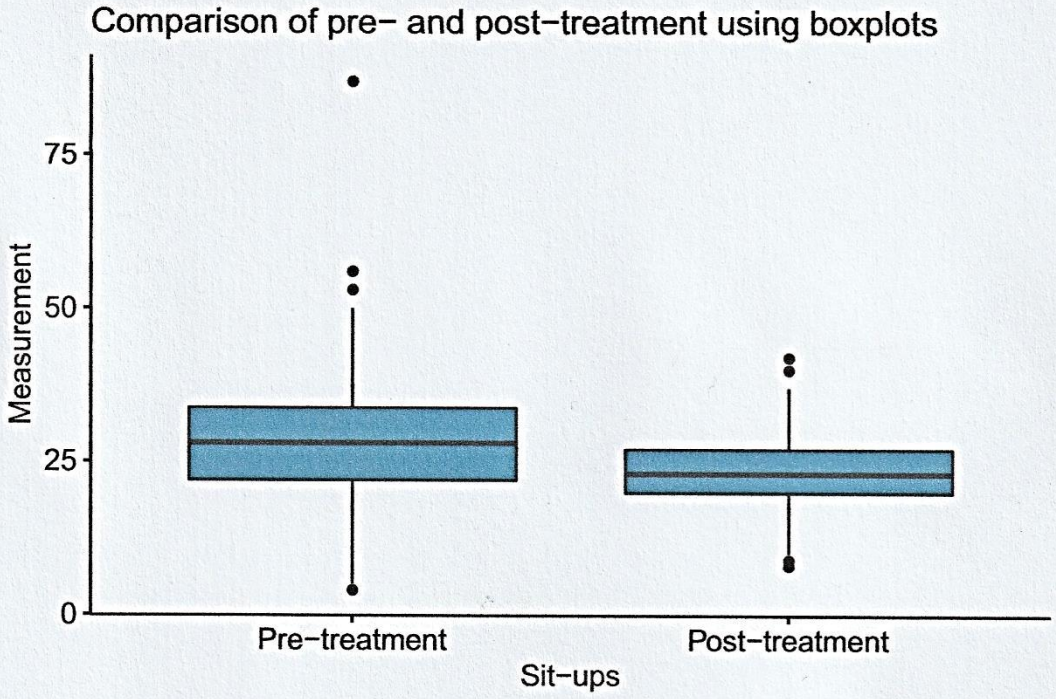
Proportion of missing values for post intervention: 43.16%.

Table 33: Summary statistics of pre-treatment: Sit-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
182	8	4	87	28	28.484	10.153	11.75

Table 34: Summary statistics of post-treatment: Sit-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
108	82	8	42	23	23.38	6.627	7



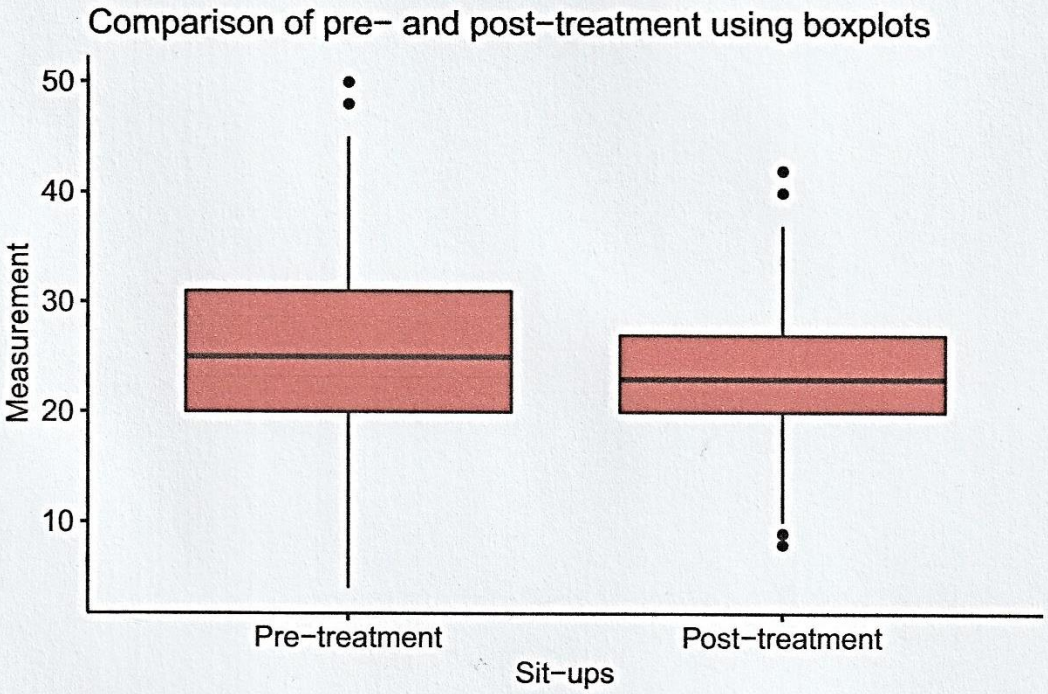
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 35: Summary statistics of pre-treatment: Sit-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
103	0	4	50	25	26.369	9.354	11.75

