

**PERSPECTIVES AND AWARENESS OF LEARNER
SEDENTARY CLASSROOM BEHAVIOUR AMONGST
PRIMARY SCHOOL TEACHERS IN SALDANHA,
WESTERN CAPE**

Liesl Jooste

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Supervisor: Dr Dawn Verna Ernstzen

Co-supervisor: Prof Quinette Abegail Louw

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DECLARATION

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ABSTRACT

Background: Primary school learners, globally and in South Africa, spend almost half of their daylight hours at school in traditional primary school classrooms with school chairs and tables which is consistent with high volumes of sitting. Sedentary behaviour amongst school-aged children is a global healthcare concern because it impacts several dimensions of health. It is vital to understand teachers' perspectives and awareness about sedentary classroom behaviour and its consequences on the health of learners. Interventions targeting sedentary classroom behaviour require teachers' input for effective design thereof and teachers' support for uptake and implementation of the interventions.

Aim: The research aimed to determine primary school teachers' perspectives and awareness of the effects of prolonged sedentary classroom behaviour on the health of primary school learners and, to explore potential strategies to address the impact of this behaviour in Saldanha, Western Cape Province of South Africa.

Methodology: An exploratory, descriptive qualitative study, with an interpretative and phenomenological approach, was conducted. Purposive sampling was used to identify and recruit primary school teachers from four public sector primary schools in Saldanha. The data collection occurred in person using semi-structured individual interviews and focus group discussions at each school. The interviews were audio-recorded, transcribed, and analysed using an inductive thematic approach.

Results: Thirty-six primary school teachers participated in the study (19 in individual interviews and 17 in the focus groups). The findings of this study indicate that participating primary school teachers were aware of the cognitive and behavioural effects and physical discomfort of prolonged sedentary time in the classroom. The participants were also aware of the effect that sitting posture can have on spinal health. The participants acknowledged that they were mostly unaware of the impact of prolonged sedentary classroom behaviour on the physical health of primary school children. Several interlinked factors influence the extent of sedentary behaviour in classrooms. The participating teachers elaborated on strategies they use to reduce sedentary time namely integrated, unstructured physical activity between lessons. Suggested future strategies to reduce sedentary time and its effects included curriculum change to create time for movement, restructuring of the classroom seating arrangements and the modification of the furniture to allow the interchangeable use of sitting with standing during lessons.

Conclusion: Primary school teachers who participated in the study were aware of the negative effects on cognition and behaviour due to prolonged sedentary time of learners in the primary school classroom. The participants were also aware of the effect that sitting posture can have on the health of the spine but mostly unaware of the negative consequences of sedentary classroom behaviour on the physical health of primary school learners. Participants identified the full curriculum and limited space in classrooms as two significant factors that influence sedentary behaviour in the classroom. Strategies proposed to address the impact of sedentary classroom behaviour involved changes in classroom activities and classroom physical organisation. Further research regarding the feasibility and acceptability of classroom interventions to address prolonged sedentary time in the classroom in the South African context is warranted.

OPSOMMING

Agtergrond: Laerskoolleerders, wêreldwyd en in Suid-Afrika, spandeer byna die helfte van hul dagligure op skool in tradisionele laerskoolklaskamers met skoolstoele en tafels, wat ooreenstem met die groot hoeveelheid sit. Sedentêre gedrag onder kinders van skoolgaande ouderdom is 'n wêreldwye gesondheidsorgprobleem omdat dit verskillende dimensies van gesondheid beïnvloed. Dit is noodsaaklik om onderwysers se perspektiewe en bewustheid oor sedentêre klaskamergedrag en die gevolge daarvan op die gesondheid van leerders te verstaan. Intervensies wat op sedentêre klaskamergedrag gerig is, vereis dat onderwysers se insette vir effektiewe ontwerp daarvan en onderwysers se ondersteuning vir die opname en implementering van die intervensies benodig.

Doel: Die navorsing het ten doel gehad om laerskoolonderwysers se perspektiewe en bewustheid ten opsigte van die gevolge wat langdurige sedentêre klaskamergedrag op die gesondheid van laerskoolleerders te bepaal, en om potensiële strategieë te ondersoek wat die impak van hierdie gedrag in Saldanha, Wes-Kaap Provinsie van Suid-Afrika, aanspreek.

Metodologie: 'n Verkennende, beskrywende kwalitatiewe studie, met 'n interpretatiewe en fenomenologiese benadering, is uitgevoer. Doelgerigte steekproefneming is gebruik om laerskoolonderwysers van vier openbare skole in Saldanha te identifiseer en te werf. Die data-insameling het persoonlik plaasgevind deur middel van semi-gestruktureerde individuele onderhoude en fokusgroepbesprekings by elke skool. Die onderhoude is deur middel van 'n induktiewe tematiese benadering benader, getranskribeer en geanaliseer.

Resultate: Ses en dertig laerskoolonderwysers het aan die studie deelgeneem (19 in individuele onderhoude en 17 in die fokusgroepe). Die bevindinge dui daarop dat deelnemende onderwysers op laerskool bewus was van kognitiewe en gedragseffekte en fisieke ongemak van langdurige sedentêre klaskamergedrag. Die deelnemers was ook bewus van die effek wat sitposisie op die spinale gesondheid kan hê. Die deelnemers het erken dat hulle meestal onbewus was van die impak van langdurig sedentêre klaskamergedrag op die gesondheid van laerskoolkinders. Verskeie interkoppelende faktore beïnvloed die omvang van sedentêre klaskamergedrag. Die deelnemende onderwysers het uitgebrei oor strategieë wat hulle gebruik om sit tyd te verminder, naamlik ongestruktureerde fisieke aktiwiteit tussen die lesse. Voorgestelde toekomstige strategieë om sit tyd en die gevolge daarvan te verminder, sluit in kurrikulumverandering om tyd te skep vir beweging, die herstrukturering van die sitplekke in die klaskamer en die aanpassing van die meubels om die om die wisselende gebruik van sit met staan tydens lesse moontlik te maak.

Gevolgtrekking: Laerskoolonderwysers wat aan die studie deelgeneem het, was bewus van die negatiewe effekte op kognisie en gedrag as gevolg van 'n lang sit tyd van leerders in die laerskoolklaskamer. Die deelnemers was ook bewus van die effek wat sitposisies op die gesondheid van die ruggraat kan hê maar meestal onbewus van die negatiewe gevolge van sedentêre klaskamergedrag op die gesondheid van laerskoolleerders. Deelnemers het die volledige kurrikulum en beperkte ruimte in klaskamers geïdentifiseer as twee belangrike faktore wat sedentêre gedrag in die klaskamer beïnvloed. Strategieë wat voorgestel is om die impak van sedentêre klaskamergedrag aan te spreek, het veranderinge in klaskameraktiwiteite en fisieke organisasie in die klaskamer behels. Verdere navorsing oor die uitvoerbaarheid en aanvaarbaarheid van klaskamerintervensies om langdurige sit tyd in die klaskamer in die Suid-Afrikaanse konteks aan te spreek, is geregtig.

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LIST OF DEFINITIONS

Classroom behaviour: Behaviours that support or hinder learning in the classroom, in other words, to keep or lose focus on a given task (Rasberry *et al.*, 2011).

Cognitive function: The mental processes that relay the decision-making function and influences educational outcomes (Rasberry *et al.*, 2011).

Foundation phase: The formal initial phase of school that includes Grades 1-3 (Statistical Publications: Education Statistics in South Africa, 2020).

Health: A position of bodily, psychological and general well-being in which diseases are absent (World Health Organization, 1948).

Integrated School Health Policy: A policy aimed at enhancing the well-being of children attending school and their respective communities in South Africa (South African Government, 2012).

Intermediate phase: Grades 4-6 (Statistical Publications: Education Statistics in South Africa, 2020).

Metabolic equivalent: One metabolic equivalent is the objective measure of energy expenditure at rest while awake (Singh, Pattisapu and Emery, 2019).

Non-communicable diseases: A disease that develops over a long time-span, commonly slow progressing, resulting from a combination of hereditary, physiological, natural and behavioural components (World Health Organization, 2014).

Overall sedentary time: Sedentary time in total spent across the whole day (Tremblay *et al.*, 2017).

Phenomenology: A research design from philosophy and psychology that focus on and describes the lived experiences of people regarding a phenomenon as expressed by individuals (Creswell, 2012).

Quintile group: The five groups public sector schools are divided into and funded depending on the socio-economic conditions of learners (Western Cape Education Department, 2013).

Resting metabolic rate: The energy expenditure of a person at rest (Singh, Pattisapu and Emery, 2019).

Screen time: Time used to watch television or the use of any other screen-based technology (Tremblay *et al.*, 2017).

Sedentary behaviour: Activities of an energy expenditure ≤ 1.5 metabolic equivalents, in reclining, lying or sitting while awake (Tremblay *et al.*, 2017).

Sedentary bout: A session of prolonged sedentary time (Altenburg and Chinapaw, 2015).

Sedentary break: The interruption in the time spend between sedentary activities (Tremblay *et al.*, 2017).

Sedentary patterns: The accumulation of time during sedentary pursuits throughout the day (Chinapaw *et al.*, 2014).

Sedentary time: The build-up of time in any environment during sedentary activities (Tremblay *et al.*, 2017).

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CHAPTER 1

INTRODUCTION AND RATIONALE

1.1 Background to the research question

A primary school learner's 24 hour day consists of school hours and after school hours and a rising public healthcare concern, regarding the risk of adverse health effects associated with prolonged sedentary behaviour, exists in this population (Carson *et al.*, 2016; van Ekris *et al.*, 2016; Canabrava *et al.*, 2019). Sedentary behaviour is described as activities with the energy use equal to or lower than 1.5 metabolic equivalents in reclining, lying or sitting, while awake (Sedentary Behaviour Research Network and Tremblay, 2012; Tremblay *et al.*, 2017). Most primary school learners, including South African learners, spend about 50% of their daylight hours at school (Western Cape Provincial School Education Act 12 of 1997, 1997).

Sedentary time in the school classroom contributes to the daily overall sedentary time of a school-aged child and is considered more uninterrupted when contrasted with the after school period (Routen, 2011; Abbott, Straker and Mathiassen, 2013; Clemes *et al.*, 2016). Studies in parts of the world reported primary school learners' sedentary time in the school classroom to be about 50% - 70% per day (Ridgers *et al.*, 2012; Aminian *et al.*, 2014; Clemes *et al.*, 2016). There are currently no studies available about sedentary time in the South African school classroom. Nevertheless, South African primary school classrooms contain seated desks and chairs in a row by row format, from the front to the back of the classroom which is consistent with high volumes of sitting.

Prolonged sedentary behaviour impacts several aspects of health, including having an impact on body composition, musculoskeletal health, fitness and cognitive functioning (van Ekris *et al.*, 2016; Carson *et al.*, 2016; Canabrava *et al.*, 2019). Furthermore, the involvedness of the health risk depends on the type of sedentary behaviour, the age group studied, as well as the duration of the sedentary session (De Rezende *et al.*, 2014). The existing literature report on the association of health effects with screen-based sedentary behaviour, which is also frequently used as a proxy marker of overall sedentary time (Chinapaw, Altenburg and Brug, 2015; van Ekris *et al.*, 2016; Canabrava *et al.*, 2019). Therefore, a need exists to investigate the impact of sedentary behaviour in a different domain such as the primary school classroom and health effects. Given that teachers are experts of the classroom environment, and familiar with learner sedentary behaviour, they are key stakeholders to consult when investigating about sedentary classroom behaviour and its

consequences on the health of learners, factors that influence sedentary behaviour in primary school classrooms, and for designing the rollout of classroom-based preventative strategies (Laine *et al.*, 2017).

It is important to consider strategies to prevent prolonged sedentary time and its resultant health effects as a prevention strategy. Additionally, such information on strategies may inform the Integrated School Health Policy of South Africa (South African Government, 2012), since this policy aims to strengthen the health services of schools by providing a comprehensive service addressing holistic learner health. Before starting interventions to address sedentary classroom behaviour in the South African context, knowledge is needed about the primary school teachers' perspectives and awareness regarding the effects of prolonged sedentary classroom behaviour on the health of learners. Therefore, this study aimed to determine primary school teachers' perspectives and awareness about the effects of prolonged sitting in class on the health of learners and to determine their views on potential classroom-based interventions aimed at reducing prolonged sitting and its effects. To the knowledge of the researcher, no qualitative study has been done to explore the perspectives of teachers regarding the effects of sedentary classroom behaviour.

1.2 The rationale for the study

The findings from this study could assist with:

- i. Gaining an understanding of the existing awareness of primary school teachers in South Africa about the effects of sedentary classroom behaviour on the health of primary school learners. This information could guide future interventions regarding health in school teacher training curricula or prospects for continuous professional development.
- ii. Understanding the presence and nature of factors that influence sedentary time in primary school classrooms.
- iii. Informing the research base regarding strategies for mitigating sedentary time in primary school classrooms in South Africa
- iv. Informing the development of effective classroom-based interventions in the South African context for mitigating sedentary classroom behaviour and promotion of health in the school-aged child. These findings may be incorporated into the integrated school health policy.

1.3 Significance of the study

This study is important in that it aims to contribute to the field of sedentary behaviour in the following ways:

To the knowledge of the researcher, this is the first study to investigate sedentary classroom behaviour in the South African context and additionally, the first study that focused on teachers' perspectives on learner sedentary behaviour in the classroom. This study may therefore provide novel information on the characteristics and consequences of sedentary classroom behaviour, as well as provide preliminary information on context-specific related strategies that may address this behaviour in the classroom.

Since the primary school-aged child spends 50% of their waking hours at school one anticipated outcome of this study, is to identify the determinants of sedentary behaviour in the primary school classroom to advance the knowledge in the field of sedentary behaviour.

A second anticipated outcome, on a practical level, is to provide information on a potential, feasible classroom-based solution to sedentary classroom behaviour based on the input of the teachers in the South African context.

The South African government undertook a strategic plan to prevent non-communicable diseases and promote health at all levels in the population (South African National Department of Health, 2013) because continued attempts on the prevention of non-communicable diseases are needed (Nojilana *et al.*, 2016). However, reducing sedentary behaviour is not one of the targets of this strategic plan. The scarcity of published data regarding sedentary behaviour and its impact on the health of the school-aged population in the South African context is regrettable. Therefore, an additional intended outcome is to add to the literature of sedentary behaviour in the South African context, specifically of the school-aged population in the classroom environment, because this type of data is required for policy-making of preventative strategies and lifestyle education from an early phase.

1.4 The research question, aim and objectives

The formulated research question for this study was as follows:

What are the perspectives and awareness of primary school teachers about the effects of sedentary classroom behaviour on the health of primary school learners and potential strategies to address the effects?

To be able to answer the above research question, the overall aim of this study was to determine the perspectives and awareness of primary school teachers about the effects of prolonged sedentary classroom behaviour on the health of primary school learners and to explore potential strategies to address the impact of this behaviour.

The study focused to achieve the following objectives:

- To determine primary school teachers' awareness about the effects of prolonged sitting on the health of primary school children.
- To explore teachers' perspectives about the factors that influence prolonged sedentary time in the school classroom.
- To explore teachers' perspectives of potential strategies to address prolonged sedentary classroom behaviour.

1.5 Design and methodology

An explorative, qualitative, descriptive study with an interpretive research paradigm and a phenomenological approach was conducted to explore primary school teachers perspectives and awareness of sedentary classroom behaviour and its effect on the health of primary school learners and possible strategies to address the impact of this behaviour in Saldanha, Western Cape South African (van Manen, 1997; Creswell, 2014). Purposive sampling was employed, and thirty-six teachers participated in the study (Creswell, 2014). Semi-structured interviews in the form of individual face-to-face interviews and focus group discussions were conducted (Gill *et al.*, 2008). The two methods were used in combination to gain more insight in the concepts that needed clarification and for the triangulation of the methods, to ensure credibility of the findings (Carter *et al.*, 2014). A demographic questionnaire was completed before the interviews. Inductive, thematic analysis was employed (Braun and Clarke, 2006).

1.6 Delimitations of the study

The scope of this study limited it to teachers in the foundation and intermediate phases in public-sector primary schools in Saldanha, of the West Coast District. In the majority of primary schools in South Africa, learners in the foundation and intermediate phases remain in one classroom with the same teacher for most of the school day. The study outcomes might not be generalisable, as the

environment of other towns as well as the institutional arrangements of the other schools might differ from that of Saldanha.

1.7 Overview of the thesis structure

This thesis has seven chapters and presents in the following order:

Chapter One: The introductory chapter introduces the study background, rationale, aim, objectives, an overview of the design and methodology as well as delimitations.

Chapter Two: The literature review presenting the literature on the concept and definition of sedentary behaviour, the related health effects in the school-aged population and classroom interventions.

Chapter Three: A complete description of the design and methodology used to complete this qualitative study.

Chapter Four: The presentation of the analysis and findings of the individual interviews of this qualitative study.

Chapter Five: The presentation of the analysis and findings of the focus group discussions of this qualitative study.

Chapter Six: The discussion, a combination of the findings of the individual interviews and the focus group discussions of this qualitative study, in the context of existing literature. The implications, limitations and recommendations of the findings for future research are provided.

Chapter Seven: The conclusion, the closing display of the study findings and presentation of the contribution of this study to the body of evidence. Figure 1.1 illustrates the thesis structure.

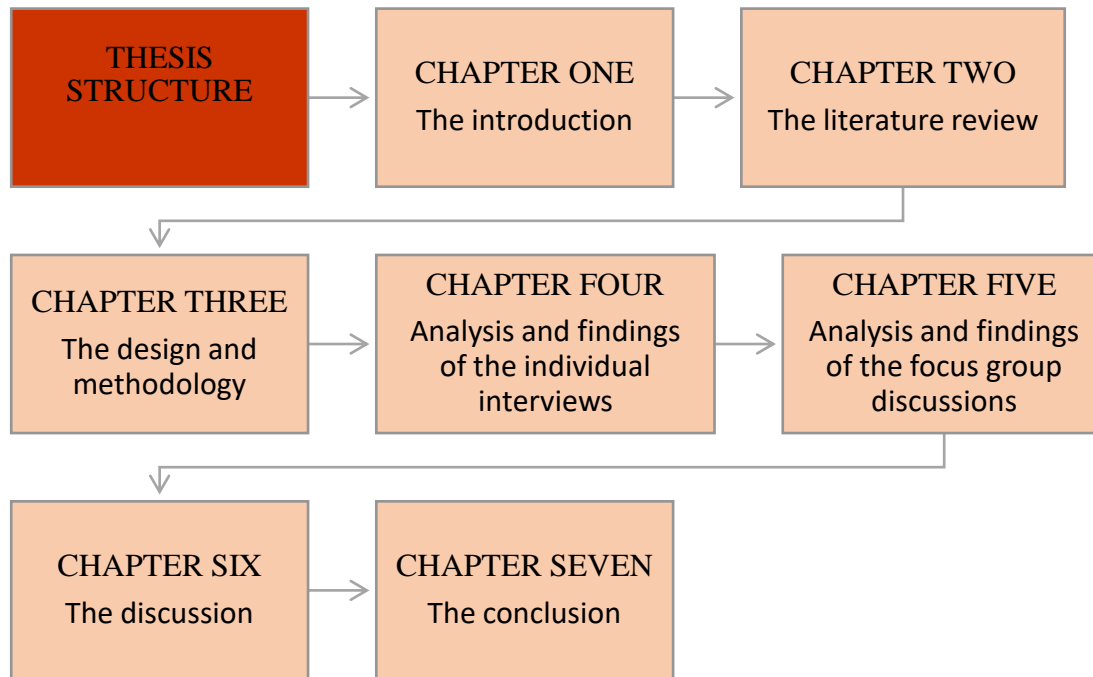


Figure 1.1: Structure of the thesis

1.8 Summary

This chapter provides the introduction to this study and includes the background and rationale that give initiation to the study, after which the significance of the study followed to underline the particular relevant aspects. Subsequently, the research question, the overall aim and objectives were stated. The final section of the chapter consisted of a discussion about the research design and methodology, sampling of participants, data collection and analysis and structure of the thesis. The next chapter will look at the relevant literature that informs this study.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter presents the review of the literature that examines sedentary behaviour in terms of its definition, the novelty of the research field, the amount of sedentary time in the primary school classroom, the types of sedentary behaviour and the determinants of sedentary behaviour in school-aged children. Thereafter, the health indicators of extensive sitting on the school-aged children are discussed. The awareness of teachers about the health effects of sedentary behaviour is mentioned. Then a discussion of current interventions used in the classroom to reduce sedentary time follows. An outline of the primary school classroom follows that look at the classroom environment and the position of the teacher. Finally, an overview describing the education in public held South African schools follows and the chapter ends with the chapter summary.

2.2 Sedentary behaviour

2.2.1 The definition of sedentary behaviour

Sedentary behaviour is defined as “any waking behaviour characterized by an energy expenditure ≤ 1.5 metabolic equivalents, while in a sitting, reclining or lying posture” (Tremblay *et al.*, 2017). This current definition of sedentary behaviour is appropriate for the paediatric population because the sedentary activities in children are found consistent with the current 1.5 metabolic equivalent definition (Harrell *et al.*, 2005; Reilly *et al.*, 2015).

