USING MOBILE TECHNOLOGY TO REDUCE SEDENTARY TIME IN EMPLOYEES OF A JOHANNESBURG MARKETING COMPANY

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A dissertation submitted to the Faculty of Health Science, University of the Witwatersrand, Johannesburg, in fulfilment of the requirements for the degree of Master of Science in Medicine

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Declaration

I, Kristi Raquel Kallmann, declare that the work within this dissertation is my own. It is being submitted for the degree of Master of Science in Medicine at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination at this or any other University.

(Signature of Candidate)

22^{nd} day of July 2025

Ethical Declaration:

This study was conducted in accordance with the ethical guidelines set out by the University of the Witwatersrand. Ethical approval was granted by the Human Research Ethics Committee (Medical) at the University of the Witwatersrand (Certificate Number: M210823) (Appendix A).

The participants were provided with all the necessary information about the study and were required to provide informed consent prior to participation. Participation in the study was voluntary, and the participants were informed of their right to withdraw from the study at any point, without any consequences to them. All data collected were treated confidentially and anonymously in the reporting of results.

Abstract

Background: Prolonged sedentary behaviour in the workplace is linked to various adverse health outcomes, including increased cardiometabolic risk and reduced psychological well-being. Office-based employees are particularly vulnerable due to their extended vocational sitting, yet simple and cost-effective interventions remain limited.

Aim: This study evaluated the effectiveness of an electronic health (eHealth) intervention by incorporating movement prompts and gain-framed health messages to reduce workplace sedentary behaviour among employees of a marketing and advertising firm in Johannesburg, South Africa.

Methods: A mixed-methods approach was used. Twenty-eight participants were assigned to either an intervention group (n=13, mean age 32.46 ±6.04 years), which received hourly movement prompts and weekly health messages designed to encourage more movement during vocational hours and highlight the benefits of decreasing sedentary behaviour, or a control group (n=15, mean age 34.94 ±6.67 years), which used a self-monitoring app. Group allocation was based on smartphone type (iPhone vs Android). Quantitative data were collected via wrist-worn accelerometers, anthropometric and cardiometabolic assessments, self-reported sedentary time and Satisfaction with Life questionnaires. Statistical analysis included descriptive statistics, paired and independent t-tests, change score comparisons, repeated measures analysis of variance (ANOVA), and Pearson's correlation analysis. Qualitative data were gathered post-intervention through focus group discussions and analysed using reflexive thematic analysis that was guided by Braun and Clarke's six-step approach, which involved becoming familiar with the data, generating initial codes, identifying and reviewing themes, defining and naming, and then producing the final report. This method was selected for its flexibility and systematic process in exploring participants' perspectives and identifying patterns within the data.

Results:

The intervention group increased their average number of workday breaks from 24.94 ±8.26 to 28.38 ±12.12 breaks per day, while the control group decreased from 30.72 ±12.06 to 25.9 ±9.04 breaks per day ($p = 0.04$). No significant difference in objectively measured sedentary behaviour was observed between the two groups and across the intervention period. Unexpectedly, diastolic blood pressure increased in the intervention group (81.47 ±10.57 mmHg to 84.54 ±11.27 mmHg), while other cardiometabolic markers, systolic blood pressure, triglycerides, cholesterol, and glucose remained unchanged. Only the intervention group showed an increase in satisfaction with life scores ($p = 0.006$). The qualitative analysis revealed five main themes, including the impact of the intervention, the role of sedentary behaviour and its impact on overall health, workplace culture and barriers to change, accountability and future recommendations. The qualitative findings highlighted increased awareness of sedentary behaviour and the perceived benefits of reducing prolonged sitting. However, several barriers to adherence were noted, such as workload, office culture, and a limited dedicated movement space, making it difficult to maintain healthy habits.

Conclusion: This exploratory study demonstrated that eHealth interventions, such as hourly smartphone prompts, may encourage workplace movement and increase awareness regarding sedentary behaviour. Although the eHealth prompt did not result in significant changes in overall sedentary time or cardiometabolic health, the qualitative findings suggest that the participants became more conscious of their behaviour, health, and accountability. These results highlight that while simple eHealth prompts may have some benefit, they are unlikely to be successful in isolation. Greater support within the workplace may be needed to help sustain long-term behaviour change within the office setting. The findings from this study offer insights that can be utilised to develop more comprehensive workplace health interventions and guide future research.