Table 36: Summary statistics of post-treatment: Sit-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
103	0	8	42	23	23.417	6.69	7



p-value for t-test = 0.051.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Sit-ups is not significantly different from zero.

p-value for Wilcoxon Rank Sum test < 0.0001.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that there is statistically significant evidence to show that the populations of pre treatment Sit-ups are not equal as compared to the post treatment for Sit-ups .

2.10 Push-ups

Proportion of missing values for pre intervention: 3.68%.

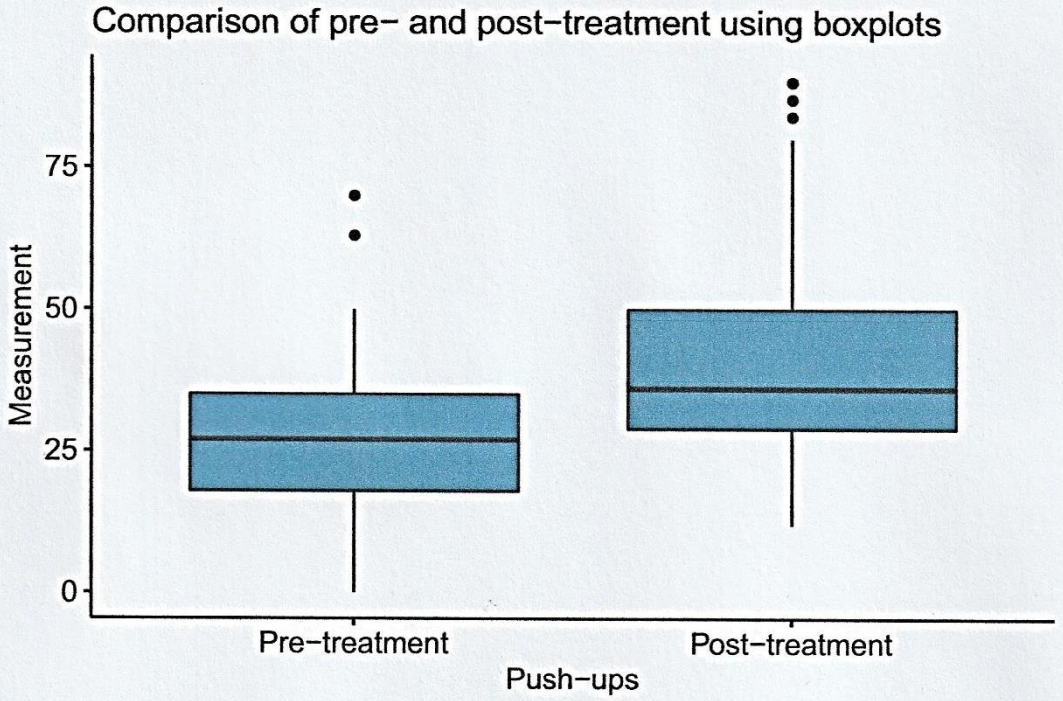
Proportion of missing values for post intervention: 18.42%.

Table 37: Summary statistics of pre-treatment: Push-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
183	7	0	70	27	26.612	11.712	17

Table 38: Summary statistics of post-treatment: Push-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
155	35	12	90	36	40.135	16.395	21