Currently, experts observe sedentary behaviour as a unique phenomenon with distinct effects on human bodily function, metabolism and health (Hamilton *et al.*, 2008; Pate, O’Neill and Lobelo, 2008; van der Ploeg and Hillsdon, 2017). Sedentary behaviour, in essence, consists of two components, namely little energy consumption and the type of conduct in a particular posture as defined above (Pate, O’Neill and Lobelo, 2008; Sedentary Behaviour Research Network and Tremblay, 2012; Tremblay *et al.*, 2017). Although the research in the field of sedentary behaviour has grown, the discussion of whether sedentary behaviour is just physical inactivity by another name continues within the scientific community (van der Ploeg and Hillsdon, 2017; Thivel *et al.*, 2018). Sedentary behaviour and physical inactivity both coexist within the continuum of activities that make up the waking hours (Tremblay *et al.*, 2010). Therefore, physical inactivity is not the same as sedentary behaviour because both are independent constructs of physical activity (Sedentary Behaviour Research Network and Tremblay, 2012; Tremblay *et al.*, 2017; van der Ploeg and Hillsdon, 2017).

Physical inactivity is an inadequate amount of moderate-to-vigorous-intensity physical activity (Sedentary Behaviour Research Network and Tremblay, 2012; Tremblay *et al.*, 2017). The description of physical activity is any movement caused by the energy-producing muscular function above the resting metabolic rate (World Health Organization, 2015; Thivel *et al.*, 2018). The resting metabolic rate corresponds to one metabolic equivalent which is in essence, the measure of the rate at which a person consumes energy at rest while awake (Jetté, Sidney and Blümchen, 1990; Singh, Patisapu and Emery, 2019). It is essential to consider that physical activity has three distinct intensity levels grouped according to metabolic equivalents (Pate, O'Neill and Lobelo, 2008; Ainsworth *et al.*, 2011). The three groups of physical activity are vigorous-intensity physical activity, moderate-intensity physical activity and light-intensity physical activity (Pate, O'Neill and Lobelo, 2008; Ainsworth *et al.*, 2011). Vigorous-intensity physical activity measures six or more metabolic equivalents; an example is running (Ainsworth *et al.*, 2011). Moderate-intensity physical activity consumes energy between 3 and 5.9 metabolic equivalents; an example is brisk walking (Ainsworth *et al.*, 2011). The light-intensity physical activity includes static activities, for instance, standing as well as light ambulatory activities at an energy consumption of 1.6 to 2.9 metabolic equivalents (Ainsworth *et al.*, 2011).

In review, it is evident that sedentary behaviour is an independent construct in the physical activity compendium, not the same as physical inactivity and not opposite to physical activity as illustrated in Figure 2.1 (Pate, O'Neill and Lobelo, 2008; Tremblay *et al.*, 2017; van der Ploeg and Hillsdon, 2017; Thivel *et al.*, 2018).

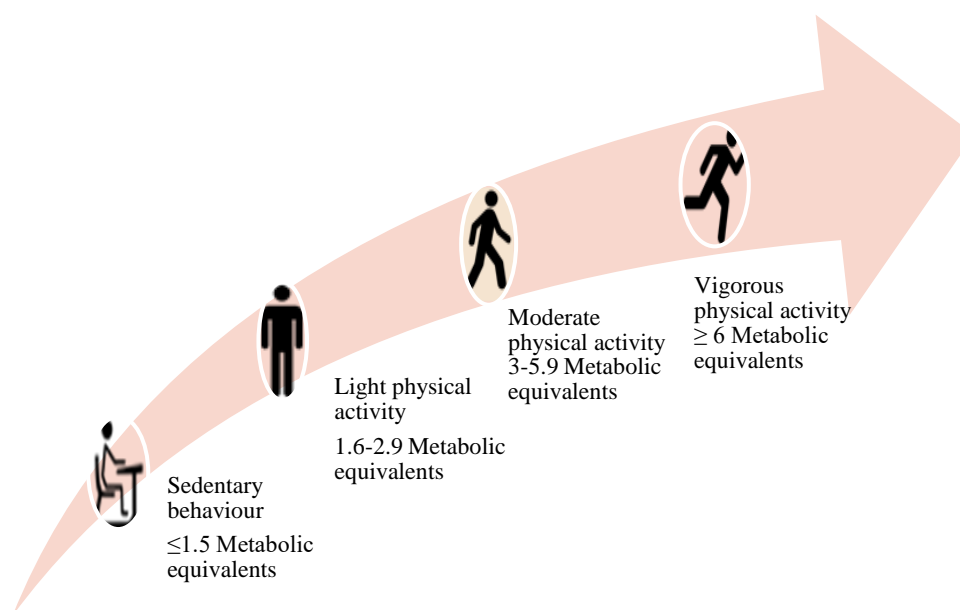


Figure 2.1: Illustration of sedentary behaviour relative to other activity intensities

Source: (Author)

2.2.2 Sedentary behaviour a new risk factor to health

Sedentary behaviour, particularly prolonged sitting as a research field, became apparent based on the duration of sitting in modern-day society and the relative deleterious health risks (Hamilton *et al.*, 2008; Salmon, Arundell, *et al.*, 2011; Biddle *et al.*, 2016). For many decades people sat less because their lives entailed hard physical work that was equal to the high energy consumption of moderate to vigorous-intensity physical activity (Brownson, Boehmer and Luke, 2005; Dunstan *et al.*, 2010; Church *et al.*, 2011). However, changes brought by the technological revolution and a transformation in various contexts such as transportation, the home environment and the workplace, negatively affect the patterns of sitting and daily energy expenditure as people increasingly sit more (Biddle *et al.*, 2004; Brownson, Boehmer and Luke, 2005; Hamilton, Hamilton and Zderic, 2007).

Experts instituted recommendations for daily physical activity of moderate to vigorous intensity to increase the physical activity levels and energy expenditure for health benefits (Pate *et al.*, 1995; Haskell *et al.*, 2007; World Health Organization, 2010). It is well known that moderate to vigorous physical activity associate with reduced adverse health risks (Biddle, Gorely and Stensel, 2004; Janssen and LeBlanc, 2010; Poitras *et al.*, 2016). However, further studying revealed a complicated, relationship between health, energy costs and physical activity (Hamilton *et al.*, 2008; Matthews *et al.*, 2012). Of concern is the coexistence of sedentary behaviour and physical activity of moderate-to-vigorous intensity because moderate to vigorous intensity physical activity do not fully diminish the health risks linked to uninterrupted sitting, even with the recommended moderate to vigorous-intensity physical activity met (Hamilton *et al.*, 2008; Matthews *et al.*, 2012; Thivel *et al.*, 2018).

Subsequently, over the last two decades, sedentary behaviour became known as a new risk factor to health and became research, clinical and policy interest (Owen *et al.*, 2000; Owen, Sparling, *et al.*, 2010; Dunstan *et al.*, 2012; Stierlin *et al.*, 2015; Biddle, García Bengoechea and Wiesner, 2017). Sedentary behaviour research is still relatively novel, the publications increased exponentially from the early 2000s, with more than fifty percent from 2010 (Stierlin *et al.*, 2015; Biddle *et al.*, 2019; Stamatakis *et al.*, 2019). The evidence that excessive sedentary time contributes to the risk of specific health implications in the school-aged, separately of inactivity, is mounting (Chinapaw, Altenburg and Brug, 2015b; Carson *et al.*, 2016; Cliff *et al.*, 2016; Canabrava *et al.*, 2019).

2.2.3 Sedentary time in the primary school classroom

The school hours are a significant contributor to the overall sedentary time of children (van Stralen *et al.*, 2014; Clemes *et al.*, 2016; da Costa *et al.*, 2019). Primary school hours make up about half of the school child's day time hours (12 hours) (Aminian, Hinckson and Stewart, 2015; Morton *et al.*,

2016), consistent with the 5.5 hours of South African primary schools (*Western Cape Provincial School Education Act 12 of 1997, 1997*).

Four studies reported on the sedentary time accumulated in the primary school classroom (Ridgers *et al.*, 2012; Aminian *et al.*, 2014; Clemes *et al.*, 2016). The most recent study, Clemes *et al.*, (2016) conducted two similar studies in Australia and the United Kingdom and indicated that 9-10-year-old primary school learners from the United Kingdom spent 70% of the class time sedentary. The Australian 11-13-year-old primary school learners' sedentary time in class amounted to 62% (Clemes *et al.*, 2016). Another Australian study with younger participants, 8-12 years old, found the classroom sedentary time to be 62% (Ridgers *et al.*, 2012). Aminian *et al.* (2014) conducted a study in New Zealand with 5-11-year-old primary school learners and indicated that 49% of class time was spent sedentary. All studies measured the sedentary time in the classroom objectively, using the ActivPal accelerometer (Ridgers *et al.*, 2012; Aminian *et al.*, 2014; Clemes *et al.*, 2016).

At present, there is no published data about objective measured sitting time in the school classroom from any of the low and middle-income countries, including South Africa (van Niekerk, Fisher and Louw, 2017).

2.2.4 Types of sedentary behaviour

Sitting is the most common sedentary behaviour displayed by individuals of all ages across the globe (Owen, Healy, *et al.*, 2010) and described in different contexts such as sitting during class at school, during motorized transport as well as at home during the discretionary time (Owen, Bauman and Brown, 2009; Salmon, Tremblay, *et al.*, 2011; Owen, 2012). However, sedentary behaviour is quantified by two major sedentary markers, namely overall sedentary behaviour, and screen-based sedentary behaviour (Carson *et al.*, 2016; Saunders *et al.*, 2017). Screen-based sedentary behaviour is the most common type among school-aged children, consequently also mostly studied (Biddle *et al.*, 2009) and frequently used as a proxy marker of overall sedentary time (total sedentary time spent across the entire day) (Tremblay *et al.*, 2011; Verloigne *et al.*, 2013; Chinapaw, Altenburg and Brug, 2015a). However, screen-time is not indicative of the overall sedentary time of school-aged children because it is a type of sedentary behaviour (Biddle *et al.*, 2009; Verloigne *et al.*, 2013). Furthermore, it is not only overall sedentary time that is a concern to health but also the patterns of sedentary time accumulation (Healy *et al.*, 2011). Therefore, more research is required for other sedentary types, such as sedentary classroom behaviour.

2.2.5 Determinants of sedentary behaviour in school-aged children

The understanding of the factors influencing sedentary behaviour is essential to lessen the potential negative impact and to advise the development of prospective interventions (Sallis, Prochaska and Taylor, 2000; Brug and Chinapaw, 2015). Due to the belief that numerous factors in various areas interconnect to compel sedentary behaviour, the classification of the determinants of sedentary behaviour are in four domains within the social-ecological framework applied by Sallis et al., namely (1) individual; (2) interpersonal; (3) environmental and (4) policy (Sallis, Prochaska and Taylor, 2000; Uijtdewilligen *et al.*, 2011). The most current systematic review on determinants of sedentary behaviour in children reported that the available data is finite (Stierlin *et al.*, 2015). This lack of knowledge on the determinants of sedentary behaviour was confirmed recently (De Craemer *et al.*, 2018).

2.2.5.1 Individual domain

The few determinants for sedentary behaviour identified for primary school children in the individual domain are age and gender because children become more sedentary as they age and girls are slightly more sedentary than boys (van Stralen *et al.*, 2014; Janssen *et al.*, 2016). This observation in age and gender-related to sedentary behaviour in children in South Africa are consistent with longitudinal data from a study investigating the patterns of sedentary behaviour, sleep and physical activity in urban South African children from birth to young adulthood done in Soweto, Johannesburg (Hanson *et al.*, 2019). A study in England of longitudinal data published in 2016, showed that the daily average increase in sedentary behaviour for seven to nine-year-olds is by 4.2 %, for nine to twelve-year-olds by 9.2 % and twelve to fifteen-year-olds by 8.8 % (Janssen *et al.*, 2016). The increase in the sedentary time among the nine to twelve-year-olds is the greatest (Janssen *et al.*, 2016). To date, the focus was entirely on the individual domain and less on the other areas (De Craemer *et al.*, 2018).

2.2.5.2 Interpersonal

In the interpersonal domain, ethnicity is suggested as a determinant for sedentary behaviour because non-white individuals are subjectively measured to be more sedentary (Brodersen *et al.*, 2007; McVeigh and Meiring, 2014). However, no reasons for the difference in ethnicity were provided. Stierlin et al., (2015) reported an inconsistency and a lack of evidence for most social determinants exist.

2.2.5.3 Environmental domain

A recent study published in 2017 reported that the most critical determinants of sedentary behaviour in school-aged children are related to the interpersonal and environmental domains (Hidding *et al.*, 2017). The school is one of the essential settings in the environmental domain for sedentary behaviour because of the amount of time children spend there (Hidding *et al.*, 2017). Hidding *et al.* distinctly pointed to the issue that sitting is a social norm and often seen as the ideal posture to work in at school (Hidding *et al.*, 2017). Clemes *et al.*, (2018) further stated that school classrooms are equipped with standard desks and chairs, and children are expected to sit throughout most lessons, which impact the extent of sedentary time.

2.2.5.4 Policy domain

Currently, limited evidence on national sedentary behaviour policies exists (Klepac Pogrmilovic *et al.*, 2020). However, (Klepac Pogrmilovic *et al.*, 2020) investigated national sedentary behaviour and physical activity policies in 76 countries of African; European; Eastern Mediterranean; the Americas; South-East Asia and Western Pacific regions, and concluded that national sedentary policies are generally less available and comprehensive. Forty percent (95% CI: 29, 52) of countries have sedentary behaviour guidelines (Klepac Pogrmilovic *et al.*, 2020). The development of sedentary behaviour policies is better in high-income countries, such as countries of European and Western-Pacific regions, compared with low and middle-income countries (Klepac Pogrmilovic *et al.*, 2020). No sedentary behaviour guidelines for South Africa could be found. The development and implementation of comprehensive and effective sedentary behaviour policies are necessary, particularly in low and middle-income countries to mitigate sedentary time (Klepac Pogrmilovic *et al.*, 2020).

2.3 Health indicators in school-aged children related to sedentary behaviour

An overview of systematic reviews in 2014, related to the health effects of sedentary behaviour, indicated that the complexity of health effects depends on the type of sedentary behaviour, the age group studied, as well as the duration of the sedentary session (De Rezende *et al.*, 2014). Over the past decade, many systematic reviews of cross-sectional, randomised controlled studies and a few longitudinal studies reported on the association of sedentary behaviour with the health of the school-aged population (Chinapaw *et al.*, 2011; Tremblay *et al.*, 2011; Fröberg and Raustorp, 2014; Cliff *et al.*, 2016; van Ekris *et al.*, 2016; Carson *et al.*, 2016; Canabrava *et al.*, 2019). Systematic reviews are grouped by health indicator, namely body composition, cardiovascular risk factors; fitness; bone health, cognition, and educational achievement. However, the existing evidence reported only on overall sedentary time and screen-based sedentary time as indicators for sedentary

behaviour in the school-aged population (Tremblay *et al.*, 2011; Canabrava *et al.*, 2019). Therefore, more research is required regarding sedentary behaviour in the school classroom. The key findings of the systematic reviews are described by the health indicators in school-aged children below.

2.3.1 Body composition

Body composition refers to overweight and obesity, which is measured by body mass index, skin fold thickness, waist circumference or fat percentage (Tremblay *et al.*, 2011).

Van Ekris *et al.* (2016) reported strong evidence for the relationship between screen-based sedentary behaviour and body mass index and overweight/obesity but insufficient evidence for overall sedentary time. Carson *et al.*, (2016) also reported a strong association between sedentary behaviour and body mass index and obesity. Tremblay *et al.* (2011) reported that screen-based sedentary behaviour is associated with an increased risk for overweight/obesity. Chinapaw *et al.*, (2011) reported insufficient evidence for a relationship between sedentary behaviour and obesity. Fröberg and Raustorp, (2014) and Cliff *et al.*, (2016) also reported an insufficient relationship between sedentary behaviour of school-aged children. Canabrava *et al.*, (2019) reported no association between overall sedentary time and body mass index, waist circumference and body fat but a relationship with screen-based sedentary time exist. These reviews concluded that strong evidence exists for a relationship between prolonged screen-based sedentary behaviour and overweight/obesity in children but insufficient evidence for an association with overall sedentary time.

2.3.2 Cardio-metabolic disease risk factors

There are four metabolic risk markers namely, elevated blood pressure, high triglycerides, decreased high-density lipoprotein cholesterol and elevated fasting plasma glucose (Alberti, Zimmet and Shaw, 2006). Metabolic syndrome is the categorisation of metabolic risk markers described as fat around the centre of the body as well as two of the four metabolic risk markers (Alberti, Zimmet and Shaw, 2006).

Tremblay *et al.* (2011) reported that screen-based sedentary behaviour is associated with higher cholesterol levels and systolic blood pressure. Chinapaw *et al.*, (2011) reported insufficient evidence for a relationship between screen-based sedentary behaviour and triglycerides and elevated blood pressure. Van Ekris *et al.*, (2016) reported no evidence for an association between overall sedentary behaviour and screen-based sedentary time with triglycerides, blood pressure and plasma glucose. However, a strong association for an inverse relationship with high-density lipoprotein cholesterol and overall sedentary time exist. Canabrava *et al.*, (2019) indicated that

prolonged overall sedentary time is not associated with elevated insulin levels, triglycerides, blood pressure or decreased high-density lipoprotein cholesterol. However, Canabrava et al., (2019) reported an association between screen-based sedentary behaviour and all four cardiovascular risk markers. Carson et al., (2016) reported an association between screen-based sedentary time and elevated cholesterol levels and blood pressure. Cliff et al., (2016) reported no association between any of the cardiovascular risk markers. These reviews concluded that weak evidence exists for a relationship between prolonged screen-based sedentary behaviour and the individual cardiovascular risk factors because these factors are inconsistent across studies.

2.3.3 Fitness

Fitness is also associated with the health of children and the typical components used to measure fitness is physical fitness in general, the maximum rate of oxygen consumption during incremental exercise, cardio-respiratory fitness, and muscular strength (Tremblay *et al.*, 2011; Carson *et al.*, 2016; van Ekris *et al.*, 2016).

Tremblay et al (2011) reported that screen-based sedentary behaviour is associated with decreased fitness. Chinapaw et al., (2011) reported that a moderate inverse relationship exists between screen-based sedentary behaviour and fitness or maximum rate of oxygen consumption. Van Ekris et al., (2016) found strong evidence for an inverse relationship with cardiorespiratory fitness or maximum rate of oxygen consumption and overall sedentary time but insufficient evidence for screen-based sedentary time. Carson et al., (2016) reported that prolonged sedentary behaviour was associated with reduced overall physical fitness, the maximum rate of oxygen consumption, cardiorespiratory fitness, and musculoskeletal fitness. Cliff *et al.*, (2016) reported no association between overall sedentary behaviour and all the typical components of fitness. These reviews concluded that inverse relationship exists between sedentary behaviour and fitness.

2.3.4 Bone health

The bone mineral content is generally called the bone mass and increases significantly during childhood, peaking when the final height is reached (International Osteoporosis Foundation, 2020).

Tremblay et al (2011) reported that screen-based sedentary behaviour is associated with less favourable bone health. Chinapaw et al., (2011) reported that insufficient evidence for a relationship between screen-based sedentary behaviour and bone health exist. Van Ekris et al., (2016) reported that no relationship exists between bone health and overall sedentary time but insufficient evidence for screen-based sedentary time. Koedijk *et al.*, (2017) demonstrated that moderate evidence exists for a negative relationship between overall sedentary time and lower extremity bone outcomes but

strong evidence for no relationship between total body bone outcomes in school-aged children. Koedijk *et al.*, (2017) further reported no relationship exists between lumbar spine bone outcomes and sedentary behaviour. In addition, no association exists between subjectively measured total sedentary time and lower extremity or total body bone outcomes (Koedijk *et al.*, 2017). Cliff *et al.*, (2016) and Chinapaw *et al.*, (2011) reported that there is currently inconclusive evidence about the relationship between sedentary time and bone health. These reviews concluded that the relationship between sedentary behaviour and bone health is inconclusive.

2.3.5 Musculoskeletal conditions

Musculoskeletal disorders are painful conditions in the musculoskeletal system (Henschke *et al.*, 2014; Kamper *et al.*, 2016). Musculoskeletal pain is widespread in preadolescent populations (El-Metwally *et al.*, 2005, 2007). Prevalence differs by age and the type of musculoskeletal pain (Kamper *et al.*, 2016). Musculoskeletal disorders are the fourth leading health problem of the global population (Hoy *et al.*, 2010; Morris *et al.*, 2018), with teenagers accounting for 15% of the low back pain population (Louw, Morris and Grimmer-Somers, 2007; Morris *et al.*, 2018).

Low back pain is one of the musculoskeletal disorder that is a grave and growing public health burden in children and adolescents (Calvo-Muñoz, Gómez-Conesa and Sánchez-Meca, 2013; Macedo *et al.*, 2015) with a relatively high prevalence among the school-aged (Minghelli, 2017). Although the risks for back pain in learners are multi-factorial (Minghelli, 2017) uninterrupted sitting is an established risk factor (Oyewole, Haight and Freivalds, 2010). Uninterrupted sitting may also lead to the onset of neck pain early in life (Kjaer *et al.*, 2011; Aartun *et al.*, 2014), and progressive development differs for individual sections of the spine (Kjaer *et al.*, 2011).

2.3.6 Cognitive function

Cognitive function is the mental processes that relay the decision-making function and influences educational outcomes (Rasberry *et al.*, 2011).

Tremblay *et al.* (2011), Carson *et al.*, (2016) and Chinapaw *et al.*, (2011) reported that screen-based sedentary behaviour is associated with attention difficulties and lower academic achievement. Cliff *et al.*, (2016) reported the inconclusive association between cognition and overall sedentary behaviour exist.

Prolonged sitting could lead to increased fatigue which may lead to difficulty to concentrate and focus on required tasks (Boksem, Meijman and Lorist, 2005). However, data linking sedentary behaviour and fatigue are needed (Wennberg *et al.*, 2016).