Acknowledgements

I would like to begin by expressing my deepest gratitude to my Lord and Saviour. Without His grace, I would not have been able to complete my dissertation.

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Finally, I am grateful for the personal and academic growth that this dissertation has given me. While this journey has been challenging, it has also been one of resilience, learning and perseverance – one that I am incredibly proud of.

Thank you to everyone who has been a part of this journey.

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List of Abbreviations

ACM	All-cause Mortality
ACSM	American College of Sports Medicine
BMI	Body Mass Index
BP	Blood Pressure
CCPA	*CardioChek Plus Analyzer*
CEO	Chief Executive Officer
CPAP	Continuous Positive Airway Pressure
CVD	Cardiovascular Disease
DBP	Diastolic Blood Pressure
eHealth	Electronic Health
ENMO	Euclidean Norm Minus One
EP	Employee Presenteeism
FG	Focus Group
HDL-C	High-Density Lipoprotein Cholesterol
HR	Human Resources
IDF	International Diabetes Federation
LDL-C	Low-Density Lipoprotein Cholesterol
LMIC	Low- and Middle-Income Country
LPA	Light Physical Activity
MET	Metabolic Equivalent
MVPA	Moderate-to-Vigorous Physical Activity
NCDs	Non-Communicable Diseases
PA	Physical Activity
ROM	Range of Motion
SB	Sedentary Behaviour
SBP	Systolic Blood Pressure
SIT-Q-7d	Last 7 days Sedentary Time Questionnaire
SSA	sub-Saharan Africa
SWLS	Satisfaction with Life Scale
T2DM	Type 2 Diabetes Mellitus
TASST	TAxonomy of Self-reported Sedentary Behaviour Tools

TC	Total Cholesterol
TG	Triglyceride
TV	Television
WHO	World Health Organisation
WHR	Waist-to-Hip Ratio

List of Definitions:

Active and sedentary: an individual who meets the recommended level of moderate-to-vigorous physical activity but spends significant periods in sedentary behaviour (Saunders, Chaput & Tremblay, 2014).

Body Mass Index (BMI): an anthropometric measurement used to estimate total body fat based on a person's height and weight - calculated by dividing weight (kg) by height in meters squared (m^2) (World Health Organization, 2000).

Chronic respiratory disease: a chronic, non-infectious lung condition, such as asthma or chronic obstructive pulmonary disease (COPD) (South Africa: Department of Health, 2013).

Composite measures: a self-report tool that uses multiple questions regarding different areas of sedentary behaviour, allowing for a more detailed estimate of total sedentary time (Dall et al., 2017).

eHealth: technology that is used to deliver healthcare services, improve health-related quality of life, and support more efficient healthcare delivery methods (da Fonseca et al., 2021).

Employee presenteeism: reduced productivity due to health-related issues despite being physically present at work (Chapman, 2005).

Gain-framed messages: messages that highlight the positive outcomes of adopting a healthy behaviour (Ratcliff et al., 2019).

Inactive: a term used to describe when an individual does not meet the recommended physical activity guidelines (Tremblay et al., 2017).

Inactive and sedentary: an individual who fails to meet physical activity guidelines and spends the majority of their waking hours sitting or engaging in low-energy behaviour (Saunders, Chaput & Tremblay, 2014).

Light physical activity (LPA): an activity that involves minimal effort with only a slight increase in energy expenditure, such as standing or slow walking (Chaput et al., 2014).
Loss-framed messages: messages that emphasise the negative consequences of not adopting a behaviour (Ratcliff et al., 2019).

Metabolic dysfunction: a group of metabolic disorders, including conditions such as insulin resistance, and elevated blood pressure, that increase the risk of chronic disease (South Africa: Department of Health, 2013).