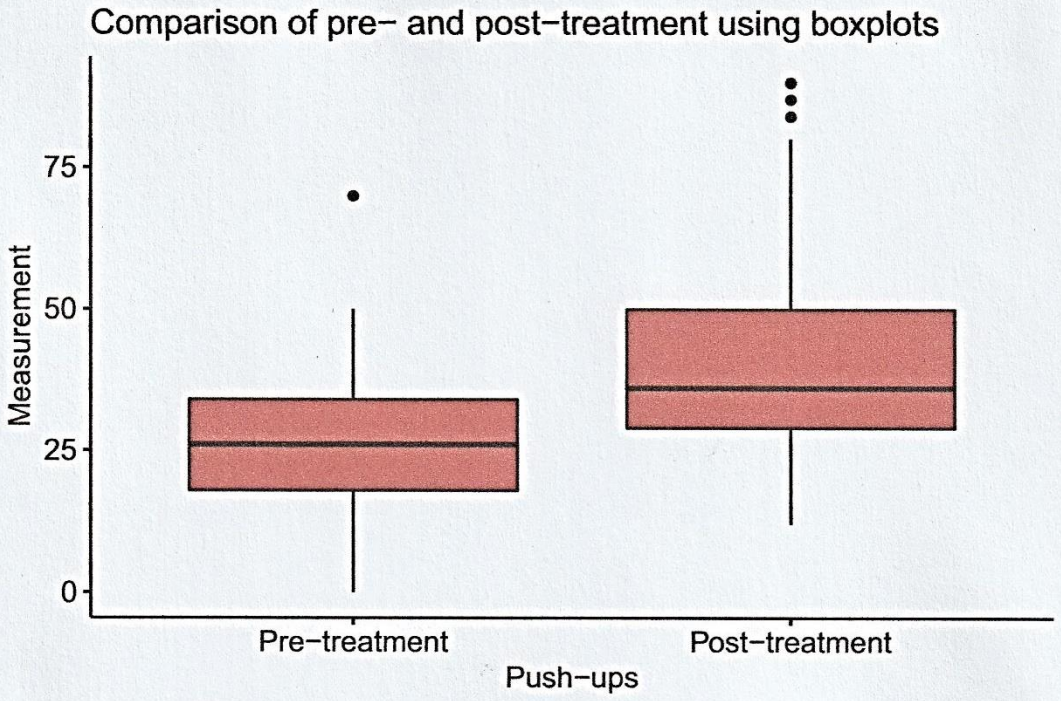
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 39: Summary statistics of pre-treatment: Push-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
149	0	0	70	26	26.221	11.576	17

Table 40: Summary statistics of post-treatment: Push-ups

n	NA_count	Min	Max	Median	Mean	stdev	IQR
149	0	12	90	36	40.309	16.552	21



p-value for t-test = 0.66.

Since the p-value is larger than 0.05, we do not reject the null hypothesis and conclude that the difference in means between pre and post treatment for Push-ups is not significantly different from zero.

p-value for Wilcoxon Rank Sum test < 0.0001.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that there is statistically significant evidence to show that the populations of pre treatment Push-ups are not equal as compared to the post treatment for Push-ups .

2.11 3min Step Test (15 second pulse)

Proportion of missing values for pre intervention: 13.16%.

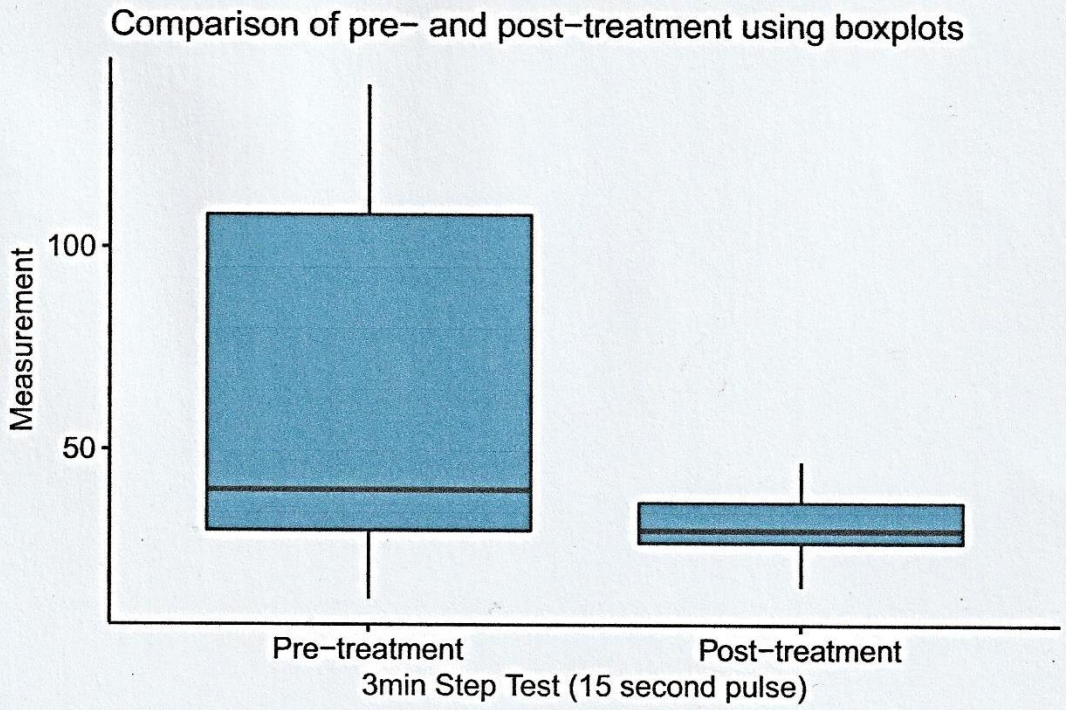
Proportion of missing values for post intervention: 81.58%.