2.4 Teachers' awareness of the health effects of sedentary behaviour

To the knowledge of the researcher, this is the first study focussing on teachers' awareness of sedentary classroom behaviour, since an extensive literature search on the topic, yielded no similar studies. However, Rawlings *et al.*, (2017) concluded that limited knowledge of sedentary behaviour and the related health effects exist in adult populations, and a need to provide information on strategies to integrate sedentary behaviour reduction in the everyday lives of people.

2.5 Sedentary behaviour interventions in the classroom

A school attending child spends a considerable portion their day time at school; therefore school presents a significant channel to change sedentary behaviour in children (Abbott, Straker and Mathiassen, 2013; Bonell *et al.*, 2014; van Stralen *et al.*, 2014). The current research on sedentary behaviour interventions in the school classroom aims at creating classes that are more dynamic to lessen sedentary behaviour (Dornhecker *et al.*, 2015).

To date, the strategies of intervention to mitigate the impact of sedentary behaviour in the school classroom present in two ways (Hegarty *et al.*, 2016). One approach is a combination of both sedentary behaviour reduction and light physical activity promotion, namely movement integration (Dunn *et al.*, 2012; Murtagh, Mulvihill and Markey, 2013). The second strategy is solely aiming at reducing sitting time in the school classroom by using unique classroom furniture (Hinckson *et al.*, 2013; Benden *et al.*, 2014; Aminian, Hinckson and Stewart, 2015; Clemes *et al.*, 2016; D. R. Silva *et al.*, 2018).

2.5.1 Movement integration

Classroom-based physical activity incorporated during regular classroom time is called movement integration, also called movement lessons, brain breaks, active breaks and activity breaks (Institute of Medicine, 2013). The objective of classroom-based movement integration is to include short movement sessions throughout the day to break up sedentary time and increase physical activity among the school-aged population (Institute of Medicine, 2013; Webster *et al.*, 2015) such as jumping an answer to a mathematics problem, or short physical activity breaks between lessons (Webster *et al.*, 2015). A systematic review and meta-analysis published in 2017 found that physical activity integrated into the classroom enhanced academic outcomes and reduced off-task classroom behaviour (Watson *et al.*, 2017). There are other benefits to movement integration, namely, to decrease sedentary time (Salmon, 2010) and to increase cognitive function (Donnelly and Lambourne, 2011; Howie, Newman-Norlund and Pate, 2014). However, the dynamics of the

classroom context and the day-to-day demands placed on classroom teachers, result in that such strategies would not take root (Webster *et al.*, 2015).

Physical activity in the classroom may offer an inexpensive and feasible strategy to improve academic outcomes (Watson *et al.*, 2017) and physical health (Janssen and LeBlanc, 2010).

2.5.2 Teacher perspectives about classroom-based movement integration

Classroom teachers are essential role players in providing occasions for physical activity and a foundation for healthy behaviour in school children (Goh *et al.*, 2013). Movement integration of any intensity during typical classroom time to enhance physical activity and or decrease sedentary time among the school-aged population (Institute of Medicine, 2013). A primary school classroom is a suitable platform for early intervention to positively influence children's physical activity per day (Webster *et al.*, 2015). Primary school children spend most of their school day with the same teacher in the same class, and it is therefore vital to understand the issues that classroom teachers have to deal with to provide practical strategies to support movement integration in the classroom (Webster *et al.*, 2015).

Teachers were eager to have children move more during class time, but a range of factors are related to the integration of movement by classroom teachers '(Webster *et al.*, 2015). The overall perceptions of teachers toward classroom-based movement integration are optimistic (Cothran, Kulinna and Garn, 2010; Dinkel, Lee and Schaffer, 2016; Stylianou, Kulinna and Naiman, 2016). The perceptions were ascribed to an individual conviction of the benefits of physical activity an identified need for learners to move more in school, a concern for learners' health and as helpful to learners' concentration (Cothran, Kulinna and Garn, 2010; Stylianou, Kulinna and Naiman, 2016). Teachers with more extensive teaching experience professed higher competence and readiness to use classroom-based movement integration than novice teachers who focused entirely on the academic content (Vazou and Skrade, 2014). Short physical activities connected to the educational content, easy manageable were preferred (McMullen, Kulinna and Cothran, 2014).

Conversely, many obstacles also exist to classroom-based movement integration which is mainly at the governmental or school level (Cothran, Kulinna and Garn, 2010; Goh *et al.*, 2013; McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016). Teachers have several competing tasks during the school day, and pressures to complete the curriculum in schools would not allow time for classroom-based movement integration activities (Cothran, Kulinna and Garn, 2010; McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016). Time pressures are related to the work schedules and standardised testing (Cothran, Kulinna and Garn, 2010; McMullen, Kulinna and Cothran, 2014). In addition to the time constraints to complete the

curriculum are the pressures to achieve academically (McMullen, Kulinna and Cothran, 2014; Webster *et al.*, 2015; Stylianou, Kulinna and Naiman, 2016).

The classroom management and control is a major issue for all teachers and the obstacles in conducting classroom-based integration movements is the fear of losing control over the learners (McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016). Two particular factors that affected the teachers' control in the classroom were chaos during physical activity and the challenge of regaining focus on tasks after physical activity (McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016).

Space constraints are another obstacle to classroom-based integration movements in terms of build space, classroom furniture placement and the number of learners (Philip J Morgan and Hansen, 2008; McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016). The limits in space link to safety aspect in the classroom (McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016).

Teachers acclaim classroom-based physical activity as a useful application (Cothran, Kulinna and Garn, 2010; Stylianou, Kulinna and Naiman, 2016; Dinkel *et al.*, 2017), but difficulties to implement it remain a setback (McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016; Calvert, Wenner and Turner, 2019).

2.5.3 Sit-stand desks

Intervention studies pilot and feasibility studies, begun to target the reduction of sedentary behaviour in primary school classrooms (Minges *et al.*, 2016; Sherry, Pearson and Clemes, 2016). The studies that solely aim at reducing sitting time in the school classroom by utilizing unique classroom furniture revealed the feasibility of sit-stand desks in primary school classrooms over about twelve to sixteen weeks (Hinckson *et al.*, 2013; Benden *et al.*, 2014; Aminian, Hinckson and Stewart, 2015; Clemes *et al.*, 2016; D. R. Silva *et al.*, 2018)

A recent study by Clemes *et al.* (2016) reported two separate but similar interventions, in the United Kingdom and Australian that replaced traditional desks with sit-stand desks (Clemes *et al.*, 2016). The results for both intervention groups showed statistical significance ($P < 0.05$). The most significant reported decrease in sedentary time in the classroom, was in the Hinckson *et al.*, (2013) pilot study with 60 minutes reduction in sitting over the entire school day, followed by the pilot control trial in the United Kingdom with 52 minutes reduction per day (Clemes *et al.*, 2016), then 45 minutes less per day in Aminian *et al.*'s study in New Zealand (Aminian, Hinckson and Stewart, 2015) and lastly the Australian pilot control trial with 44 minutes reduction (Clemes *et al.*, 2016).

Other studies that explored the practicability of sit-stand desks in school classrooms found it to be efficient in increasing energy expenditure (Benden *et al.*, 2014; Silva *et al.*, 2018) and intellectual participation during class time (Dornhecker *et al.*, 2015). Sit-to-stand desks also have the prospect to improve posture and musculoskeletal health (Sherry, Pearson and Clemes, 2016). The unique classroom furniture proved useful, and no reports about adverse results concerning learning-related outcomes or musculoskeletal discomfort exist (Minges *et al.*, 2016; Sherry, Pearson and Clemes, 2016). Therefore, sit-stand desks might offer a feasible option to conventional seated desks to decrease sedentary time in school classrooms (Lanningham-Foster *et al.*, 2008; Benden *et al.*, 2011, 2014; Silva *et al.*, 2018). Furthermore, the intervention studies happened on a relatively small-scale, with short intervention times, occurred in relatively well-resourced settings with no statement of the economic costs of the interventions, which limit its generalisability (Hegarty *et al.*, 2016; Minges *et al.*, 2016; Sherry, Pearson and Clemes, 2016). Therefore, more research is needed for the long term benefits of sedentary behaviour interventions in the school classroom (Hegarty *et al.*, 2016; Minges *et al.*, 2016; Sherry, Pearson and Clemes, 2016).

2.6 The primary school classroom as a sedentary behaviour domain

2.6.1 The classroom environment

School classrooms are rooms that offer space for continuous learning away from outside distractions (Barrett *et al.*, 2015). During primary school education, learners spend most of their time in one class following a curriculum (Barrett *et al.*, 2015; Routen, Chalkley and Sherar, 2017). In the classroom setting, several factors influence the amount and duration of the sedentary time of learners (Abbott, Straker and Mathiassen, 2013), for instance, the physical features of the classroom environment (Marmot and Ucci, 2015) and the curriculum content (Ridgers *et al.*, 2012; Abbott, Straker and Mathiassen, 2013; Aminian *et al.*, 2014). Objectively measured data about the sedentary time of ten to twelve-year-old children found that learners sit longer during school time (Ridgers *et al.*, 2012; Abbott, Straker and Mathiassen, 2013). The accumulative sedentary time during class could be continuous for ≥ 30 minutes (Abbott, Straker and Mathiassen, 2013) because learners do not have much choice over the sedentary activities they perform during class time (Arundell *et al.*, 2016).

Traditional primary school classrooms have school chairs and tables (Domljan, Vlaović and Grbac, 2010; Clemes *et al.*, 2018). Prolonged typical chair sitting posture puts considerable stress on the lumbar spine as a flexed trunk in a seated position increases the intradiscal pressure (Parcells, Stommel and Hubbard, 1999; Wilke *et al.*, 2001; Domljan, Vlaović and Grbac, 2010). Most learners sit at desks and chairs that are too high because school furniture manufacturers assume a cost-

effective one-size-fits-all attitude (Parcells, Stommel and Hubbard, 1999). Consequently, furniture dimensions are unaccommodating to most learners (Parcells, Stommel and Hubbard, 1999). Mismatched classroom furniture often is responsible for sitting discomforts (Cardon *et al.*, 2004; Domljan, Vlaović and Grbac, 2010). Learners are at risk of developing poor postural habits due to intensified fatigue initiated by the extended sedentary time spent in mismatched furniture (Domljan, Vlaović and Grbac, 2010; Brink *et al.*, 2014). Spinal mal-alignments such as forward head posture, scoliosis, kyphosis and lordosis (Janakiraman *et al.*, 2017) may originate during rapid musculoskeletal development in childhood and adolescence and could cause back pain (Foltran *et al.*, 2012; Brink *et al.*, 2014). Puberty is the time of significant skeletal growth, putting learners particularly at risk of musculoskeletal pain if neutral spinal posture is not maintained (Brink *et al.*, 2014; Macedo *et al.*, 2015; Minghelli, 2017).

In this way, the classroom setting adds to the development of back pain, especially in learners where school furniture is not adjusted to their anthropometric dimensions, leading to inappropriate posture adoption behind desks (Parcells, Stommel and Hubbard, 1999; Domljan, Vlaović and Grbac, 2010). The evidence concluded that school furniture design must consider postures of learners and that the current static design of chairs and desks is inappropriate to a learner of healthy development (Domljan, Vlaović and Grbac, 2010). In addition, contemporary furniture should fulfil essential ergonomic and anthropometric principles, to provide dynamic and active sitting during class for proper development and health of young people (Domljan, Vlaović and Grbac, 2010).

2.6.2 The position of the school teacher

A school teacher is a professional who assists learners to construct, recognise and obtain skills that enhance development to face the challenges in life (Senge *et al.*, 2012). Teachers influence a child's learning and potential due to the amount of time they interact with learners throughout the school day (Senge *et al.*, 2012; Webster *et al.*, 2015). Teachers are essential gatekeepers of the classroom environment, including the behaviour of learners and key stakeholders to consult when designing the rollout of proposed classroom-based preventative strategies (Webster *et al.*, 2015). classroom interventions could not be effectively employed or continued without teachers' approval (Martin and Murtagh, 2015). An extensive literature search yielded no information on studies related to the awareness of teachers regarding SB in the classroom.

2.7 Education in South Africa

2.7.1 Overview of education in public held South African schools

In 2019 the number of South African public schools were 23076, with 12 408755 learners and 407001 teachers (Statistical Publications: Education Statistics in South Africa, 2020). There were 7 284775 primary school learners, and the national average learner-to-educator ratio was 34,3 to 1 (Statistical Publications: Education Statistics in South Africa, 2020).

The National Education Department of South Africa consists of the Department of Basic Education and the Department of Higher Education and Training (Western Cape Education Department, 2013). The Department of Basic Education constitutes the primary and secondary schools, and the Department of Higher Education and Training constitutes tertiary education and vocational training (Western Cape Education Department, 2013). The South African education in public schools consists of two major stages, (1) General Education and Training and (2) Further Education and Training (Statistical Publications: Education Statistics in South Africa, 2020). The General Education and Training stage comprises the foundation phase (Grades R to 3), intermediate phase (Grades 4 to 6) and senior phase (Grades 7 to 9) (Statistical Publications: Education Statistics in South Africa, 2020). Figure 2.3 illustrates the structure of the National Education Department of South Africa.

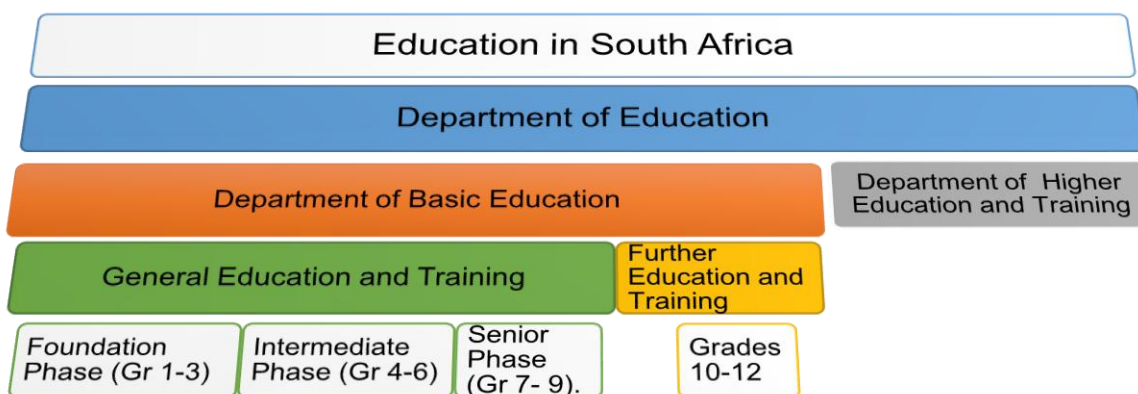


Figure 2.2: Structure of the National South African Education Department

Source: (Author)

2.7.2 Quintile classification of South African schools

The South African public-sector schools are classified into five quintile groups mainly to allocate financial resources (Western Cape Education Department, 2013). These quintile groupings are

concluded depending on the financial circumstances of the community around the school (Western Cape Education Department, 2013). The quintile one, two and three schools are no fee-paying schools, and the quintile four and five are fee-paying schools (Western Cape Education Department, 2013).

2.7.3 The Integrated School Health Policy

The Integrated School Health Policy commenced in South Africa in 2012. It aimed to strengthen the health services of schools by providing a comprehensive service addressing not only learning obstacles but health conditions as well (South African Government, 2012). The South African Integrated School Health Policy program seeks to provide an inclusive service by addressing education barriers as well as health aspects, with the accent on providing health services in schools (South African Government, 2012).

Physical education comprises one of the sections of the subject Life Orientation, one of the primary school learning areas (Hendriks, 2004; Van Deventer, 2011). Concurrently, physical education is taught by a class teacher who may lack skills and no longer by a physical education teacher with expertise (Hendriks, 2004; Van Deventer, 2011). The cross-sectional, International Study of Childhood Obesity, Lifestyle and the Environment study indicated that South Africa, out of twelve countries, was the country with the most significant percentage (32%) of learners not participating in physical education (Silva *et al.*, 2018). No evidence of prioritisation of physical education in the school curriculum exists at a national level (Draper *et al.*, 2019).

2.8 Chapter summary

The information contained in this chapter illustrates the need for the exploration of primary school teachers' perspectives and awareness on health effects associated with sedentary classroom behaviour and possible strategies to address sedentary behaviour from an early phase in the South African school context. The health effects associated with other sedentary types were discussed. The use and availability of existing classroom-based interventions to reduce sedentary classroom behaviour as well as the perspectives of teachers about movement integration were explored.

In the next chapter (Chapter 3) the researcher shall explain how the study was performed to achieve its goals. The study design and methods will be explained and the development of the instrumentation from the literature will be discussed. This will be followed by a discussion on how the data was managed and analysed.

CHAPTER 3

STUDY DESIGN AND METHODOLOGY

3.1 Introduction

This chapter explains the design and methodology of the study, including the researcher's role, the setting, the study participants, the procedures used for data generation and analysis as well as the ethical aspects and the trustworthiness of the study. The chapter ends with a summary.

3.2 Research study design

The researcher conducted an exploratory, qualitative descriptive study, with an interpretive research paradigm and a phenomenological approach. The phenomenon under study was classroom sedentary behaviour of children attending primary school. The main purpose of choosing this research design was to explore and gain understanding regarding primary school teachers perspectives of sedentary classroom behaviour and its effect on the health of primary school learners. Additionally, the teachers' perspectives about possible strategies to address classroom sedentary behaviour in the South African primary school classroom context, was also explored (van Manen, 1997; Creswell, 2014).

3.3 Study setting

3.3.1 The geographical location

The study was conducted in Saldanha, a small urban coastal town, located in Saldanha Bay municipality in the West Coast District of the Western Cape Province of South Africa. The researcher purposefully chose this geographical location due to its diverse population, diverse quintile school types and because of the proximity to the researcher's place of work. The diverse population and socioeconomic structure of the town made Saldanha the appropriate setting to obtain multiple and varied perspectives for this research study. According to Census 2011, Saldanha had a total population of 28,142, of whom 54,3% are Coloured, 29,9% are Black African, 13,5% are White African, 1,4% are Indian/ Asian, and 0,9% are other groups (Statistics South Africa, 2013). Afrikaans (70.3%), isiXhosa (19.6%) and English (7.0%) are the three major spoken languages in Saldanha (Statistics South Africa, 2013). There are four primary schools in Saldanha - one quintile 2 school, two quintile 4 schools and one quintile 5 school.

3.3.2 Research sites in the study setting

The quintile classification of the Saldanha primary schools is in the quintile two, three, four and five categories. Table 3.2 presents a summary of the characteristics of the four research sites.

Table 3.1: Research sites

Quintile	5	4	3	2
Setting	Central business district	Residential area	Residential area	Residential area
Number of teachers	35	24	34	20
Number of learners	1210	1180	1340	828
Type of instruction	Subject (Gr4-6)	Class (Gr4-6)	Class (Gr4-6)	Class (Gr4-6)
Medium of instruction	Afrikaans/English	Afrikaans	Afrikaans	Xhosa/English

3.4 Study population and sampling

3.4.1 Study population

The study population comprised qualified primary school teachers with fulltime appointment in the foundation and intermediate phases from the four public-sector primary schools in Saldanha.

3.4.2 Sampling strategy

A purposive sampling strategy, using the criteria below, was used to allow for the identification and selection of suitable participants due to their possession of appropriate qualities and for the capturing of a wide range of perspectives relating to sedentary classroom behaviour (Creswell, 2014).

3.4.2.1 Inclusion criteria:

Male and female qualified primary school teachers with a full-time appointment in the foundation and intermediate phases, from all four primary schools in Saldanha

3.4.2.2 Exclusion criteria:

- Teachers from secondary school

3.4.3 Sample size

The researcher envisaged recruiting 36 participants to provide adequate representation between the four selected schools. The 36 participants would comprise of five individual interviews and one focus group discussion of 4 participants per school. This number of participants has been recommended as an adequate sample size to explore phenomena for phenomenological studies Creswell (2012). The intensity of the contact needed to gather sufficient and the rich descriptions regarding a topic could influence the number of selected participants (van Manen, 2014); therefore, if data saturation was not obtained, more participants would have been recruited (Gill *et al.*, 2008). An ideal focus group size is between four and ten participants (Gill *et al.*, 2008).

Participation in the study was constrained by teachers' school commitments. One teacher declined the invitation to participate as the teacher did not want to be recorded. This led to teachers of school four not participating in any individual interviews, despite numerous recruitment drives from the researcher. Table 3.3 below presents a summary of the participants from the four research sites.

Table 3.2: Participants from research sites

Research site	1	2	3	4
Number of individual interviews	8	7	4	0
Focus group size	3	4	4	6
Total participants	11	11	8	6

3.5 Instrumentation

Data were collected using individual interviews, focus group discussions and a short demographic questionnaire.

3.5.1 Semi-structured individual interview schedule

Individual interviews were chosen since it enables participants to tell their individual experience, perceptions, feelings and understanding about a given phenomenon and to allow the researcher to ask probing questions to delve deeper into relevant issues in support of a deeper understanding (Gill *et al.*, 2008). The researcher developed a semi-structured interview schedule (Appendix E), based on the study objectives as well as relevant literature (Pate, O'Neill and Lobelo, 2008; Cothran, Kulinna and Garn, 2010; Aminian *et al.*, 2014; Marmot and Ucci, 2015; Stylianou, Kulinna and Naiman, 2016), to ensure that all aspects regarding the aim of the study were covered. The interview schedule consisted of nine open-ended questions to obtain abundant information as they

allowed participants to explain their views and feelings, and to answer in their own words. The topics in the interview schedule covered the classroom routine; the time learners spend in sitting; knowledge about sedentary behaviour; perception of the impact of sedentary behaviour on the health of learners; factors influencing sedentary classroom behaviour and perspectives on reducing sedentary behaviour. The researcher developed the interview schedule in English and Afrikaans since these were the language mediums of the schools. The researcher described the phrase, sedentary behaviour as “prolonged sit behaviour” to all participants.