Moderate-to-vigorous physical activity (MVPA): any physical activity that increases energy expenditure significantly, including activities such as brisk walking (moderate) and running (vigorous) (World Health Organization, 2020).

Non-communicable diseases (NCDs): a group of chronic diseases not caused by direct person-to-person transmission. These include cardiovascular diseases, cancers, diabetes, and chronic respiratory diseases (South Africa: Department of Health, 2013).

Sedentary and active: when an individual engages in long periods of sedentary behaviour but still meets the recommended physical activity guidelines (Saunders, Chaput & Tremblay, 2014).

Sedentary and inactive: when an individual does not meet physical activity guidelines and spends most of their day engaging in sedentary behaviours (Saunders, Chaput & Tremblay, 2014).

Sedentary behaviour (SB): any waking activity performed in a seated, reclining or lying position that involves a low energy expenditure (≤1.5 METs) (Tremblay et al., 2017).

Singular measures: a self-report method that assesses sedentary behaviour using a single item only, such as one question on total sitting time (Dall et al., 2017).

Type 2 Diabetes Mellitus (T2DM): a chronic metabolic condition characterised by insulin resistance and elevated blood glucose levels (Goyal, Singhal & Jialal, 2023).

World Health Organisation (WHO): a specialised agency of the United Nations responsible for setting global public health and evidence-based guidelines (World Health Organization, 2020).

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CHAPTER 1: INTRODUCTION

1.1 Introduction

Despite widespread efforts to promote healthier lifestyles, the workplace, where many adults spend nearly a third of their lives, remains one of the most sedentary environments. In South Africa, where rates of non-communicable diseases (NCDs) are rising, workplace sedentary behaviour (SB) is a growing concern. Research aimed at addressing workplace SB through effective interventions is crucial.

Sedentary behaviour encompasses all aspects of modern-day living, including daily commute, the work environment, home life, and leisure activities. It has been linked to numerous adverse health outcomes, including obesity, cardiovascular disease (CVD), cancer and type II diabetes mellitus (T2DM). Beyond physical health, there is evidence to suggest a relationship between SB and a decline in mental health (Diamond & Byrd, 2020). Adults with higher SB levels have an increased risk of depression, while regular physical activity (PA) has been shown to mitigate the risk of onset (Hallgren et al., 2018). In both developed and developing countries, it is estimated that approximately 6% of all deaths could be attributed to prolonged sitting time, even when PA is considered (Chau et al., 2013).

The evidence is unequivocal: even if an individual meets the recommended PA level, prolonged SB remains a significant risk factor for cardiovascular morbidity, premature mortality, and overall poor health outcomes (Owen et al., 2010; Carter et al., 2020). Interventions that aim to reduce prolonged sitting vary widely. However, many are costly and lack evidence of long-term sustainability, making them impractical for widespread implementation in the South African workforce (Shrestha et al., 2018). There is a clear need for low-cost, effective interventions that target occupational SB and improve worker health.

Increased SB and reduced PA are linked to increased risk of developing NCDs (Patterson et al., 2018). A systematic analysis of obesity trends between 1980 and

2013 found that South Africa had the highest prevalence of overweight and obese individuals in the Southern sub-Saharan African (SSA) region, with approximately 70% of women and 39% of men classified as overweight or obese (Ng et al., 2014). This aligns with South African government reports indicating that 68% of women and 31% of men are overweight or obese (Western Cape Government, 2020). Given the county's high NCD burden, understanding these global trends in the South African context is crucial.

Mental health and NCDs are closely linked, with growing evidence highlighting the relationship between them. In South Africa, Pandey et al. (2019) demonstrated that individuals with mental health disorders are at an increased risk of developing NCDs. Yet, effective interventions to address these overlapping issues remain underexplored (Shrestha et al., 2018). Following chronic back pain, major depressive disorders are the second leading cause of disability in SSA, with anxiety disorder ranking fifth (Vancampfort et al., 2017).