Table 41: Summary statistics of pre-treatment: 3min Step Test (15 second pulse)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
165	25	13	140	40	63.861	38.967	78

Table 42: Summary statistics of post-treatment: 3min Step Test (15 second pulse)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
35	155	16	47	30	31.171	7.54	10



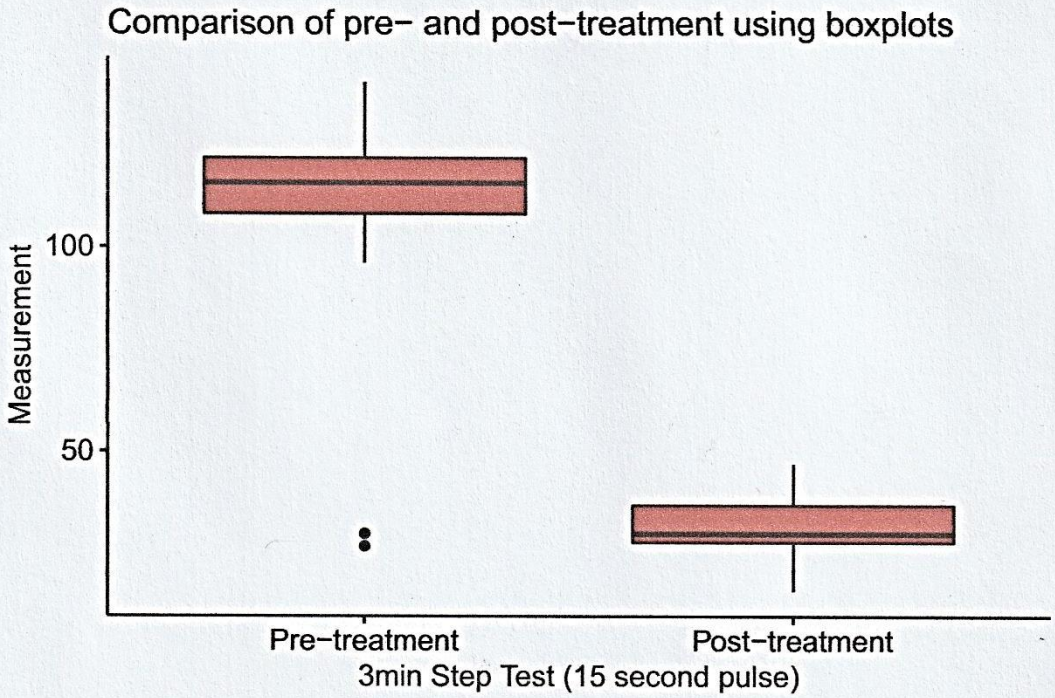
Only individuals with complete pre and post measurements were retained for testing. The summary statistics for these individuals are as follows.

Table 43: Summary statistics of pre-treatment: 3min Step Test (15 second pulse)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
30	0	27	140	115.5	109.933	25.152	78

Table 44: Summary statistics of post-treatment: 3min Step Test (15 second pulse)

n	NA_count	Min	Max	Median	Mean	stdev	IQR
30	0	16	47	30	31.067	7.52	10



p-value for t-test < 0.0001.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that the difference in means between pre and post treatment for 3min Step Test (15 second pulse) is significantly different from zero.

p-value for Wilcoxon Rank Sum test < 0.0001.

Since the p-value is smaller than 0.05, we reject the null hypothesis and conclude that there is statistically significant evidence to show that the populations of pre treatment 3min Step Test (15 second pulse) are not equal as compared to the post treatment for 3min Step Test (15 second pulse) .