3.5.2 Pilot interview

The researcher conducted a pilot interview with a participant in the intermediate phase from one of the schools, at the school, to establish a clear and understandable interview schedule (Gill *et al.*, 2008). The recruitment and consent process for the pilot interview participant occurred with the rest of the study participants, as discussed in section 3.6. This exercise also focused the attention to body language and non-verbal responses (Gill *et al.*, 2008). The pilot interview was forty-five minutes long and audio-recorded to ensure the correct use and that the technical aspects of recording the conversations were satisfactory. Accordingly, it became apparent that the interview guide was adequate to address the objectives of the study. The researcher could also reflect on her interview skills and noted that the need to allow the participants’ time to describe their experiences before asking prompt questions. The data of the pilot interview was excluded from the study results.

3.5.3 Semi-structured focus group discussion schedule

Focus groups discussions provided the researcher with different perspectives from the various individual participants and contribute to a broader collection of knowledge because the interactions between participants trigger more responses from other co-participants to delve deeper into core concepts identified, and for topics needing further clarification (Gill *et al.*, 2008). The two methods, individual interviews and focus group discussions, were used for the triangulation of the methods, to facilitate trustworthiness of the findings (Carter *et al.*, 2014). An interview schedule (in English and Afrikaans) that consisted of four open-ended follow up questions regarding the effects of sedentary behaviour and classroom-based interventions were developed and used for the focus group discussions (see Appendix G).

3.5.4 Demographic questionnaire

The researcher developed a brief demographic questionnaire that included questions about gender, age, work experience, highest education, grade instructing and language in English and Afrikaans (Appendix H). The above data would enable a description of the participants to provide the context

of the participants (Allen, 2017). The researcher used the obtained demographic data, filled out before the individual interviews and focus group discussions, to provide background information on the participants.

3.6 Data collection procedures

3.6.1 Permission to conduct the study

The Health Research Ethics Committee at Stellenbosch University (HREC Ref S19/01/013) (Appendix A) granted ethical approval for the study. Permission to conduct the study was granted by the Western Cape Department of Education [WC 20190424-3966] (Appendix B) and the principals at the respective schools also provided permission to conduct the study (Appendix C).

3.6.2 Invitation to research sites

The researcher obtained the contact numbers of public sector primary schools from the Boland and West coast telephone directory. As part of the process to gain entrée to the research participants, the researcher contacted the principal of each of the four primary schools telephonically to request permission to visit the schools, to extend an invitation to participate in the study and to recruit participants. Subsequently, the principals accepted the invitation, permitted the researcher to include the respective schools as research sites and confirmed acceptance of the study invitation via email (Appendix C). The school principals indicated that they preferred to identify willing participants, based on the inclusion criteria, to minimise disruption. The researcher handed a list of the inclusion criteria and the study information sheets to the respective principals (Appendix D). The principals informed the teaching staff about the study, identified appropriate, willing participants and provided the researcher with the personal details of the prospective participants who consented.

3.6.3 Recruitment of participants

When the researcher recruited potential participants by contacting them telephonically, introduced her, informed them about the purpose and interview procedures of the study and invited them to participate in the individual interviews and focus group discussions. Each participant was screened according to the inclusion criteria for their eligibility to participate in the study. The researcher emphasised the confidentiality of shared information and the anonymity of the participants' data. The researcher answered questions from the participants about any aspect of the study. All the participants consented verbally and indicated whether they wanted to be part of a focus group discussion and or an individual interview. The participants indicated a day and time during the after school hours that was convenient for them to do an interview or focus group discussion.

3.6.4 Interview procedures

The individual interviews and focus group discussions were conducted in quiet, closed rooms, on the school premises to allow for a natural setting, free from distractions (Creswell, 2014). To uphold privacy and confidentiality non-participants were not allowed into the rooms while the interviewer was in session. The interview arrangements with the participants for the pilot interview, individual interviews and the focus group discussions were confirmed telephonically a day before. All the individual interviews were first completed and thereafter the focus groups were scheduled.

3.6.4.1 Written informed consent

On the day, before the individual interviews, the focus group discussions and the pilot study were conducted; the researcher obtained written informed consent for participation and voice recordings (Appendix D) and provided a copy of the signed consent form to each participant. The researcher guaranteed and upheld the confidentiality of the participants' names interviewed (Creswell, 2014). Participants in the interviews and focus groups were informed that they could withdraw from the interview process at any time should they feel uncomfortable. Doing so ensured that none of the participants was obligated to partake in the process and that their participation was voluntary at all times. The aim was to maintain trust and honesty during the process of mutual interaction (Creswell, 2014).

3.6.4.2 Individual interview procedures

The individual interviews occurred face-to-face with nineteen participants in their classrooms and lasted for approximately 20-40 minutes. The researcher asked open-ended questions based on the semi-structured interview schedule that guided the conversation to ensure that all aspects regarding the study objectives were covered. The participants were encouraged to talk about issues related to the research question and were allowed the freedom to talk about their experiences in a way they found comfortable. An opening question was asked at the start and probing questions, at appropriate points of interest, to clarify or to trigger further thoughts to uncover a deeper understanding of issues relating to the research question. The researcher avoided asking leading questions but aimed to direct the participants to share information in their own words. When all the points on the interview schedule were covered, the participants were asked if there was anything they wanted to add or ask about the study. The meeting ended when there was no more data to be obtained through individual interviews. Each conversation was recorded with a digital voice recorder to allow a verbatim transcription of the conversations. Written notes were recorded on aspects such as atmosphere and non-verbal language of the participants. At the end of the conversation, the

participants were thanked for their participation and rewarded with a gift voucher for their time. No repeat interviews were conducted.

3.6.4.3 Focus group discussion procedures

The focus groups consisted of 3-6 participants and were conducted face-to-face with participants after school in the staff room. The researcher explained the purpose of the groups and the goals of the meeting, laid the ground rules and encouraged open participation. The researcher followed the semi-structured discussion schedule and moderated the focus groups by asking broad questions about the topic, before asking the focal questions. The participants were encouraged to talk and interact with each other to allow free discussion amongst participants. Where deemed necessary, questions for clarification were asked to ensure correctly captured information. Gestures, physical expressions, and physical posturing during the discussions in the forms of field notes were recorded and later added to the transcripts. After the completion of the points on the discussion schedule, questions were allowed from participants about the study. The focus group discussions lasted between 40- 60 minutes. At the end of the conversation, when there was no more data to be obtained through the focus group discussions, the participants were thanked for their participation. Each focus group discussion was recorded with a digital voice recorder to allow a verbatim transcription of the conversations. Each focus group participant was rewarded with a gift voucher for their time.

3.7 Data management

3.7.1 Data processing

The researcher organized and prepared the data for analysis by typing up field notes, capturing demographic questionnaires on an Excel spreadsheet and transferring the voice recordings of every conversation from the digital recorder onto the researcher's password-protected personal computer. Every transcript was coded with a unique identification number to uphold confidentiality and anonymity. The researcher scored the data from the demographic questionnaires and captured it on an Excel spreadsheet for analysis. The Afrikaans transcriptions of the interviews were translated into English to provide an in-context translation, which required the listening of the original interview recordings. Appendix I provide examples of the translated quotes. The researcher will safely store all documentation and transcriptions and destroy all documentation and electronic data after five years, in keeping with the Stellenbosch university health research ethics committee policy. A reflective diary was kept to capture her thoughts after each interview and new issues to be pursued in the following interviews. These notes were used during data analysis to gain deeper insight into the context of recorded data.

3.7.2 Transcription

The researcher transcribed the first five audio recordings of the interviews verbatim with the use of the Express scribe transcription audio player on her computer to allow for immersion in the data. Due to time constraints and the limited time between the need to analyse individual interviews and to conduct the focus group discussions, an independent professional transcription company transcribed the remainder of the voice recordings from the individual interviews and the focus group discussions. The researcher verified each transcription by reading the transcripts while replaying the respective voice recording and corrected any divergence.

3.7.3 Member Checking

The transcripts were sent to the participants via electronic mail and checking by the participants was done to ensure the validity of the data. No changes were necessary after member checking.

3.8 The researcher's role in research

In a qualitative phenomenological study, the researcher is the fundamental research instrument operational through the interview and data analysis (Creswell, 2012; van Manen, 2014). The researcher did a reflexive analysis to improve the confirmability of the study by acknowledging any influence that may have affected the findings of the study.

3.8.1 Personal Characteristics of the researcher

The interviewer's characteristics, cultural background, professional experience and qualifications affect the relationship built with participants and the collection and analysis of data (Sutton and Austin, 2015). It is therefore important to reflect on the role of the researcher in data collection and analysis (Sutton and Austin, 2015). The researcher is a qualified physiotherapist and currently practices in the private health sector of the geographical region. On the day of the pilot and individual interviews as well as focus group discussions, the researcher introduced herself as a researcher. When asked explicitly, she disclosed that she is a physiotherapist which could have influenced the participant responses. The researcher underwent training in qualitative research methods as preparation for conducting the study.

3.8.2 Relationship with Participants

Gaining entrée, building trust and respect with the research participants in the course of this study formed an important part of the research approach. The interviews occurred in the participants' natural settings, which were unfamiliar environments for the researcher. The researcher communicated a willingness to learn from the participants, emphasised the contribution of the

participant and respected the information they shared. Due to the interpretative nature of this study, the researcher kept the focus on finding the participants' meaning and put aside her understanding of the subject of the investigation to listen and understand what the participants told her. She tried to develop a holistic picture of the phenomenon under study by reported on several perspectives.

3.9 Data analysis

Inductive thematic analysis as described by (Braun and Clarke, 2006) was used. This method of analysis provides a six-step framework to guide the analysis (Braun and Clarke, 2006), which the researcher followed as described below.

3.9.1 Step 1: Familiarisation with the data

Inductive analysis of the data involved a repetitive procedure of reading through the digital transcripts several times to get familiar with the data and to get a sense of what the participants said. This first step allowed the researcher to be immersed in the data and afforded her with a general sense of the information to reflect on its meaning as a whole.

3.9.2 Step 2: Creating initial codes

The researcher created a codebook based on five transcriptions focusing on significant quotes in the transcripts, guided by the study objectives, and identified a list of different words and phrases as codes (see Appendix I). She then used DocTools in the Microsoft Word program to extract the comments as codes. Thereafter, she used the Excel computer program to alphabetize the codes.

The study supervisor conducted independent parallel coding of the same five of the transcripts. The researcher and the study supervisor contrasted, discussed, and combined the codes to establish a codebook (see Appendix K) to define codes and allow consistency among codes. Subsequently, the researcher used the codebook and continued coding the data independently. She updated the codebook and the revisited the data as new codes appeared to ensure validity.

3.9.3 Step 3: Searching for sub-themes

The researcher examined the codes and the relationships between the codes. It was an iterative and reflective process and involved constant moving back and forward between phases of data collection and analysis. The continuous reflecting on the objectives of the study, relevant information was selected to create meaningful patterns within the data. At the end of this step, the researcher organised the codes and used the Excel computer program to group it into broader sub-themes that said something specific about this research question. The most descriptive wording was used to form sub-themes.

3.9.4 Step 4: Reassessing of sub-themes

The sub-themes were then presented to the supervisors and discussed to explore the relationships between the sub-themes. The subthemes were organised to create major overarching themes. The justification of the sub-themes and main themes occurred through the keeping of an analytical diary alongside the codebook. This contributed to the study's credibility.

3.9.5 Step 5: Defining themes

Finally, the researcher refined and defined the themes to identify the deep meaning of each theme. The meanings of the various themes in the context of study aim were also discussed with the supervisor.

The analysis of the focus group data occurred separately from the individual interviews in the same manner as described above in step 1 to 5. The respective coded transcripts with an overview of the data that presented all the themes were emailed to the participants for verification and to suggest changes if they were misreported.

3.9.6 Step 6: Report in writing

The researcher reported the findings from the individual interviews in chapter four and the findings of the focus group discussions in chapter five.

3.10 Data saturation

Data saturation was obtained regarding the major objectives of the study when no more data emerged during collection and no new codes and themes originated from the data during data analysis (Guest, Bunce and Johnson, 2006).

3.11 The trustworthiness of qualitative research

Data trustworthiness encompasses four significant components namely the credibility, transferability, confirmability and dependability of the research study (Anney, 2014). Table 3.3 presents a summary of the trustworthiness of this study.

3.11.1 Credibility

Credibility indicates the truthfulness of the research findings (Anney, 2014). The researcher warranted credibility by the triangulation of sources when she used three different schools as data sources within the same method to investigate different participant perspectives. As well as methods triangulation using individual interviews and focus group discussions. Member checking was done by emailing the transcript to each participant. Voice recordings and transcripts were compared to ensure accuracy. Peer debriefing was requested from the research study supervisors who provided scholarly guidance by looking at background information, data collection methods transcripts, data analysis procedure, and research findings in developing the conclusion of the study.

3.11.2 Transferability

Transferability indicates the extent to which the findings of one study can be conveyed to other research situations (Anney, 2014). The researcher provided thick description by the extensive, clear description of all the research processes, from the sampling strategy, the data collection, background of the study to the production of the final report. She also including verbatim participants' quotations in reporting the findings (Chapter 4 &5) so that researcher who seeks to transfer the findings would be able to do so.

3.11.3 Confirmability

Confirmability allows the researcher's interpretation of the findings from the perspectives of the participants (Anney, 2014). Confirmability was established by the researcher using member checking and the participants generally agreed with the inferences derived by the researcher. She discussed the research process and findings with the supervisor. The researcher used open questions during the interviews and reported on a variety of perspectives to minimise her biases.

3.11.4 Dependability

Dependability refers to the consistency of the study findings concerning the contexts wherein they were created (Anney, 2014). Dependability was warranted through the repetitive data collection and analysis strategy. The researcher ensured discussions between herself and her supervisor, who assess consistency between the data presented and the findings. Peer examination was done when the researcher discussed her research process and findings with neutral colleagues who are experienced in qualitative research.

Table 3.3: Summary of the trustworthiness of the research study

Strategy	Credibility	Transferability	Confirmability	Dependability
Triangulation of data sources	x			
Sampling strategy		x		
Audio recordings and verbatim transcriptions	x			
Member checking	x		x	
Peer debriefing	x			
Peer examination				x
Documentation of reflexivity	x			
Thick descriptions		x		

3.12 Reporting

The researcher used the Consolidated Criteria for Reporting Qualitative Research (COREQ): A check-list with 32 items to report essential aspects of the research process (Tong, Sainsbury and Craig, 2007).

3.13 Ethical considerations

The researcher considered the principles of the Medical Research Council Ethical Guidelines for Research (Medical Research Council, 2012), the South African Guidelines for Good Clinical Practice (Department of Health, 2015) as well as the International Declaration of Helsinki (WMA, 2008) and the following ethical principles for research.

3.13.1 Respect for autonomy and informed consent

The researcher explained the aim and procedures of the research study to the participants. She ensured that all participants understood that they were not under obligation and that they could withdraw from the study at any point in time. Written, informed consent was obtained in English and Afrikaans from all the participants, which included the audio recording of the interviews. Each

participant received a copy of their respective signed informed consent and understood that they could request the switching off of the audio recorder during the interview and the removal of their shared data from the research.

3.13.2 Confidentiality and anonymity

Interviews and group discussion were carried out in a room in which non-participant was not allowed while interviews were conducted. The researcher upheld confidentiality and kept the participants' personal information classified. All the data files were coded with distinct, corresponding serial numbers for the digital transcripts and audio files. All the coded data files are password-protected on the researcher's computer. None of the research sites will be named at any stage.

3.13.3 Non-maleficance and beneficence

The researcher provided the demographic questionnaire and forms to the participants in English and Afrikaans. No harm was anticipated because the nature of this study was not sensitive and unlikely to harm anyone. The participants were mature and did not fall into the category of vulnerable people. However, appropriate referral of participants would take place if shared information caused distressing responses during interviews. The researcher respected the power relationship between herself and the participants at all times by focusing on their perspectives and communicating the willingness to learn from the participants. Trust was established with the participants before the interviews and group discussions. The impact of the study on work was minimal, as teachers participated in single interviews which last not more than one hour. On the request of participants, the findings of the study will be made available to them. All source documents in the study were acknowledged. The researcher provided no advice during or after the interviews, to protect the research relationship and to prevent any influenced on the research process. Each study participant received a small gift voucher as an incentive for their participation in the study.

3.14 Chapter summary

The use of an exploratory, qualitative study design with an interpretive research paradigm and a phenomenological approach was the appropriate methodology for this study. It allowed the researcher to gain an understanding of the lived experiences of primary school teachers regarding the effects of sedentary classroom behaviour on the health of primary school learners, and a possible solution to address the impact. The study took place in four public-sector primary schools in Saldanha in the West Coast district of the Western Cape. The participants were fulltime teachers in the foundation and intermediate phases selected through criteria sampling to increase the possibility of appropriate information-rich sources. The researcher used a semi-structured interview schedule, to collect the data through individual interviews and focus group discussions. and discussed her position within the study. The analytical procedure used was thematic analysis, an inductive method that identified codes, sub-themes and overall themes. This section also included the discussion of the four significant components of data trustworthiness of the study and the ethical considerations relevant to the present study.

The next chapter reports on the analysis and findings of the individual interviews.

CHAPTER 4

ANALYSIS AND FINDINGS OF INDIVIDUAL INTERVIEWS

4.1 Introduction

This chapter presents the analysis and findings from the face-to-face, individual interviews that focused on the perspectives and awareness of primary school teachers regarding the effects of sedentary classroom behaviour on the health of learners, including the potential strategies to reduce the impact. The data include the demographic questionnaire and qualitative data obtained from the foundation and intermediate phase teachers of the four schools within Saldanha. The researcher collected the data over four months, from the beginning of May 2019 to end of July 2019. Tables and figures display the summarised data.

4.2 Demographic data of the participants from the individual interviews

Nineteen of the thirty-six participating teachers took part in the individual interviews. Table 4.1 presents the summarised demographic information of the participants that took part in the individual interviews.

Table 4.1: The demographic data of individual interviews

Variable	Number (n=19)	%	Mean (SD)
Geographical location			
School 1	8	42.1	
School 2	7	36.8	
School 3	4	21.1	
School 4	0	0.0	
Gender			
Female	15	78.9	
Male	4	21.1	
Language			
Afrikaans	13	68.4	
IsiXhosa	4	21.1	
English	2	10.5	
Age (years)			
21 - 25	1	5.3	43.3(12.9)
26 – 35	7	36.8	
36 – 45	1	5.3	
46 – 55	6	31.6	
56 – 65	4	21.1	
Teaching experience (Years)			
<1	1	5.3	
1 – 5	3	15.8	
6 – 10	5	26.3	
>11	10	52.6	
Level of education			
Diploma in Education	9	47.4	
Bachelors degree in Education	10	52.6	
Grade instruction			
Gr 1	3	15.8	
Gr 2	3	15.8	
Gr 3	2	10.5	
Gr 4	4	21.1	
Gr 5	2	10.5	
Gr 6	5	26.3	

4.3 Presentation of qualitative findings of the individual interviews

The researcher used thematic analysis inductively and four significant overarching themes originated from the data as follows:

- Theme 1: Teachers' awareness about health effects related to sedentary classroom behaviour
- Theme 2: Determinants of classroom sedentary behaviour
- Theme 3: Teachers' awareness of learners movement needs in the classroom
- Theme 4: Initiatives to address sedentary classroom behaviour

An overview of the overarching themes and sub-themes that originated from the data is presented in Table 4.2. The section below elaborates on it. Verbatim quotes follow, referenced by the participant number, gender, age, and grade instruction to substantiate the themes (e.g., P4, F, 46-55yrs, Gr3). In Appendix I, examples of translated verbatim quotes are obtainable.

Table 4.2: Summary of significant themes and sub-themes from the individual interviews

Theme	Sub-themes
<p>Theme 1: Teachers' awareness about health effects related to sedentary classroom behaviour</p>	<ul style="list-style-type: none"> • Unawareness of the association of health effects with prolonged sitting • Unfamiliarity with the health effects related to prolonged sitting • A lack of education about health aspects in general • Teachers' postulations about spinal health in learners
<p>Theme 2: Determinants of classroom sedentary behaviour</p>	<ul style="list-style-type: none"> • Curricular demands • Time constraints • Classroom routines • Space limits • Beliefs about sitting
<p>Theme 3: Teachers' awareness of learners movement needs in the classroom</p>	<ul style="list-style-type: none"> • Behavioural effects • Cognitive effects • Physical effects
<p>Theme 4: Initiatives to address sedentary classroom behaviour</p>	<ul style="list-style-type: none"> • Current strategy • Future strategy

4.3.1 Theme 1: Teachers' awareness of the effect of classroom sedentary behaviour on the health of learners

This theme describes the participants' views about the association of the effects of prolonged sitting in the classroom on the health of learners. The participants expressed an unawareness of the association of prolonged sitting with adverse health effects. They ascribed it to unfamiliarity and a lack of education regarding health aspects. However, they postulated about possible adverse spinal health in learners later in life.