There is growing evidence supporting the role of PA interventions in preventing the onset of mental health disorders such as depression (Mammen & Faulkner, 2013). Exercise has been shown to have an antidepressant effect compared to non-active interventions (Schuch et al., 2016). Additionally, a significant association exists between hypertension and high levels of perceived stress (OR 7.35; 95% 3.28-16.45), highlighting the link between cardiovascular health and everyday stress levels (Dėdelė et al., 2019). Increased leisure-time PA, higher cardiorespiratory fitness, and lower body fat composition have all been associated with reduced stress levels during vocational hours (Hadgraft et al., 2018).

It’s evident that SB is a growing concern in South Africa, with the advertising and marketing sector being no different, where employees are often required to work for extended periods of time in a fast-paced, deadline-driven environment. In many developed countries, strategies to increase workplace movement, such as sit-stand desks, active workstations, and structured movement breaks, are already part of the work environment. Many South African workplaces have yet to incorporate these interventions, often due to limited budgets or a lack of space. This is particularly concerning given the increasing burden of NCDs on this country. Additionally, high workloads and the demand they place on employees make it difficult to prioritise movement during the typical workday. Understanding how workplace interventions can be used to effectively increase movement in this demanding environment is crucial to creating long-lasting behavioural changes.

1.2 Rationale for the Study

Despite substantial evidence of the risk associated with prolonged SB, research on effective workplace interventions remains limited (Hadgraft et al., 2021). Prolonged periods of SB have been independently linked to an increased risk of CVD, T2DM, all-cause mortality, and musculoskeletal discomfort, even in those who meet the daily recommended guidelines for PA (Ekelund et al., 2016; Patterson et al., 2018). These increased risks highlight the need for a scalable intervention in the workplace setting.

The specific risks posed by SB in the South African workplace remain unclear, particularly in occupations that require prolonged sitting. However, recent South African studies have begun to address this. The *Ukumela Impilo* Trail showed that sit-to-stand desks can reduce sitting time and lead to modest effects on health outcomes (Phaswana & Gradidge, 2023). A qualitative study exploring the feasibility of sit-to-stand desks in university office workers found that they were feasible and beneficial, though there were broader challenges noted (Gradidge, Phaswana & Chau, 2022).

Understanding the impact of a low-cost intervention in the workplace setting is critical. The use of an eHealth mobile app was chosen due to its low cost and the ease with which it would integrate into the typical workday of the participants. The use of smartphones in South Africa is already high, with most adults utilising their phones during the workday. Previous research has shown that phone-based interventions can improve SB patterns through real-time prompts (Compernolle et al., 2019; Yerrakalva et al., 2019). This makes eHealth mobile phone app interventions a practical and sustainable option for workplace intervention.

1.3 Research Aims and Objectives

The study aimed to determine whether a simple, cost-effective movement prompt delivered via an eHealth mobile app, along with health messages sent via email, effectively reduced SB during vocational hours among workers at a marketing firm in Johannesburg, South Africa. Furthermore, the study explored whether these interventions impacted cardiometabolic health and overall satisfaction with life.

1.4 Overview of the Study Design:

This study made use of a 12-week intervention design that was aimed at reducing SB in the workplace setting. The participants were assigned to either an intervention or control group based on their phone type. Those with iPhone were placed into the intervention group and received movement prompts via an eHealth mobile app, while those with Android phones were placed in the control group and received no researcher-driven input.

Data were collected at baseline, mid-intervention (week 6), and then post-intervention (week 12). This allowed for the analysis of change in SB, PA levels, anthropometric markers, and life satisfaction scores. The baseline data help provide insight into the participants' SB patterns, overall life satisfaction, and body composition. Repeating the measurements over time enabled within- and between-group changes. Both objective and subjective measurements of SB and the overall life satisfaction scores were analysed quantitatively, while the qualitative data were gathered through post-intervention focus group discussions to explore the participants' experience of the intervention, the perception of the intervention, and its feasibility in a workplace setting. This mixed-methods approach offered a full understanding of the intervention's impact.

1.5 Study Objectives

1. To determine baseline measurements of SB, PA, body composition, and satisfaction with life in office-based workers at a marketing firm.
2. To assess changes in these variables following a 12-week intervention of eHealth prompts and compare the results with a control group.