4.3.1.1 Unaware of the association of health effects with prolonged sitting

Most teachers stated that they are unaware that adverse health effects could be associated with prolonged sedentary time, particularly in primary school-aged children, as quoted:

"Definitely if there are health effects, especially for children, not that I'm aware of, but if there had to be, then obviously we have to be informed about it." [P13, F, 26-35yrs, Gr4]

Some participants stated that in all their years of teaching, learners had been sitting during class and that they are quite surprised that prolonged sitting could be associated with poor health in children, as quoted:

"It's quite surprising to me that this (health effects related to sitting) is currently a concern that research touches on because it's been like this all the years since I started teaching. The child sits in class. We've been doing this all these years." [P3, F, 56-65yrs, Gr2]

Some participants expressed that sitting is so ordinary in the school classroom that they do not think whether the association is beneficial or not, as quoted:

"I do not think we think of it (health effects of prolonged sitting). It is not even something that one thinks about whether it (prolonged sitting) is a disadvantage or an advantage. Sitting is required; it just needs to happen." [P4, F, 46-55yrs, Gr3]

"I do not think we thought of prolonged sitting in that way (health effects). You are awakening something in us. I have not thought about it yet, but thinking about it makes me realise we must be made attentive about it (health effects)." [P6, F, 46-55yrs, Gr5]

4.3.1.2 Unfamiliarity with the health effects related to prolonged sitting

Most participants are not knowledgeable about health effects particularly associated with prolonged sitting in the classroom, as illustrated in quotes below:

"Okay, I don't know much about health because I'm thinking now blood circulation. That's all I think of, but I don't really know much about health, but maybe it (prolonged sitting) could have an effect on learners' health." [P16, F, 26-35yrs, Gr6]

"I really can't say. Sitting definitely affects learners' behaviour, but I can't say about health because I don't know now. I don't know. It is you, physiotherapists, that will probably know what a child's spine looks like that sit all day and what a child's spine looks like that does not sit all day." [P5, F, 26-35yrs, Gr4]

4.3.1.3 A lack of education about health aspects in general

Most teachers revealed that health aspects are outside of their professional scope because they are not educated about it in their official, professional teachers' training and it is also not prioritised for continuous professional development, as quoted below:

"I don't know much, honestly. One would think that universities teach you this, but no, they don't. Or at least they didn't teach me that at university. I generally know about sitting when it comes to everyone, not just learners, I know it's important to sit upright for your posture because if you slump over here, shoulders it becomes like that, hunched. That I know but I'm not too sure specifically with let's say ages 9 to 14 what the effects could be or are." [P13, F, 26-35yrs, Gr4]

"I don't think we are very educated in that area (sedentary behaviour). It is always just the curriculum and then if children need psychologically testing or if there are psychological problems or social problems or something like that. So that's a need." [P1, F, 46-55yrs, Gr1]

4.3.1.4 Teachers' postulations about spinal health in learners

All the participants postulated about adverse spinal health in learners. They felt that prolonged sitting could be a potential risk for adverse spinal health later in the life of children because of their poor sitting postures, as expressed in the following quotations:

“Yes, it is possible. Perhaps not at this stage but in later years learners might be complaining about back problems. I noticed my daughter who’s currently in matric, complains now and then, ‘Mommy my back hurts’, and I think it's just coming from this (prolonged sitting).” [P12, F, 46-55yrs, Gr2]

“Can be because three-quarters of the day, I mean they write four learning areas, and they're bent over to write so that it can affect the spine later.” [P3, F, 56-65yrs, Gr2]

“Nobody...in all my years of education has said I have a back problem, because it's just something they accept, and even if it hurts, they just have to get through it. It is not something that is entertained but still as one gets older, the effect is experienced.” [P4, F, 46-55yrs, Gr3]

4.3.2 Theme 2: Determinants of classroom sedentary behaviour

This theme describes the factors that influence prolonged sitting in the classroom. The participants identified the curriculum as the main factor which influences the class routines, time and the frequency of movement. Two other identified factors are space limits and the teachers’ beliefs about sitting during lessons.

4.3.2.1 Curricular demands

All participants stated that the curriculum is the biggest influences on the sedentary experience of learners. Most participants stated that the pressure to complete the curricular content is the main priority for classroom activities which require sitting. They underscored the fact that the curriculum has a strong academic focus and that the structure is as stated by the Department of Basic Education’s directives, with work schedules arranged in specified time frames that span over the academic year, as illustrated in the quotes below:

“It's the curriculum, the curriculum determines, and the content is sometimes too much. It's too much for the child to know, and the teacher pushing for the work to be completed. The children become anxious. You provoke them because you pressurise them to complete the work. There, also, is the problem. Then the children get so restless, so when they get a chance to move, then they do it yes. Yes, so the pressure is great for the child and the teacher.” [P1, F, 46-55yrs, Gr1]

"That's the prescription of the educational institution we now call it CAPS (Curriculum Assessment Policy Statement). These are the requirements of the Department that this work should be done. So you are caught up in that structural obligation. It is absolutely, and we do not have a prescription for children to move and so on." [P7, M, 56-65yrs, Gr6]

"We are doing the CAPS (Curriculum Assessment Policy Statement), so we work according to the CAPS documents. The Department sets the work schedules of what we need to do and the time frames. Say week 1 to 5 you do this or for the term, you cover that work and so on. They determine, and we have to work from that." [P1, F, 46-55yrs, Gr1]

"It's too many subjects. So the children are sitting here all day, there is no exchange, so it is the same educator or not even a break. It's only during breaks that they stand up." [P5, F, 26-35yrs, Gr4]

"They (learners) have to sit, listen and read all the time and if he does not read, then he has to write because the curriculum has to be completed." [P4, F, 46-55yrs, Gr3]

If I look at the volume of work that the curriculum requires me to do, I'm not going to get through my work if they do not sit that time. [P2, F, 46-55, Gr3]

4.3.2.2 Time constraints

All participants explained that the amount of work that learners have to complete per day results in time constraints, and time cuts are at the expense of movement, as illustrated in the quotes below::

"I would prefer that they get more movement, but as I say, our time doesn't allow it because after the break is my reading time. And we still read until the bell rings some days." [P12, F46-55yrs, Gr2]

"So the curriculum also doesn't allow you to say, I have five minutes extra I'm going to use it, to do something outside because there are too many things to do. So we have to raise bookworms, there is no time for play. No time." [P5, F, 26-35, Gr4]

"We do not have time. I can tell you sometimes then it feels to me the day is too short, for what you have to do for the child and your daily tasks in class." [P3, F, 556-65yrs, Gr2]

"We are pressed by the Department because the curriculum must get done. You may not be spending the right amount of time outside of class because the curriculum needs to be finished." [P4, F, 46-55yrs, Gr3]

4.3.2.3 Classroom routines

Most participants explained that the curriculum influences the flexibility of the class routines and results in extended sedentary time, with some days longer than others. They explained that those curricular demands produce anxiety in teachers and learners. Many participants admitted, to manage the classes they demand learners to remain seated to prevent disciplinary problems, as stated in the following quotes:

"No, there are days that they sit longer. I have five math groups, so if one group is on the carpet, and they are here for 15 minutes, then once they are done, they go back and then the next group comes. As a result, the others have been sitting by then for half an hour." [P10, F, 26-35yrs, Gr1]

"This is not to say that sit is the best position, but what should they do? They have to write, so you can't stand and write. They can certainly stand, but what does the WCED (Western Cape Education Department) look for when they do an inspection? They want to see writing books, they are not going to accept my lesson if I say, they sang it, for example." [P5, F, 26-35yrs, Gr4]

"A lot of work. They (learners) sit a lot on the carpet and at the desks too. They alternate between it. Sometimes, I take small groups with me on the carpet, and then I give to the other tasks so that they stay busy at their desks and not to bother us here on the carpet." [P12, F, 46-55yrs, Gr2]

"If you want to have order in your class they have to sit. Yes, it has a real effect on classroom management because I will not be able to run the class if they (learners) cause chaos." [P3, F.56-65yrs, Gr2]

"Look, for the discipline, it is sometimes necessary not to allow free movement because you get one or two that might hurt someone or they get up all the time. So in a way, it is necessary for discipline. They cannot just get up and do just anything because they misbehave. Yes, it will be nice if they can move a little especially the children that do behave." [P9, F.26-35yrs, Gr5]

4.3.2.4 Space limits

All the participants identified the barriers that influence corporate movement in the classroom are the structural design of classrooms, overcrowding and furniture placement, as demonstrated in the quotes below:

"It would have been great if we had smaller classes so that you have more room for the kids to move, but a classroom like this they built for twenty-four learners." [P2, F, 56-65yrs, Gr3]

"That's a lot, that's a lot, and the classes are not big, and space is not great." [P1, F, 46-55yrs, Gr1]

"I mean with thirty-seven learners, if you had ten, then you can make a plan. You could say that side stations and groups, or you could say now we do this and that, but with thirty-seven learners, it is tough in a class if everyone gets up." [P10, F, 26-35, Gr2]

"If you go to the Grade 4 classes, you will also see that the desks are up to the front of the class because there is no space." [P4, F46-55yrs, Gr3]

"The setup within the classrooms takes us even further back because then we have to look at restructuring our classrooms. And unfortunately, it will have to be about the seats as well, changing the seats." [P13, F, 26-35yrs, Gr4]

"But giving thirty-five bodies with all these benches space to move safely is quite a challenge." [P2, F, 56-65yrs, Gr3]

4.3.2.5 Beliefs about sitting

Most participants' believe that sitting in the classroom is synonymous with the education system and that there is not much of an option. They stated that learners must sit to learn, as stated in the following quotes:

"I think a lot of children can't do it, and I don't think they're supposed to sit that long. You feel sorry for them, but unfortunately, the education system we are in demands it." [P11, F, 26-35, Gr2]

"If they don't sit and learn, how are they going to learn? Do we stand and teach them? What would happen? Unfortunately, sitting has to be a part of it. I do, however, think that there should be a way to have intervals with it." [P13, F, 26-35yrs, Gr4]

"Whether they are in a public school or a private school, they still sit. In the end, during a formal lesson, they have to sit and listen. They cannot lie down. They cannot stand; simply have to sit and listen." [P4, F, 46-55yrs, Gr3]

"Because they are here at school and they know at school, there are chairs and desks. In their mind they know oh I'm going to school. In my school I have my chair, I have my desk, so I have to sit and write and listen to the teacher. Maybe since it was like that for us back then, so it is now." [P19, F, 56-65, Gr1]

4.3.3 Theme 3: Teachers' awareness of learners movement needs in the classroom

This theme describes the participants' awareness regarding the movement needs that learners demonstrate as a result of the effects that prolonged sedentary time has on the behaviour, cognition and the physical effects that learners experience.

4.3.3.1 Behavioural effects

The participants articulated that the foremost and most visible effect of sedentary behaviour was learners becoming restless, fidgeting, and moving around in the classroom. All the participants expressed that learners display specific, deliberate behavioural patterns that are typical behaviour related to prolonged sitting. They stated that learners would do certain things in the classroom to counter the duration of prolonged sitting and when they get an opportunity to get up, they are reluctant to sit down, as illustrated in the quotes below:

"They sit a lot yes because while you teach, they have to sit and they can't sit still many times, they all sit on the rug but some of our children really cannot sit still. Really, it is a problem." [P1, F, 46-55yrs, Gr1]

"After all, they will start to fidget. They won't do what they have to do, they will stop writing, they lose interest, and we might think they are naughty, but perhaps prolonged sitting is the reason." [P5, F, 26-35yrs, Gr4]

"The children cannot sit still and that contributes to disciplinary problems in the classroom; that I can see certainly." [P15, F, 26-35yrs, Gr6]

"Yes, I think because you can see that they get fidgety in a while. Some can sit longer than others and so forth, but you can see in their attitude that they want to get up all the time, to throw away a piece of paper or something, or do something for you like being a messenger or hand out books (laughs)." [P9, F, 26-35yrs, Gr5]

"They sit a lot. They do, as a result, when the teacher leaves the classroom; they all stand because they've been sitting for a long time." [P16, F, 26-35yrs, Gr6]

"They will do anything to move. Drink water, go to the toilet, some of the learners will sharpen a pencil or two in a day. 'Please may I have a tissue?' You get that type of behaviour when they are tired." [P2, F, 56-65yrs, Gr3]

"Yes, sitting affects them, because once they get the chance to stand up, they get uncontrollable and time is wasted. They get tired; sitting too much is very tiring." [P17, M, 26-35yrs, Gr4]

4.3.3.2 Cognitive effects

The participants described that the pressure to remain seated and listen for long periods caused cognitive fatigue in learners. The participants explained that learners become fatigued, uncomfortable, lose concentration and even sleep. They also notice that learners start to fidget and that it is a sign of a loss of concentration, boredom and the need to move, as quoted:

"Yes, they (learners) do get tired; this is where the fidgeting begins because then they no longer concentrate since it is uncomfortable now." [P4, F46-55yrs, Gr3]

"They (learners) get tired and bored, and so, they want to move." [P1, F46-55yrs, Gr1]

"We already know from experience that after a certain time the child no longer concentrates effectively, or if he sits too long you will not get anything out of him anymore" [P7, M56-65yrs, Gr6]

"Remember when you're tired you don't concentrate, you become sleepy, and when you become sleepy, you don't listen. You're just hearing, your body is here, but your mind is somewhere else. So I think that's the effect that prolonged sitting has." [P16, F, 26-35yrs, Gr6]

4.3.3.3 Physical effects

All participants stated that they were aware of the physical effects of classroom sedentary behaviour which referred to fatigue and physical discomfort. The participants stated that learners often adopted awkward sitting postures, which they attributed to fatigue as described in quotes below:

"As I perceive it, it's the prolonged sitting. You, as the educator, notice that after a while, the learners tire and start fidgeting." [P3, F, 56-65yrs, G2]

"If they complain, it would be the buttocks, and some would say it rudely. Or "Sir my leg, the foot is numb" but no complaints about the spine or back or so forth." [P7, M, 56-65yrs, Gr6]

"If a child is sitting too long at this age, it can lead to fatigue. Therefore they get tired." [P2, F, 56-65yrs, Gr3]

"Because they get tired, their muscles are tired, and they will even lie down many times, head on the desk." [P11, F, 26-35yrs, Gr1]

"So they sit, and I can see they are tired of sitting, 'Please, Miss, can I go out.'" [P19, F, 56-65yrs, Gr1]

"You can see the learner is lying down when he gets tired. So they just rest their heads on the desk." [P17, M, 26-35yrs, Gr4]

4.3.4 Theme 4: Initiatives to address sedentary classroom behaviour

This theme describes the current strategies that teachers use to mitigate prolonged sedentary time in the classroom as well as future possibilities. The current strategies are integrated physical activity. The future strategies suggested to bring an effective reduction in sitting time in the classroom are the combined use of technology and physical activity, the change of the curriculum to free up time for movement, the restructuring of the classroom in terms of seating and the modification of the furniture to allow the interchangeable use of sitting with standing during lessons.

4.3.4.1 Current strategies to reduce sitting

Participants responded to the movement needs of the learners in the stride of classroom activities, by providing opportunities for physical activity, not frequently, but as the daily curricular activities allow it, as pointed out in the following quotes:

"We try to get them up a little now and then and to stretch a little or so, but not much. It's usually just sitting and works, to getting done." [P12, F, 46-55yrs, Gr2]

"You sometimes have to, in between your work, sing a song where they can stand. Or you give them a few commands, rub your head, crawl under the table, and stand next to the table. I do that kind of thing just for them to pay attention again. Yes, poems in between with actions help. It also helps them just to relax a little and so on. They need that, to relax." [P1, F 46-55yrs, Gr1]

"Just after ten minutes or after fifteen minutes, then I would say get up, get your hands on it, roll your things, go back, sit down, do some squads, or whatever. I let them go out, as well if it's a nice day, and time permits, just to run around on the field" [P4, F, 46-55yrs, Gr3]

"We try as far as possible to make the theory practical. A lot of the theory where they would be sitting we try to bring in movement in the form of role-playing or games. That's how we break up sitting." [P7, M, 56-65yrs, Gr6]

"So many times I do workstations, and when I say you measure here, you estimate there, you just do it, so they move around too." [P14, M, 26-35yrs, Gr6]

"But say, for example, we change activities or the learning area, Maths for instance, and then they will stand to start counting while jumping up and down to interrupt the sitting." [P3, F, 56-65yrs, Gr2]

4.3.4.2 Future strategies

Most of the participants had difficulties with suggestions for the reduction of prolonged sedentary time other than what they currently use because they cannot envisage a solution amid the curriculum demands and time constraints, as quoted:

"I do not know. I do not have an answer because we are pressed to get through the work. There are days that some of the other classes are already in their queue then mine have not even packed their bags yet. I have so many struggling children, I have four groups, and then I have four children who need individual attention so my day is .., I have an assistant at the moment that helps especially with those four weak ones but my day runs until the last minute." [P12, F, 46-55yrs, Gr2]

If I look at the workstation thing I do, the hour that I'm busy with them (learners) I get work done. It is not always possible like I say it's a big group. With the sitting, I also get work done. I just do not know if there might be an effective way other than that. I know if you sit on the carpet, then you sit too. If you sit on a chair, you sit also. So I'm not sure if we have other alternatives if there were any, I would love to try them, but I do not know [P6, F, 46-55yrs, Gr5]

Two participants suggested the use of technology in the classrooms in combination with physical activity as well as regular breaks reduce prolonged sitting as quoted below:

"Because they (learners) can't sit and concentrate for longer than half an hour. You have to get them up every half hour, and you know the overseas schools are doing it. If you have nice interactive boards, then you put up a video, and they can do some exercise or dance." [P11, F, 26-35yrs, Gr2]

"They need regular breaks so that they can concentrate again. So that prolonged sitting does not influence their thinking and their behaviour and that." [P7, M, 56-65yrs, Gr6]

A few participants suggested that the curriculum needs to change to allow more movement and to get the learners to do physical activity more frequently as in years ago, as quoted below:

"You know, our kids have to move more, but the curriculum needs to change to allow more movement, then I would say it will work." [P1, F, 46-55yrs, Gr1]

"Those years, we had the music and the rhymes. So if we can have more of it than the child can sit less. Something like reciting poems, rhymes, those singing periods, then, of course, they would sit less." [P3, F, 56-65yrs, Gr2]

A few participants explained to bring an effective reduction in sedentary time in the classroom the classrooms need to be restructured. This includes a creative potential solution to reduce the prolonged sedentary time that would give the learner the freedom to choose between sitting and standing without distracting the class, as quoted below:

“But in the setup within the classrooms, then it's going to take us even further back because then we have to look at restructuring our classrooms. And unfortunately and then it will have to be about the seats as well, changing of the seats.” [P13, F, 26-35yrs, Gr4]

“Now imagine if the children all had to stand, it is also going to, what should happen is a type of desk design with different levels then if he is tired he can stand up and then again sit a bit. A type of desk design as such.” [P6, F, 46-55yrs, Gr5]

4.4 Summary of findings

This chapter presented the analysis of the data from the individual interviews. The sample contained a heterogeneous group of primary school teachers who expressed unawareness about adverse health effects on learners related to prolonged sitting in the classroom and a marked awareness about general effects such as fidgeting, diminished cognitive function and fatigue. The participants further postulated about adverse spinal health of learners in later years. The participants expressed their unfamiliarity with health aspects in general as well as those associated with prolonged sedentary time. Most teachers revealed that health aspects are outside of their professional scope because they are uneducated about it. The official professional training of teachers does not include health aspects and are not a priority for continuous professional development.

A variety of factors are facilitators for prolonged sedentary behaviour in the classroom such as the curriculum, time constraints, rigid class routines, space limits and beliefs about sitting during lessons. The participants are aware that learners sit for prolonged periods because they notice that learners demonstrate a need to move. The participants integrate physical activity in the classroom as a current strategy to break up sitting but recognised the need for more initiatives because their efforts are infrequent due to the factors that influence prolonged sitting.

Most of the participants had difficulties with suggestions for solutions to reduce prolonged sedentary time in the classroom, considering the factors that influence sedentary time. However, the participants suggested the combined use of technology and physical activity, the amendment of the curriculum to free up time for movement, the restructuring of the classroom in terms of seating and the modification of the furniture to allow the interchangeable use of sitting with standing during lessons as future solutions. Figure 5.1 on page 65 illustrates the findings.

The next chapter presents the data on the focus group discussions.

CHAPTER 5

ANALYSIS AND FINDINGS OF FOCUS GROUP DISCUSSIONS

5.1 Introduction

This chapter presents the analysis and findings from four focus group discussions, one per school. This data includes the demographic questionnaire and qualitative data obtained from the foundation and intermediate phase teachers of the four schools within Saldanha. The researcher facilitated the focus group discussions from the beginning of August until the end of August 2019 to generate data. Tables and figures display summarised data.

5.2 Demographic data of participants of the focus group discussions

Seventeen participants took part in four focus group discussions. Table 4.2 presents the summarised demographic information from the focus group discussions.

Table 5.1: The demographic data of focus group discussion

Variable	Number (n=17)	%	Mean (SD)
Geographical location			
School 1	3	17.7	
School 2	4	23.5	
School 3	4	23.5	
School 4	6	35.3	
Gender			
Female	15	88.2	
Male	2	11.8	
Language			
Afrikaans	13	76.5	
IsiXhosa	4	23.5	
English	0	0.0	
Age (years)			
21 - 25	1	5.9	43 (11.7)
26 – 35	4	23.5	
36 – 45	4	23.5	
46 – 55	6	35.3	
56 – 65	2	11.8	
Teaching experience (Years)			
<1	1	5.9	
1 – 5	5	29.4	
6 – 10	2	11.8	
>11	9	52.9	
Level of education			
Diploma	8	47.1	
Bachelors degree	9	52.9	
Grade instruction			
Grade 1	3	17.7	
Grade 2	2	11.8	
Grade 3	2	11.8	
Grade 4	4	23.5	
Grade 5	4	23.5	
Grade 6	2	11.8	

5.3 Presentation of qualitative findings of the focus group discussions

The focus group discussions focused on topics identified from the analysis of the individual interviews that needed further clarification. The researcher included those topics in the focus group interview schedule (see Appendix F). The focus group discussions focused mainly on the teachers' perceptions of the effects of sedentary behaviour on the health of learners' and future solutions to reduce sedentary classroom behaviour, as that were the main focus of the study. The focus group participants' descriptions corresponded to that identified by the individual interview participants in

Chapter 4. The researcher derived three themes from the data of the focus group discussions and, Table 5.2 provides an overview of the overarching themes and sub-themes, as follows:

Theme 1: Teachers' perceptions and postulations of potential health effects of sedentary classroom behaviour

Theme 2: Reducing sedentary time in the classroom is a challenge

Theme 3: Strategies to reduce sitting in the classroom

Table 5.2: Summary of significant themes and sub-themes from the focus group discussions

Theme 1:	Sub-themes
Teachers' perceptions and postulations of potential health effects of sedentary classroom behaviour	<ul style="list-style-type: none"> • Perceptions of health effects • Postulations of adverse spinal health in learners
Theme 2:	Sub-themes
Reducing sedentary time in the classroom is a challenge	<ul style="list-style-type: none"> • Written work dominates the classroom environment • Learners' unpredictably movement is disruptive
Theme 3:	Sub-themes
Strategies to reduce sitting in school classrooms	<ul style="list-style-type: none"> • Current approach • Future approach

5.3.1 Theme 1: Teachers' perceptions about cardiovascular and spinal health effects of sedentary classroom behaviour

This section describes the participants' insight on sedentary behaviour as well as what they think could be potential effects. The participants supposed they are well-informed about the general effects of sedentary behaviour but uninformed about health effects related to prolonged sitting. They believe that learners of this young age could develop spinal problems because their bodies are still developing and, their poor sitting postures put unnecessary load on the spine.

5.3.1.1 Perceptions of cardiometabolic health effects

All teachers stated that they know about the general effects that prolonged sitting has on learners such as fatigue, diminished cognitive function and fidgeting as well as the effect that slumped postures could have on spinal health. They acknowledged that they lack knowledge about health effects related to prolonged sitting, especially that of cardiometabolic diseases, as quoted:

"I think we know a bit because I did know, and I did realise that sitting at some point does affect my children, I mean my learners, it does make them bored, but I don't know enough. To such an extent that it could perhaps cause muscle weakness, it could cause diabetes, and it could cause high blood pressure. So, the teachers do not know enough. They do know that for the kids to sit for such a long time is not alright but not to understand what it can cause to the body." [F3, F, 36-45yrs, Gr1]

Most teachers explained that they had not thought about any health implication related to prolonged sitting before because they are not aware of any effects and would in the future look to see if they could discern any, as quoted:

"As I said, we haven't thought about it yet. If you're coming in a month, then maybe we will ... but now we're going to look out for such effects of sitting (health effects). We have not thought about it previously." [F4, F, 46-55yrs, Gr5]

The teachers agreed that they have different levels of insight regarding sedentary behaviour and its adverse health effects but that their understanding is mostly related to an upright sitting posture and the potential negative impact it can have on the body, as illustrated in the quote:

"Not as much as he does. [Laughs] I ... I do not know, I feel it probably has side effects but as you get older you learn about your posture, about carrying yourself adequately. Then you try ... I also sometimes sit wrong ... it comes from a young age but then you learn to remind yourself to sit up nicely or ... yes." [F2, F, 26-35yrs, Gr4]

"They sit in one class, on one chair, all day. I am thinking, with the children sitting in such postures, it could affect one's spine, sclerosis and that kyphosis stuff. So it can be very serious if the child is sitting in that way all the time." [F1, F, 21-26yrs, Gr4]

5.3.1.2 Aware of adverse spinal health in learners

The participants stated that classroom furniture plays an important role in terms of the anthropometrics and ergonomics of learners. They further explained that this results in forwarding

slumped postures which subject the learners' vertebral column to unnecessary stress and could potentially result in adverse spinal health later as they age. The participants also expressed that learners are not always mindful of the manner they are sitting and because they are still young and developing their muscles are not at optimal strength.

"In my class, I have big chairs, and those chairs are not fit for my kids. Sometimes they don't sit with bums on the chair; they sit with their knees because they want to make them level with the desk. And the muscles are even damaged because they are not sitting with their bums; they are sitting on their knees. When they stand up, something is happening with their knees." [F3, F, 46-55yrs, Gr5]

"It affects your back too. If you concentrate and forget you have to sit up straight, then you are forward and then you sit like that all the time. It has an impact on your back." [F4, P1, F, 46 -55yrs, Gr5]

"In my opinion, sitting affects especially the young ones, because of their spinal cord. Some of the kids do not sit up straight. They sit like this (slumped) with their back. And then, because they are still young, the formation of the bones is ... you see." [F3, F, 36-45yrs, Gr1]

"When they are sitting, they are not sitting upright, they are sitting like this (slumped). This is the chair, and they sit like this, you see? They must sit against the back of the chair and write but when they are writing, they lean too far forward, bend their backs and write that way. It affects their backs because their bodies are not well developed." [F3, F, 45-56yrs, Gr3]

"It can affect the child because I think their backs also need that correct support and a manner of sitting so that they do not have a problem with their backs later." [F1, F, 56-65yrs, Gr3]

"I would say sitting behaviour can also have many side effects on a child because some of the children's muscle tone in their bodies is not yet properly formed." [F1, F, 21-25yrs, Gr4]

"I agree. I too think, especially one's back. Someone whose back muscles are not strong in general is also going to sit with greater difficulty. So I think sitting is also negative." [F2, M, 36-45yrs, Gr5]

"It will affect your body too, I mean because you do not get enough exercise, by walking regularly ... Even if it is in class or whatever. I think it plays a role in your posture." [F4, F, 46-55yrs, GR4]

"But if they sit for an hour, the time is running out and you find them," aah, ooh. "It has got effects; it affects the joints. That's why they must at least have some active, other movements." [F3, F, 45-56yrs, Gr2]

5.3.2 Theme 2: Reducing sedentary time in the classroom is a challenge

This theme describes the main challenges in the classroom that the teachers associated with the prolonged duration of sitting in the school classroom and the difficulty to allow movement.

5.3.2.1 The written work dominates the classroom environment

All the participants reported that the written work of the learners serves as proof of that which was done of the curriculum and that a strong focus is placed on the completion of the written activities. The result is time constraints and ultimately less movement and more sitting.

"But, the ... as she also says ... time is limited, because of the written activities people these days want proof of everything, so no matter what you do, it must be captured in writing. So the child's writing tasks dominate that time that he actually could have walked freely on the carpet or whatever." [F1, F, 36-45yrs, Gr2]

"So we do little movements in between, but it's not with every class that you can do it. So when we write, then there is no time for muscle tone exercise or stuff because they have to write." [F1, F, 21-26yrs, Gr4]

5.3.2.2 Learners' unpredictably movement is disruptive and time-consuming

All teachers stated that they have empathy with learners that have to sit for prolonged periods and, that they would rather have learners move around more but that it is disruptive and time-consuming to have learners get up unpredictably during lessons. They explained that it is not easy to allow learner freedom to move because it results in chaos.

"So it's too long for me to have them sit like that but it's the restless guys who're having a bit of a hard time, ... it makes the situation difficult because for us it's bad when you're busy with a lesson, and then out of the blue one jumps up here because he wants to do this, another one wants to do that, and then it's all chaos." [F1, F, 36-45yrs, Gr2]

"I sometimes have problems with it when children sit for too long, and if I could have done it differently, it would have been better for me. In the sense of a little more free time, but nowadays, it is a bit impossible. The minute you give them that little bit of leeway, after that everything is chaos and time is wasted." [F1, F, 56-65yrs, Gr3]

"So say if there is a piece of paper, or there is just something around them that they can throw away, they will get up and throw it away. So, in addition to what he said, in fact, every little opportunity they get they will use to get up and walk around and that causes discipline problems." [F2, F, 26-35yrs, Gr1]

"If a child just has to sit all day, for example in all classes where he goes, it causes discipline problems, because that child will discover that he has to throw away a piece of paper, or he wants to go there, soon thereafter he would come and ask Miss something. Then it's just because he's tired he is." [F1, F, 56-65yrs, Gr3]

Most participants stated that the large number of learners moving together in small classrooms and the disinclination of learners to sit down after a movement session result in chaos and wasted teaching time.

"I think the amount of learners affects movement because if we have fewer kids in class, there will be more room for movement. If all thirty-eight in my class have to move around all day, then I'm not going to be able to teach." [F2, F, 26-35yrs, Gr1]

"I think the number of children affects because if we have fewer children in the class, there will be more room for moving around. And more ... If all 38 in my class have to move around all day, then I'll not be able to give the class as the sir says, the moment you do something nice, it takes you 10 minutes to calm them down again." [F2, F, 46-55yrs, Gr1]

5.3.3 Theme 3: Strategies to reduce sitting in school classrooms

This theme describes the strategies that are currently in use to reduce sitting in the classroom and suggestions for future possibilities to reduce sedentary behaviour in the classroom.

5.3.3.1 Current approach

The current strategies that the participants use to reduce sitting and its effects on the learners are unstructured, integrated physical activities.

All teachers acknowledged that it is hard for learners to sit for prolonged periods and that it takes less than half an of uninterrupted sitting for learners to creative ways to move. The participants stated that they are aware that movement and to stand up a few seconds benefit the learners. They explained that they use cues from the learners, such as fidgeting or frequent disruptive movements and use physical activities during lesson time to reduce the sedentary time. Some participants stated, that if time allows, they include exercises for about five to ten minutes. The following quotes illustrate the participants' statements:

"What I can say about that point is my point has already been mentioned, but I will add by saying that, 30 minutes for them, for a learner to sit is very difficult. Within 20 minutes, the learner will ask to go and sharpen the pencil. The other one will come and ask to go and buy a pencil. The next one will come and ask to go to the toilet. So really, 30 minutes for learners to sit is too much. They need for us to add that break, maybe a few seconds, to let them stand and do some exercises. And that also will help to refresh their mind." [F3, F, 36-45yrs, Gr1]

"But what I have said, if the child is tired, I know, they stand up. I know that child is tired of sitting on those chairs, so they stand up and then they sit and whenever I notice one of them, I call them all to stand up, sit down, jump, sit; only five to ten minutes, I allow them and then they sit down again. Then we relax and then after that, we go and do the lesson." [F3, F, 45-56yrs, Gr5]

Some participants stated that they use dancing on music or an action rhyme or even classroom activities outside the classroom, for instance, dance moves for mathematics to reduce the sitting and its effects on learners, as demonstrated in the following quotes:

"What I do to reduce the sitting, is perhaps a rhyme and I give instructions, for instance, hands on your head, body, ears. Then they sit down, for the lesson. As soon as I see there is too much fidgeting, then we quickly stand up again, and we do a dance or brain exercise. Just light intensity activities just to move again. When I say stop, freeze, then it's calm again and we move on. " [F1, F, 21-25yrs, Gr4]

"Some days they are with me for three periods. Then they think sir is crazy when sir says, get up, after 20 minutes. We jump, music is turned on, and then it is movement, crazy in class because it's important, every 20 minutes, especially your children who are constantly sitting. " [F2, M, 36-45yrs, Gr5]

"Okay, it is true, they are becoming bored, so to help them sometimes, you must say stand up, sit, stand, sit, so that they can refresh, turn around, all that things". [F3, F, 45-56yrs, Gr2]

"I sometimes, when it's summer, I like to take my learners outside for oral and also in the mornings during math period to perform dance moves for the multiples of numbers. But I do not do it regularly." [F4, F, 46-55yrs, Gr4]

5.3.3.2 Future approach

The prospective solution to reduce prolonged sitting in the classroom revolved around one participant's suggestion that he often uses. The participants found it hard to consider another posture than sitting during lesson time. No other suggestion for solutions came forward and, teachers realised that they need a paradigm shift in terms of another posture such as standing during lessons.

The one participant explained that he regularly improvises during group work by turning the traditional school desk into a standing-desk to allow a standing posture which learners use with comfort, as illustrated in the following quote:

"Yes, if I go back to my class now, it's now, and the Natural Science class too, I'm using a table and on the table, we place, for instance, a crate, and a plank on top then the learner stands comfortably, explaining to the group." [F2, M, 36-45yrs, Gr5]

Most participants stated that they could not envisage another posture than the sitting during lesson time and that they need a change of focus and perspective, as quoted:

"Can we, will it work, if we in Grade one, if they stand and write, and then write on the writing board?" [F2, F, 56-65yrs, Gr1]

"But we as teachers must make the change because we are not going to just allow it (learners standing). We are now considering it, but not everyone will. So if the child now suddenly just stands, it's going to be a problem. So, maybe we should have the mind-shift that they (learners) do not just have to sit. Do you understand? So maybe it's could start with us too." [F4, F, 26-35yrs, Gr5]

Another participant suggested the grade ones kneel but did not think that it is different from sitting, as quoted:

"We will find it hard to stand, in our class, if I consider the grade ones, because we have not, ...our tables are not very high. It's just perfect for sitting. Otherwise what one can do is to let these learners kneel but it's also a form of sitting." [F2, F, 26-35yrs, Gr1]

Some participants stated that standing could be a possibility considering how much learners enjoy it, as quoted:

"For the learner, she will feel in charge. When a learner is on his or her feet, it's like that, they feel good. They are in charge. So, maybe we should consider that." [F2, M, 46-55yrs, Gr5]

5.4 Summary of findings

This chapter summarises the analysed findings from the four focus group discussions. The participants stated that they are well-informed about the general effects of sedentary behaviour and aware that slumped posture could affect learners' spinal health later in life. However, they are

uninformed about cardiometabolic health risks related to prolonged sitting. The participants vary in their understanding regarding sedentary behaviour and, their reference is related to an upright sitting posture. They further stated that the reduction of sitting in the classroom is a challenge because of certain factors influencing movement in the classroom. The participants explained that they try to add a physical activity during lesson time to reduce sedentary time but unable to do it regularly. The suggestion for future possibilities to reduce sedentary time in the classroom was a challenge because most participants could not envisage another posture than sitting during lesson time. Some participants considered the standing posture during lesson time as a possibility, while others expressed that they need a change of focus and perspective. Figure 5.1 below illustrates the study findings.

The next chapter presents a discussion of the study findings.

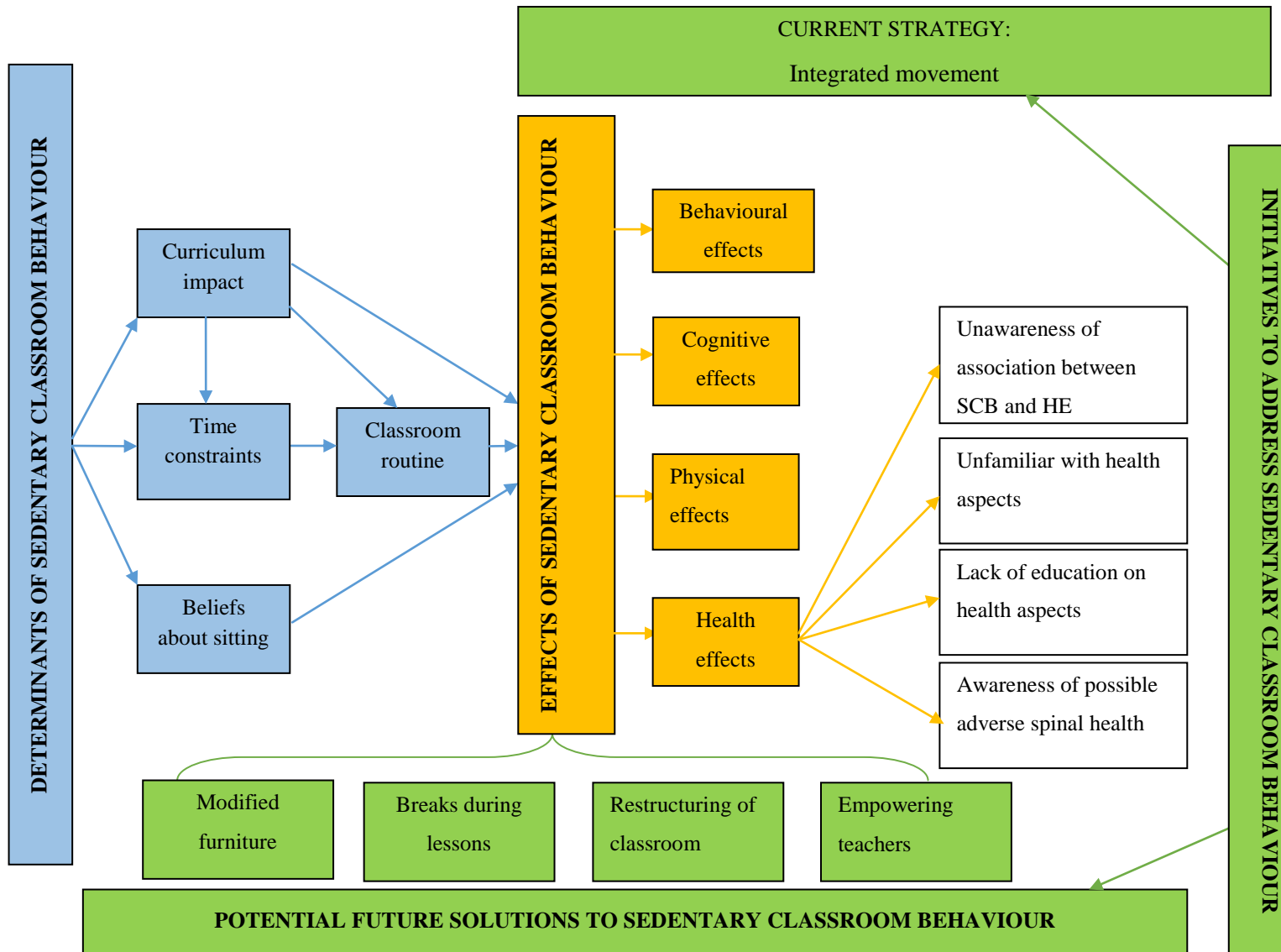


Figure 5.1: Illustration of findings

Abbreviation: SCB-Sedentary classroom behaviour; HE Health effects

CHAPTER 6

DISCUSSION

6.1 Introduction

This chapter presents an integrated discussion of the most significant findings that originated from the individual interviews and focus group discussions presented in Chapter four and five and the relevant literature in chapter two. The overall aim of this study was to determine the perspectives and awareness of primary school teachers about the effects of prolonged sedentary classroom behaviour on the health of primary school learners and, to explore potential strategies to address the impact of this behaviour. This section also summarises the implications and limitations of the study as well as the recommendations for future research.

6.2 Summary of main findings

This qualitative study adds to the scant body of knowledge about primary school teachers' perspectives and awareness of potential adverse spinal health in primary school learners associated with prolonged sedentary time in the classroom and, the determinants of sedentary time in this environment. The findings indicate that primary school teachers in this study are aware of the cognitive, behavioural and physical effects of sedentary behaviour on primary school learners. Nevertheless, participants postulate the development of adverse spinal health later in the life of learners, based on their slumped sitting postures. However, they are mostly unaware of physical health effects on primary school learners associated with prolonged sedentary classroom behaviour. There are a variety of factors that influence prolonged sedentary behaviour in the classroom, such as rigid class routines and time constraints associated with the overloaded curriculum, space limits and teachers' beliefs about sitting during lesson instruction. The primary school teachers currently utilise physical activity as a strategy to reduce sedentary time. The suggestions for future possibilities to reduce sedentary classroom time included the amendment of the activities in the classroom and re structuring of the classroom, including the modification of classroom furniture.

6.3 Primary school teachers' unawareness/awareness about the health effects of prolonged sitting on primary school children

The findings indicate that the participants are aware of the cognitive and behavioural effects of prolonged sedentary classroom behaviour but unaware of physical health effects of prolonged classroom sedentary time on primary school learners (sub-section 4.3.1.1). The participants stated

that when learners sit for long periods they lose concentration and start to fidget (sub-section 4.3.3.1 and 4.3.3.2). The cognitive and behavioural effects of prolonged sedentary classroom behaviour indicate that sub optimal learning take place. This finding is consistent with Tremblay et al (2011), Carson et al., (2016) and Chinapaw et al., (2011) who stated that sedentary behaviour is associated with attention problems.

The participants further stated that prolonged sitting result in physical discomfort (sub-section 4.3.3.3) and all participants postulated that adverse spinal health could manifest in the later years of children' lives because of their slumped sitting postures (sub-section 4.3.1.5 and 5.3.1.2). The slumped sitting postures of learners are ascribed to fatigue and musculoskeletal discomfort due to prolonged sitting (sub-section 4.3.3.3). These current findings are consistent with Domljan, Vlaović and Grbac (2010) that stated musculoskeletal discomfort results in uncomfortable sitting, because the body becomes uncomfortable after an extended time, in any position. These current findings are also consistent with the findings of Domljan, Vlaović and Grbac, (2010) that learners are at risk of developing poor postural habits due to intensified fatigue initiated by the extended sedentary time spent in mismatched furniture.

The participants further mentioned the mismatch of furniture as a factor for the slumped postures of learners because most learners sit at desks and chairs that are too high (sub-section 5.3.1.2). After all, school furniture are a one-size-fits-all (Parcells, Stommel and Hubbard, 1999). Prolonged chair sitting posture puts considerable stress on the lumbar spine because a flexed trunk in a seated position increases the intradiscal pressure (Parcells, Stommel and Hubbard, 1999; Wilke *et al.*, 2001; Domljan, Vlaović and Grbac, 2010). The postulations of the participants are confirmed by Macedo *et al.*, (2015) and Minghelli, (2017) who indicated that puberty is the time of significant skeletal growth that put learners at risk of musculoskeletal pain if neutral spinal posture is not maintained (Macedo *et al.*, 2015; Minghelli, 2017). However, a reason why the participants have not reported on spinal complaints could be because foundation and intermediate phase learners are typically pre-puberty.

The participants ascribed their unawareness of physical health effects to several aspects, such as their unawareness that health effects are associated with prolonged classroom sedentary time particularly in primary school-aged children (sub-section 4.3.1.1). Findings from the literature review (Section 2.3) revealed that a growing body of published literature on the health effects of prolonged sedentary time in the school-aged population is associated with a risk for the development of health consequences in children and adolescents (Carson *et al.*, 2016; van Ekris *et al.*, 2016; Canabrava *et al.*, 2019). Participants' limited awareness about health risks associated with

sedentary behaviour is partially explained by the indication that the body of research gives about the inconclusive and developing association (see section 2.3.2). Considering the nature of non-communicable diseases and the external invisibility of the signs and symptoms during development, the findings of this study about teachers' unawareness regarding health effects on primary school learners associated with prolonged classroom sedentary time is not surprising. Van Ekris *et al.*, (2016) stated that although the evidence related to sedentary behaviour and adverse health effects in the school-aged population is inconclusive, it does not mean that such relationship does not exist. Therefore, although the teachers' are unaware of health effects associated with prolonged sedentary time in the classroom, it does not mean that learners are not at risk of developing health effects later in life. The findings indicate that learners interrupt their sedentary time (sub-section 4.3.3.1) indicating that children's exposure to sitting might be in shorter bouts which prevent the development of related health conditions.

Conversely, the participants further expressed that health aspects are outside of their professional scope because it is not included in the curriculum of the formal teaching training or prioritised as part of their continuous professional development (sub-section 4.3.1.2 and 4.3.1.4). The participants' lack of knowledge regarding health aspects is a critical finding because the primary role of a teacher is to impart knowledge to learners through classroom instruction and the amount of time they interact with learners throughout the school day (Aubrey, 1968; Senge *et al.*, 2012). However, the research on the adverse health effects of prolonged sedentary time is rather new (Katzmarzyk, 2010; Owen, Sparling, *et al.*, 2010) and general awareness at the South African population level may be also lacking (Rawlings *et al.*, 2019). Therefore, primary school teachers might not have had the opportunity to consider prolonged sedentary time as a potential risk.

The study findings indicate that although teachers of this study are unaware of physical health effects because none is evident, one should still be proactive and not wait until later years when non-communicable diseases and adverse spinal health manifest. It is imperative to intervene at the primary school level to avert potential health effects later in learners' life as most children will spend half of their day time hours, for most of their childhood, at school. This study established the need to increase primary school teachers' knowledge about sedentary behaviour and its adverse health effects to broaden their knowledge base so that they can have the ability to create a supportive environment which will provide learners with skills to make better decisions for their health as they grow and mature. South African teachers and schools can be a significant force in driving and leading sedentary behaviour reduction in school classrooms, which could assist South

Africa to reduce non-communicable diseases and promote health at an early phase of life as well as optimising learning in the primary school.

6.4 Determinants of sedentary time and teachers' response to the learners' movement needs in the classroom

The study findings further indicate that learners sit for long periods and that there are intricate and interconnected factors that influenced the sedentary time in the classroom (section 4.3.2). The identified determinants of sedentary classroom behaviour cannot be observed separately because they influence the interaction between the teacher, the learner and the overall classroom context. The overloaded curriculum is the core determinant of sedentary time (sub-section 4.3.2.1) because it starts off a chain reaction that impacts time and the classroom routines. The chain of events starts with the curriculum that is set out according to preset time schedules from the Department of Education (sub-section 4.3.2.1). Then the teachers are required by the Department of Education to do a certain amount of work in a specific time frame (sub-section 4.3.2.1) and the written work of learners serves as a method of verification of the curriculum content done (sub-section 4.3.2.3 and 5.3.2.1). The load of the curriculum content and the delivery pace results in the learners' inability to cope with the demands (sub-section 4.3.2.3) and this put pressure on the teachers because time frames are not met. The curriculum does not prescribe to teachers how often learners are required to move (sub-section 4.3.2.1) and this results in rigid class routines with little movement and an escalation of longer sedentary times.

These current findings indicate that the identified determinants of sedentary classroom behaviour are similar to the barriers of physical activity found in previous studies that investigated the integration of physical activity into the classroom (Jenkinson and Benson, 2010). Jenkinson and Benson (2010) reported that pressures to complete the content of a full curriculum are a considerable challenge in the primary school classroom. Other authors also indicated that the curriculum content has a high impact on the amount and duration of sedentary time (Ridgers *et al.*, 2012; Abbott, Straker and Mathiassen, 2013; Aminian *et al.*, 2014) and those time constraints related to work schedules, standardised testing, and test marks in the primary school classroom are identified as barriers to physical activity (Cothran, Kulinna and Garn, 2010; McMullen, Kulinna and Cothran, 2014).

In addition to the overloaded curriculum, time constraints and rigid classroom routines, the findings revealed limited space and teachers' beliefs about sitting as other determinants of sedentary behaviour (sub-section 4.3.2.4 and 4.3.2.5). The participants acknowledged that they are aware of the cognitive and behavioural effects of prolonged sedentary time because learners present with

fatigue and fidgeting accompanied by diminished cognitive function (sub-section 4.3.3.2 and 4.3.3.3). However, the determinants of sedentary classroom behaviour result in the participants' infrequent response to the learners' movement needs (section 5.3.2) because of the limited space; interconnected with the overcrowded classrooms, furniture placement, the safety of learners and the chaos that results from moving learners (sub-section 4.3.2.4 and 5.3.2.2). The findings indicated that classrooms were built for a lesser number of learners and that classroom furniture fill the floor space from back to front (sub-section 4.3.2.4). This poses a threat to the safety of the learners during physical activities in class (sub-section 4.3.2.4). Previous studies, consistent with these study findings, found that small classrooms, furniture placement, the number of learners and the safety of learner with movement significantly increased sedentary behaviour in the classroom (Morgan and Hansen, 2008; Jenkinson and Benson, 2010; McMullen, Kulinna and Cothran, 2014; McMullen *et al.*, 2016; Stylianou, Kulinna and Naiman, 2016).

According to the findings, once learners are allowed to stand up and move learners are reluctant to sit down because they are tired of sitting, there is chaos and lesson time get wasted (sub-section 5.3.2.2). This was reported by the participants as another reason for the infrequently movement in class. This finding was confirmed by studies that found that chaos during physical activity and to regain focus on tasks after physical activity to be problematic (McMullen, Kulinna and Cothran, 2014; Stylianou, Kulinna and Naiman, 2016)

However, this infrequent response to the movement needs of the learners further fuels the chain reaction of prolonged sedentary time. Consequently when the teachers do not respond to the learners need for movement, learners create their opportunities for movement. They get up all the time and request to drink water, to go to the toilet, or they find a paper to throw in the bin, merely to move (sub-section 4.3.3.1). Conversely, these self-initiated movement opportunities are sometimes stifled by the teachers because it results in disciplinary problems (sub-section 5.3.2.2 and 4.3.2.3).

Another interesting determinant of sedentary classroom behaviour is the teachers' beliefs that sitting in the classroom are the most suitable posture for learning and classroom management (sub-section 4.3.2.5). Most of the participants believe that learners have to sit down in class especially during lessons. It is difficult for them to consider other postures, for instance, standing, as an appropriate alternative to sitting because sitting has always been part of the education system. Hidding *et al.* distinctly pointed to the issue that sitting is a norm and it is often seen as the ideal posture to work in at school (Hidding *et al.*, 2017).

When considering the teachers' beliefs of sitting as the most suitable posture, one could suggest that this belief in itself is a facilitator for sedentary behaviour and a barrier to the creativity related to classroom-based solutions to reduce the sedentary time (sub-section 5.3.3.2).

All these determinants of prolonged sedentary classroom behaviour create an unnatural environment for children who need ample movement at this stage in their lives. Although these determinants of sedentary classroom behaviour may be difficult to transform, ways should be created to lessen the sedentary time and its impact through classroom-based interventions. The study findings indicate the need to balance prolonged sitting for classroom learning activities with initiatives to reduce sedentary classroom behaviour. The development of guidelines to reduce sedentary behaviour, context-specific to the classroom, is necessary for South Africa. These guidelines should be incorporated into the South African Integrated School Health Policy, which takes into consideration the health and educational outcomes to encourage healthy behaviours in primary school learners.

This study adds important new insights to determinants of children's sedentary behaviour because it identified the determinants of sedentary behaviour in the classroom, which could inform prospective classroom-based interventions in the local setting. The most current systematic review on determinants of sedentary behaviour in children reported that the available data is finite (Stierlin *et al.*, 2015) and the lack of knowledge on the determinants of sedentary behaviour was confirmed recently (De Craemer *et al.*, 2018). The understanding of the factors influencing sedentary behaviour is essential to lessen the potential negative impact and to advise the development of prospective interventions (Sallis, Prochaska and Taylor, 2000; Brug and Chinapaw, 2015).

6.5 Current and future strategies to reduce sedentary time in the classroom

One of the objectives of this study was to explore potential strategies to address the impact of prolonged sedentary behaviour. The findings indicate that there is a strategy currently in practice in the classroom to reduce the sedentary time, which is integrated physical activity (sub-section 4.3.4.1 and 5.3.3.1). Although the current strategy is valuable and beneficial, it is not working efficiently (sub-section 4.3.4.1) because the determinants of sedentary classroom behaviour, discussed in the previous section, makes the frequent use of integrated physical activity difficult (section 6.4). A previous study by Webster *et al.*, (2015) found that if teachers are not autonomously motivated to integrate movement, then the chances that they will incorporate movement may decrease.

Nevertheless, the participants found it challenging to come up with a prospective solution considering the determinants of prolonged sedentary time. Two participants suggested the use of

technology in the classrooms in combination with physical activity as well as regular breaks to reduce prolonged sitting (sub-section 4.3.4.2). However, this option will still be challenged by the determinants of prolonged sitting. A few participants suggested that the curriculum needs to change to allow more movement and to get the learners to do physical activity more frequently as in years ago (sub-section 4.3.4.2). Still, this option can be very difficult to change because the curriculum is academically focused. A few participants suggested the restructuring of the classroom in terms of the seating and alternating sitting with standing as an alternative to reduce classroom sedentary time (sub-section 4.3.4.2 and 5.3.3.2). These participants' suggestion is in line with the classroom-based intervention, the sit-to-stand desks, that is currently the most useful solution for the reduction of sitting time (Hinckson *et al.*, 2013; Aminian, Hinckson and Stewart, 2015; Clemes *et al.*, 2016). Sit-to-stand desks also have the prospect to improve posture and musculoskeletal health (Sherry, Pearson and Clemes, 2016). Although the standing posture is certainly currently a posture used by many of the participants to break up sitting patterns, even though it is for short periods during lesson time (sub-section 4.3.4.1 and 5.3.3.1), most participants cannot fathom the standing posture as an option during lesson time (sub-section 5.3.3.2). The findings further indicate that participants' beliefs about sitting in the classroom possibly obscure the creativity of the participants regarding prospective solutions related to the intermittent standing posture during lessons (sub-section 4.3.2.5). The participants indicated that on their side a paradigm shift is needed regarding the suggestion of the use of intermittent standing in the classroom as a solution to the reduction of sedentary time (sub-section 5.3.3.2).

This type of data is required for policy making for preventative strategies and lifestyle education from an early phase. Therefore, this finding implies the need to reduce the sedentary time in the primary school classroom with a more effective solution. Hence, the suggestion to introduce a school-based intervention such as sit-stand desks to investigate the acceptability and feasibility of such intervention in the different socioeconomic background of public sector and private sector South African schools.

6.6 Significance of the study

The first significant outcome of this study was the identification of significant determinants of sedentary behaviour in the South African primary school classroom, which are time constraint associated with an overloaded curriculum, space limits due to overcrowding and teachers' belief about sitting during lesson instruction.

The second significant outcome of this study provided information on a potential, feasible classroom-based solution to sedentary classroom behaviour in the South African context that

considers the determinants of sedentary classroom behaviour which are the curricular demands resulting in time constraints and space constraints.

The third significant outcome of this study was the advancement of the existing body of knowledge in the field of sedentary behaviour in the South African context, specifically of the school-aged population in the classroom environment that could inform policy-making of preventative strategies and lifestyle education from an early phase.

6.7 Strengths and Limitations of the study

- To the researcher's knowledge, this is the first study that explored the perspectives and awareness of primary school teachers about the effects of sedentary classroom behaviour on the health of primary school learners and the strategies to address the impact in the South African classroom context.
- A diverse group of participants from diverse school settings were interviewed which gave multiple participant perspectives about the context of sedentary classroom behaviour.

This study has limitations, which should be considered when interpreting the findings. The limitations are discussed below.

- The participants' views are from one town in the West Coast District of the Western Cape and do not represent all the primary school teachers in the South African context. The qualitative design of this study limits the generalisation of the study findings to similar settings, while the transferability of the study allows for application elsewhere. The suggestions about the participants' perspectives and awareness of the effects of sedentary classroom behaviour on the health of learners need testing in different environments in the South African schools, such as the private sector schools and deep rural areas.
- The study sample included mostly females and older participants with the average age of the participants being 43 years in both the individual interviews and the focus group discussions. The study topic, as well as the recruitment strategy used, may have attracted participants of a particular type, more aged than younger and more females than male participants. The timing of the interviews after school could have influenced the participation of teachers involved in sport-education, coaching or training. An alternative sampling strategy, such as quota sampling, could be considered for future studies to sample younger, male and teachers involved in sports-education. The consideration of their perspectives could have provided valuable information about the impact of sedentary classroom behaviour and the mitigation of it.

- The time scheduled for interviews was a weakness of the study. Although the interviews were scheduled on a day and time indicated by the participants as convenient for them, many teachers still had time constraints because of personal and after school activities. The researcher had assured the participants that they could leave the study at any time, according to the ethical considerations. Different times of the day such as evening, interviews or before school interviews were considered but would have drawn fewer participants than necessary for the study. The interviews also coincided with the time teachers prepared for the midyear exams. A different time of year should be considered when teachers' time schedules are less demanding such as the beginning of the year right after learners are settled into school. The researcher may have reached the teachers involved in sport-education and gained useful information about insights and strategies to mitigate the impact of sedentary classroom behaviour.
- In caution to avoid asking leading questions, the researcher asked too few prompting questions to elicit responses during the individual interviews and focus group discussions, which could have skewed the results. Researchers in future studies should ask more prompt and specific questions about particular cardiometabolic diseases.
- In qualitative research, there is an acknowledgement of the role of the interviewer. The researcher introduced herself as a researcher but disclosed that she is a physiotherapist when asked directly. Although the researcher took several measures to ensure validity and reliability of findings, she was aware that response bias may have still existed from participants, particularly about spinal health, because the participants' knowledge about the researcher's profession could have influenced their responses.
- The isiXhosa participants chose to speak English and although they were proficient in English it could have hindered the expression and disclosure of vital data.
- The researcher translated the Afrikaans in-context quotes of the participants into English for validation and the purpose of this thesis. It is acknowledged that translations could change the meaning of sentences. Therefore, the analysis of the transcripts occurred in the language that it was written in (the language of the interview).

6.8 Recommendations and future work

The researcher makes the following recommendations and future research suggestion as a result of the study findings:

- More studies are recommended to determine the perspectives and awareness of primary

and secondary school teachers in the private education sector as well as the rural areas of South Africa about the impact of sedentary classroom behaviour on the health of learners. Classroom-based interventions that target reduction of prolonged sedentary classroom behaviour should also be explored in different socioeconomic areas in the South African, because the availability of resources for implementation may vary across school settings such as private schools and different quintile schools in the public sector.

- This investigation revealed that teachers' knowledge about sedentary behaviour and its association with spinal health would be a beneficial strategy for lifestyle education from an early phase of South African learners, in different socioeconomic areas, to avert the impact later in life. On this basis, the findings established that there is a need to empower South African teachers about health risks associated with prolonged sedentary behaviour. Therefore, the researcher recommends the inclusion of a module that focuses on sedentary behaviour in the classroom and the associated health aspects in tertiary educational platforms such as teacher training colleges and universities.
- The findings indicate that curricular demand is a significant factor in sedentary classroom behaviour. There is a real opportunity to change the sedentary classroom behaviour by addressing the approach of curriculum and workload completion in this context. Amendments to the curriculum are recommended to the South African Department of Education and policymakers to incorporate breaks during lessons to ensure adequate time for organised physical activity and, to include this in the South African integrated school health policy.
- Additionally, the lack of space is another factor of sedentary classroom behaviour. To mitigate sedentary classroom behaviour, the researcher recommends that policy targets this issue in particular by balancing prolonged sitting for classroom learning activities with initiatives to reduce sedentary classroom behaviour. Primary schools in collaboration with the Department of Education and policymakers should enable the restructuring of the school classroom in terms of furniture that create space and the opportunity to alternate between sitting and standing, such as height-adjustable sit-stand desks. However, the resource constraints in certain quintile school and the cost-effectiveness of such interventions should be considered. This study made headway in generating knowledge on the sedentary classroom behaviour and given the current context, it is clear that additional research needs to explore the acceptability and feasibility of height-adjustable sit-stand desks as part of the South African school classroom environment.

- Further studies should consider the perceptions of South African learners regarding the impact of sedentary classroom behaviour on their health. The learners themselves are important stakeholders to consider when developing classroom-based interventions to benefit them.

CHAPTER 7

CONCLUSION

The research aimed to determine the perspectives and awareness of primary school teachers about the effects of prolonged sedentary classroom behaviour on the health of primary school learners and, to explore potential strategies to address the impact of this behaviour. The study findings described in chapter six indicate that the objectives outlined in chapter one have been achieved. The objectives were to determine primary school teachers' awareness about the effects of prolonged sedentary classroom behaviour on the health of primary school children, to explore teachers' perspectives about the determinants of sedentary time in the school classroom and to explore teachers' views of potential strategies to address sedentary classroom behaviour.

Based on the thematic analysis of the face-to-face individual interviews and focus group discussions the findings concluded that primary school teachers are aware of the cognitive, behaviour and sitting discomfort of learners that are related to prolonged sedentary classroom behaviour. They predominantly postulate the development of adverse spinal health later in the lives of learners, based on the slumped sitting postures of learners. However, they are mostly unaware of physical health effects on learners associated with prolonged sedentary classroom behaviour. There are intricate and interconnected factors that influenced the sedentary time in the classroom, resulting in learners to sit for long periods. The identified determinants of prolonged sedentary time in the primary school classroom are the demands of the overloaded curriculum resulting in time constraints and rigid class routines. Limited space due to the classroom built or layout and the number of learners was another determinant of sedentary time. An interesting determinant of sedentary time was the beliefs of teachers about sitting as the appropriate posture during lessons.

Teachers have strategies in place to reduce sedentary time in the classroom, but the influence of the determinants of sedentary time in the classroom makes it ineffective. The findings indicate that space and the impact on time during class are the factors to consider for the development of prospective classroom-based interventions to reduce prolonged sedentary time. The prospective strategies that consider those determinants are considerations to modify the classroom furniture to provide learners freedom to alternate between sitting and standing interchangeably. Those are in line with the classroom-based intervention, the sit-stand desks, that are currently considered the most useful to reduce sitting by previous research.

Based on these conclusions and the current context, further research is needed to determine the perspectives and awareness of teachers, primary and secondary, regarding the effects of sedentary

classroom behaviour on the health of learners in rural and private sector South African schools. In addition, the researcher recommended the determination of the acceptability and feasibility of standing interchanged with sitting, linked to modified furniture, such as height-adjustable sit-stand desks, as a classroom-based intervention to address prolonged sedentary behaviour in the South Africa classroom.

The views of participants are from one town in the West Coast District and, do not represent all the primary school teachers in this region of South Africa. Therefore, further research should be conducted in different settings, such as rural and private sector schools in this regard. The socio-economic context, in other words, budgets allocated for education in South Africa which faces economic woes should also be kept in mind in future research. While the qualitative design limits the generalizability of the findings, this approach provided new insights into the determinants of sedentary time in the South African primary school classroom, which also informs a potential feasible classroom-based solution to address sedentary classroom behaviour in South Africa. The study further contributed to the South African knowledge base of the field of sedentary behaviour. In doing so, the study provides one building block for future research and possible recommendations for the future in a challenging educational environment.

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APPENDICES

APPENDIX A: Approval from Health Ethics Research Committee



UNIVERSITEIT
STELLENBOSCH
UNIVERSITY

Approval Notice

New Application

12/04/2019

Project ID :8546

HREC Reference # S19/01/013

Title: Perspectives and Awareness about Health Effects on Learner Classroom Sedentary Behaviour among Primary School Teachers in

Saldanha, Western Cape

Dear Ms Liesl Jooste,

At an HREC1 meeting held on 6 March 2019, the New Application received on 05/02/2019 was reviewed by members of the Health Research Ethics Committee and modifications were requested. Your response to modifications received on 02/04/2019 was reviewed by members of Health Research Ethics Committee via expedited review procedures on 12/04/2019 and approved.

Please note the following information about your approved research protocol:

Protocol Approval Period: 12 April 2019 to 11 April 2020.

Please remember to use your project ID (8546) on any documents or correspondence with the HREC concerning your research protocol.

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

After Ethical Review

Translation of the informed consent document(s) to the language(s) applicable to your study participants should now be submitted to the HREC.

Please note you can submit your progress report through the online ethics application process, available at: Links Application Form Direct Link and the application should be submitted to the HREC before the year has expired. Please see [Forms and Instructions](#) on our HREC website (www.sun.ac.za/healthresearchethics) for guidance on how to submit a progress report.

The HREC will then consider the continuation of the project for a further year (if necessary). Annually a number of projects may be selected randomly for an external audit.

Provincial and City of Cape Town Approval

Please note that for research at a primary or secondary healthcare facility, permission must still be obtained from the relevant authorities (Western Cape Department of Health and/or City Health) to conduct the research as stated in the protocol. Please consult the Western Cape Government website for access to the online Health Research Approval Process, see: <https://www.westerncape.gov.za/general-publication/health-research-approval-process>. Research that will be conducted at any tertiary academic institution requires approval from the relevant hospital manager. Ethics approval is required BEFORE approval can be obtained from these health authorities.

We wish you the best as you conduct your research.

For standard HREC forms and instructions, please visit: [Forms and Instructions](#) on our HREC website <https://applyethics.sun.ac.za/ProjectView/Index/8546>

If you have any questions or need further assistance, please contact the HREC office at 021 938 9677.

Yours sincerely,

Mrs. Melody Shana ,

Coordinator,

HREC1

National Health Research Ethics Council (NHREC) Registration Number:

REC-130405-012 (HREC1)+REC-230205-010 (HREC2)

Federal Wide Assurance Number: 00001372

APPENDIX B: Approval from the Western Cape Education Department

Directorate: Research

Audrey.wyngaard@westerncape.gov.za

tel: +27 021 467 9272

Fax: 0865902282

Private Bag x9114, Cape Town, 8000

wced.wcape.gov.za**REFERENCE:** 20190424-3966**ENQUIRIES:** Dr A T Wyngaard

Mrs Liesl Jooste
 PO Box 1118
 Saldanha
 7395

Dear Mrs Liesl Jooste

**RESEARCH PROPOSAL: PERSPECTIVES AND AWARENESS ABOUT LEARNER CLASSROOM
 SEDENTARY BEHAVIOUR AMONG PRIMARY SCHOOL TEACHERS IN SALDANHA, WESTERN CAPE**

Your application to conduct the above-mentioned research in schools in the Western Cape has been approved subject to the following conditions:

1. Principals, educators and learners are under no obligation to assist you in your investigation.
2. Principals, educators, learners and schools should not be identifiable in any way from the results of the investigation.
3. You make all the arrangements concerning your investigation.
4. Educators' programmes are not to be interrupted.
5. The Study is to be conducted from **06 May 2019 till 30 August 2019**.
6. No research can be conducted during the fourth term as schools are preparing and finalizing syllabi for examinations (October to December).
7. Should you wish to extend the period of your survey, please contact Dr A.T Wyngaard at the contact numbers above quoting the reference number?
8. A photocopy of this letter is submitted to the principal where the intended research is to be conducted.
9. Your research will be limited to the list of schools as forwarded to the Western Cape Education Department.
10. A brief summary of the content, findings and recommendations is provided to the Director: Research Services.
11. The Department receives a copy of the completed report/dissertation/thesis addressed to:

**The Director: Research Services
 Western Cape Education Department
 Private Bag X9114
 CAPE TOWN
 8000**

We wish you success in your research.

Kind regards.

Signed: Dr Audrey T Wyngaard

Directorate: Research

DATE: 25 April 2019

Lower Parliament Street, Cape Town, 8001

tel: +27 21 467 9272 fax: 0865902282

Safe Schools: 0800 45 46 47

Private Bag X9114, Cape Town, 8000

Employment and salary enquiries: 0861 92 33 22

www.westerncape.gov.za

APPENDIX C: Permission from research sites

School 1

Dear Ms Jooste

Permission Research at school

Permission has been granted for your research at our school.

We wish you success.

Kind regards

School 2

Geagte Mev Jooste

Toestemming vir Navorsing

Hiermee veleen ons toestemming vir u navorsing by ons skool.

Sterkte.

Groete

School 3

Geagte Mev Jooste

Toestemming vir Navorsing

Hiermee veleen ons toestemming vir u navorsing by ons skool.

Alle voorspoed en sterkte.

Vriendelike groete

School 4

Geagte Mev Jooste

Toestemming vir Navorsing

Hiermee veleen ons toestemming vir u navorsing by ons skool.

Baie sterkte.

Groete

APPENDIX D: English participant information sheet and consent form



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PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

Study Title: Perspectives and Awareness about Learner Classroom Sedentary behaviour among Primary School Teachers in Saldanha, Western Cape

Ethics Reference number: S19/01/013

Participant Reference number:

Principal Investigator: Liesl Jooste

Principal Investigator's Address and Affiliation: Stellenbosch University Division of Physiotherapy,

Department Of Health Sciences, Faculty Of Medicine And Health Sciences, P.O. Box 19083, Tygerberg, 7505

Supervisors: Dr Dawn Ernstzen, Prof Quinette Louw, Mr Dominic Fisher

Dear Prospective Participant

You are being invited to take part in a research study. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied, that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part. This study has been approved by the Health Research Ethics Committee at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What this research study is all about?

The focus of the study is on the perspectives and awareness of primary school teachers about the effects of classroom sedentary behaviour (specifically sitting behaviour) on the health of primary school learners in Saldanha. I will be doing interviews and discussion groups with teachers. The interviews will be one-on-one and



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Faculty of Medicine and Health Sciences



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will take 60-minutes. The group discussions will consist of up to four to five people and will take 60minutes. The groups will only be teachers. Interviews and discussions will be recorded for better analysis by the researcher.

Why you have been invited to participate?

You have been invited to participate because you are a teacher at a primary school in Saldanha.

What your responsibilities will be

As a participant you will take part in an interview and/or a discussion group to answer questions about classroom sitting behaviour and its impact on learners.

Benefits and costs for taking part in this research study

There is no direct benefit to you as a participant as **this study aims to impact learners' health in the future.**

Participants will not be paid to take part in the study but will be compensated for their time and effort if taken part in the form of gift vouchers. There are no additional costs to you as a participant.

Risks involved in taking part in this research study

There are no risks involved in participating. No sensitive questions will be asked.

Who will have access to records and information?

All information collected will be treated as confidential. The interview will not require you to provide any personal information. Personal information will not be shared as to maintain anonymity. Recordings will be stored on a password protected computer and paperwork will be stored in a locked office for protection. All names will be removed from the recording transcripts and recordings will immediately be destroyed on completion of this study. Only the research team will have access to data and information obtained and members of the Ethics Committee may inspect records to ensure that the research is being done according to guidelines.

Additional information and contact details

You can contact Liesl Jooste at 0727138021 if you have any further queries regarding the study

You can contact the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by your study researcher.

You will receive a copy of this information and consent form for your own records



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DECLARATION BY PARTICIPANT

By signing below, I **agree to take part in a research study entitled Perspectives and Awareness about Learner Classroom Sedentary behaviour among Primary School Teachers in Saldanha, Western Cape**

I declare that:

- I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions and all my questions have been adequately answered.
- I understand that taking part in this study is voluntary and I have not been pressurised to take part.
- I may choose to leave the study at any time and will not be penalised or prejudiced in any way.
- I may be asked to leave the study before it has finished, if the study researcher feels it is in my best interest, or if I do not follow the study plan, as agreed to.
- The interview or discussion may be recorded.

NO	YES
----	-----

Signed at (place) on (date).....

.....
Signature of participant

.....
Signature of witness

DECLARATION BY INVESTIGATOR

I (name) **declares that:**

- I explained the information in this document to:.....
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above.

Signed at (place) on (date).....

.....
Signature of investigator

.....
Signature of witness



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APPENDIX E: English semi-structured individual interview schedule

Discussion schedule for Individual interviews

Sedentary classroom behaviour in primary schools

IDNo: | | | |

Facilitator Initials: | | | |

School Level: Primary

Grade: | | |

Audio File #: | | | |

Date: / /

Introduction

- General purpose of study
- Aims of the interview
- Importance of participant's cooperation
- What will happen with collected data
- Consent given. May stop interview at time
- Any questions?

Questions regarding sedentary behaviour and spinal Health in schools:

1. Please tell me about your daily routine in the classroom

Prompts: What types of activities are done in the class?

Do some of the activities involve sitting on the floor/mat; on chairs/benches
movements

2. Can you estimate how much time learners are spending in a sitting position in your classroom?

Break this up into the school periods: arrival to 1st break;
between 1st and 2nd recess;
after 2nd recess to the end of the day.

3. What do you know about sedentary behaviour?

Energy expenditure
Postures
Effects

4. How do you feel about the amount of time learners spend sitting?

Positive Negative

5. Are you aware of the effects of sedentary behaviour on the body

Prompts: e.g. effect on the spine, effects on the joints, effect on the hearts and lungs posture,
muscle tone, muscle weakening, pain, academic performance/concentration

6. What do you feel are the factors that encourage sedentary behaviour?

7. What do you think can be done to facilitate the reduction of sitting in class?

Talks Demonstrations

8. What do you think are the most important aspects to be included in a campaign aimed at reducing sitting?

9. What do you think are the most important things we must consider when we planning a campaign to teach teachers about the effects of prolonged sitting and the reduction of prolonged sitting?

Education Exercises

APPENDIX F: Afrikaans semi-structured individual interview schedule

Besprekingskedule vir die Individuele Onderhoudsvrae:

Klaskamer sittende gedrag in laerskole.

Studie Nr: |_|_|_|_|

Skoolvlak:

Graad: |_|_|

Audio Lêer #: |_|_|_|_|

Datum: / /

Inleiding

- Algemene doel van studie
- Doelwitte van die onderhoud
- Belangrikheid van deelnemer se samewerking
- Wat sal gebeur met versamelde data
- Toestemming gegee. Mag onderhoud stop
- Enige vrae?

1. Vertel my asseblief van jou daaglikse roetine in die klaskamer

ProntVrae: Watter tipe aktiwiteite word in die klas gedoen?

Behoort sommige van die aktiwiteite om op die vloer / mat te sit; op stoele / banke bewegings

2. Kan jy skat hoeveel tyd leerders in 'n sittende posisie in jou klaskamer spandeer?

Breek dit op in periodes: aankoms tot 1ste pouse;

tussen 1ste en 2de pouse;

na 2de pouse tot aan die einde van die dag.

3. Wat weet jy van sit gedrag?

Energie verbruik

Posisies

Effekte

4. Hoe voel jy oor die hoeveelheid tyd wat leerders in sit spandeer?

Positief

Negatief

5. Is jy bewus van die effekte van sedentêre gedrag (sit gedrag) op die liggaam het

ProntVrae: bv. effek op die ruggraat, effekte op die gewigte, effek op die harte en longe postuur, spiertonus, spier verswakking, pyn, akademiese prestasie / konsentrasie

6. Wat voel jy is die faktore wat sittende gedrag aanmoedig?

7. Wat dink jy kan gedoen word om die verlaging van sit in die klas te fasiliteer?

Praatjies

Demonstrasies

8. Wat dink jy is die belangrikste aspekte wat ingesluit moet word in 'n veldtog wat daarop gemik is om langdurige sit te verminder?

9. Wat dink jy is die belangrikste dinge wat ons moet oorweeg wanneer ons 'n veldtog beplan om onderwysers te leer oor die gevolge van langdurige sit en die vermindering van langdurige sit?

Opvoedkundig

Oefeninge

APPENDIX G: English semi-structured focus group discussion schedule**English Semi-structured Focus Group Discussion Schedule:****Interview Questions: Sedentary Classroom behaviour in primary schools**

Study No:

School Level:

Grade:

Audio File no:

Date: / /

Introduction

- General purpose of study
- Aims of the discussion
- Importance of participant's cooperation
- What will happen with collected data
- Any questions?

Questions regarding sedentary behaviour and spinal Health in schools:

1. What do you know about sedentary behaviour?
2. Are you aware of the health effects of sedentary behaviour on the learners?
3. What do you think can reduce sitting in class?
4. Do you think one can use another posture than just sitting during lesson time?

APPENDIX H: English demographic questionnaire

English Demographic Questionnaire

Perspectives and Awareness about Health Effects on Learner Classroom Sedentary behaviour among Primary School Teachers in Saldanha, Western Cape

Date:

Please fill in the blanks or place an X next to the word or phrase that best matches your response.

What is your gender?

- Male
- Female

What is your age?

- 21-25years
- 26-35years
- 36-45years
- 46-55years
- 56-65years
- Over65years

What is your teaching experience?

- Less than 1 year
- 1-5years
- 6-10
- More than 11years

What is your highest level of education?

- Diploma
- Bachelor's Degree
- Master's Degree
- Doctorate Degree
-

How would you describe your race or ethnicity?

- Black
- Coloured
- Indian
- White
-

What grade are you teaching?

- Gr1
- Gr 2
- Gr3
- Gr4
- Gr5
- Gr6

What language do you speak?

- Afrikaans
- English
- Xhosa
-

APPENDIX I: Extract from a coded transcript

- 1 **GAS:** Nee, dis mos nie meer grondslag fase nie. Die kleintjie sit mos, ons sit glad nie
 2 meer op matte nie, ons doen mos nie meer matwerk eintlik nie. Want hulle is mos nou
 3 groot.
- 4 **ONDERHOUDVOERDER:** Okay, so almal sit nou in hulle se bankies.
- 5 **GAS:** Almal sit nou in hulle se bankies. Heel dag. Comment [LJ1]: Sitting is prolonged
- 6 **ONDERHOUDVOERDER:** Sou u sê dat hulle kla oor hulle so sit?
- 7 **GAS:** Ek dink nie hulle sal kla nie, maar hulle is kiewelrig, definitief. 'n Kind voel ek kan
 8 definitief nie heeldag so sit nie, hulle kry maar net op dag 2 byvoorbeeld, dis een keer 'n Comment [LJ2]: Perspective: Learners sit for prolonged periods
 9 week wat hulle LO kry wat hulle bietjie uitgaan. Die res van die tyd is ons heeldag in die Comment [LJ3]: A lack of physical activity
 10 klas want daar is so baie werk om te doen. So die kurrikulum laat ook nie toe dat jy kan sê Comment [LJ4]: Overloaded curriculum
 11 ek het nou al vyf minute, ek gaan dit gou afknyp en ek gaan 'n bietjie iets buite doen nie,
 12 want daar is te veel dinge om te doen, so ons moet maar half boekwurms grootmaak, daar
 13 is nie tyd vir speel nie. Letterlik niks tyd nie. Hulle het hoeveel vakke, hulle het 10, 9 Comment [LJ5]: Time constraints
 14 vakke. Daar is die rooster, elke dag moet daar byvoorbeeld vyf vakke gedoen word, so die
 15 dinge moet gedoen word. Comment [LJ6]: Work according to time schedules
- 16 **ONDERHOUDVOERDER:** So hulle gaan uit die een vak in die ander een?
- 17 **GAS:** Uit die een vak en in die ander vak, net soos dit nou daar is twee periodes
 18 Wiskunde, so maar die tyd so self dophou na 'n uur of soms nou nie so akkurat nie, maar
 19 dan begin ons met die volgende vak. Sit jou boek in jou sak en haal jou volgende boek uit.
 20 Daar is nie nou nog 'n break of enige iets tussen in nie. Comment [LJ7]: Haptic class routines
- 21 **ONDERHOUDVOERDER:** Mm
- 22 **GAS:** Maar gewoonlik in die ander skole, die skool is eintlik hoe kan ek sê al skool wat
 23 nog so klasonderwys. Die ander skole gee vakonderwys, vakonderrig waar die
 24 onderwysers miskien na die kind toe kom of the die kind ruil. Maar ek dink dit skep te veel
 25 chaos, want as jy ruil dan vat hulle omtrent vyf minute om weer rustig te raak, of tien
 26 minute vir die kinders om te sien en weer te begin werk. So dis seker maar een van die Comment [LJ8]: Learners take a long time to settle after movement

APPENDIX J: Examples of translated verbatim quotes of participants

<p><i>Ja, hulle raak mos moeg, dit is waar die kriewelrigheid begin, want dan konsentreer hulle nie meer van, want dis mos nou ongemaklik.” [P4, F46-55yrs, Gr3]</i></p>	<p><i>“Yes, they (learners) do get tired; this is when the fidgeting starts because then they no longer concentrate since it is uncomfortable now.” [P4, F46-55yrs, Gr3]</i></p>
<p><i>“Dis die voorskrif van die akademie ons noem dit nou CAPS. Dis die voorskrifte van die Departement dat daai werk gedoen moet word. So jy word vas gevang in daai strukturele, verpligting. Dit is absoluut, ons het nie daar is nie 'n voorskrif dat kinders moet beweeg en so aan nie.” [P7, F56-65yrs, Gr6]</i></p>	<p><i>“That's the prescription of the educational institution we now call it CAPS. These are the requirements of the Department that this work must be done. So you are caught up in that structural obligation. It is absolutely, and we do not have a prescription for children to move and so on.” [P7, F56-65yrs, Gr6]</i></p>
<p><i>“Hulle sal enige iets doen of te kan beweeg. Drink water, gaan toilet toe, sommige van die leerlinge sal 'n potlood of twee skerp maak in 'dag. 'Asseblief mag ek 'n sneusdoekie kry?' Jy kry daai tipe gedrag as hulle moeg is. [P2, F, 56-65yrs, Gr3]”</i></p>	<p><i>“They will do anything to move. Drink water, go to the toilet, some of the learners will sharpen a pencil or two in a day. 'Please may I have a tissue? You get that type of behaviour when they are tired. [P2, F, 56-65yrs, Gr3]”</i></p>
<p><i>“Maar die ... soos sy ook sê ... tyd is beperk, vanweë die geskrewe aktiwiteite wat mense deesdae 'n bewys van alles wil hê; dit maak nie saak wat jy doen nie, dit moet op skrif vasgelê word. Die kind se skryftake oorheers dus daardie tyd wat hy eintlik vrylik op die mat kon loop of wat ook al. [F1, F, 36-45yrs, Gr2]”</i></p>	<p><i>“But, the ... as she also says ... time is limited, because of the written activities people these days want proof of everything, so no matter what you do, it must be captured in writing. So the child's writing tasks dominate that time that he actually could have walked freely on the carpet or whatever.” [F1, F, 36-45yrs, Gr2]</i></p>

APPENDIX K: Extract of the codebook

Definition	Comment scope	Code	Sub-theme	Theme	Author	Date
Any act of movement initiated by learners to reduce sitting	“Hulle sal sit en hulle sal self besluit hulle het nou lank genoeg gesit”	Enough of sitting	Learners’ movement patterns	Teachers’ awareness of learners movement needs in the classroom	Liesl	09-Sep-2019
Any decrease in mental processes, including attention span, focus or alertness	“Hulle kan nie meer as 'n uur natuurlik fokus nie uhm,dan gaan hulle begin gesels. Dertig minute op die meeste werk hulle en so aan maar daarna begin hulle gesels dan moet jy 'n afwisseling het”	Loss of concentration	Diminished cognitive performance	Teachers’ awareness of learners movement needs in the classroom	Liesl	09-Sep-2019
Any plan of action designed by the teacher to initiate movement or break up sitting in class	“Maar sê nou byvoorbeeld ons ruil nou aktiwiteite of die vakke, die leerarea, dan as hulle nou Wiskunde doen, dan sal ons nou staan dan sal ons nou tel ek laat hulle staan spring op die been, een, twee, of tien, twintig, spring op die been, en dan dat hulle nie so baie kan sit nie.”	Jumping while doing math	Current strategies to reduce sitting	Initiatives to address sedentary classroom behaviour	Liesl	05-Sep-2019
An acceptance that sitting is the only appropriate posture	"Ek sien nou al die prentjie as hulle nou moet staan. Nee, dit gaan nie werk nie.”	Standing is not an option	Belief about sitting	Determinants of classroom sedentary behaviour	Liesl	09-Sep-2019

Definition	Comment scope	Code	Sub-theme	Theme	Author	Date
Any plan of action proposed by the teacher to initiate movement or break up sitting in class	“Hulle kort gereelde breke, ‘breaks’ soos hulle sê sodat hulle weer kan konsenteer”	Need breaks	Future strategies to reduce sitting	Initiatives to address sedentary classroom behaviour	Liesl	09-Sep-2019
Any factor which decisively affects the duration of sitting in class	“Dis die voorskrif van die akademie ons noem dit nou CAPS. Dis die voorskrifte van die departement dat daai werk gedoen moet word so jy word vas gevang in daai strukturele uhm, verpligting. Dit is absoluut, ons het nie daar is nie 'n voorskrif dat kinders moet beweeg en so aan nie.”	Prescription of the educational institution	Curricular demands	Determinants of classroom sedentary behaviour	Liesl	09-Sep-2019
The understanding, knowledge or connection associated with adverse health effects and prolonged sitting	“Dit het my nogal verbasend dat dit nou 'n kwelpunt is wat navorsing nou aanraak, want dit is soos jy al die jare nou vandat ek gekom het, die kind sit in die klas. Ons het al die jare so gemaak “	Cannot associate sitting in school with poor health	Unawareness of associated health effects with prolonged sitting 7.1.1.1	Teachers’ awareness about health effects related to sedentary classroom behaviour	Liesl Jooste	27-Aug-2019