3. To determine the association between sedentary behaviour and the mental health of workers.
4. To conduct focus group discussions with participants in the intervention group to explore their perceptions of the eHealth app in addressing sedentary behaviour.

CHAPTER 2: LITERATURE REVIEW

2.1 Review of Literature

This chapter covers several topics that establish the rationale for this dissertation. It is divided into three sections. The first section will focus on PA and SB by reviewing guidelines and recommendations set for PA and SB, the health impacts associated with these behaviours, and the methods available for measuring them. The second section examines SB in the workplace, addressing the consequences of prolonged occupational sitting and strategies to mitigate it among desk-based workers. The final section explores the influence of technology on SB and PA.

2.2 Section 1: Physical Activity and Sedentary Behaviour

2.2.1 Distinction Between Physical Activity and Sedentary Behaviour

In 2020, the World Health Organisation (WHO) advised that all adults should aim to limit the time spent engaging in SB (World Health Organization, 2020). The terms SB and physical inactivity are often used interchangeably, with SB often incorrectly used to equate to a lack of PA. This can be confusing, as they are two distinct concepts (Sedentary Behaviour Research Network, 2012). It is important to distinguish between the two concepts.

Physical Activity – By combining the definition by Caspersen, Powell and Christenson (1985) with the current WHO (2024) description, physical activity can be described as any bodily movement that is a result of skeletal muscle contractions, resulting in energy expenditure. It includes all forms of movement, including leisure activities, transportation, work-related activities, exercise, and daily routine. While all individuals engage in some level of PA as part of daily living, the extent and intensity of this activity vary significantly based on personal preference, lifestyle choices, and different life stages.

Physical inactivity occurs when an individual fails to meet the recommended guidelines for PA. The term *inactive* is used when there are inadequate amounts of moderate-to-vigorous physical activity (MVPA) (Sedentary Behaviour Research Network, 2012). The WHO guidelines recommend that adults engage in 150-300 minutes of moderate-intensity aerobic activity per week, 75-150 minutes of vigorous-intensity aerobic activity per week, or an equivalent combination of the two. Additionally, adults should participate in muscle-strengthening activities at least twice per week. Importantly, the WHO highlights that any movement is better than nothing, and even minimal PA provides some form of health benefits (World Health Organization, 2020).

Sedentary Behaviour - the word *sedentary* originates from the Latin verb "*sedere*", meaning "to sit" (Magnon, Dutheil & Auxiette, 2018). Sedentary behaviour can be defined as any low-energy activity carried out while awake. These movements can be performed while in a seated, reclining or lying position. The activities are often classified as ≤1.5 metabolic equivalents (METs). Metabolic equivalents are the units used to measure different levels of physical activity. Activities that are below 1.5 MET are characterised as sedentary, with higher METs levels correlating to higher physical activity levels (Tremblay et al., 2017).

Although research on PA has long been a central focus within health science research, the study of SB remains a relatively new area of inquiry. The majority of evidence regarding the detrimental effects of SB on overall health has only emerged in the past decade (Henson, De Craemer & Yates, 2023). Unlike PA, the WHO has not yet established specific guidelines for SB. It is entirely possible for an individual to meet or even exceed the recommended PA guidelines while simultaneously spending the majority of their waking hours engaging in sedentary activities. Being physically active does not necessarily prevent a sedentary lifestyle. Common examples of SB include prolonged sitting during work, television viewing, and extended periods spent driving or riding in a vehicle (Dempsey et al., 2020).

Saunders et al. (2014) proposed a classification system that illustrates (Figure 2.1) the different ways in which SB and PA can coexist, categorising individuals into four distinct groups based on their activity levels:

1. *Sedentary and inactive* – individuals who spend the vast majority of their time either lying down, reclining, or seated, while also failing to meet PA guidelines.

2. *Sedentary and active* – individuals who engage in lengthy periods of SB but still meet the PA guidelines.
3. *Inactive, not sedentary* – individuals who spend a limited time engaging in SB, but still do not meet the PA guidelines.
4. *Active, not sedentary* – individuals who engage in minimal SB and also meet the PA guidelines.

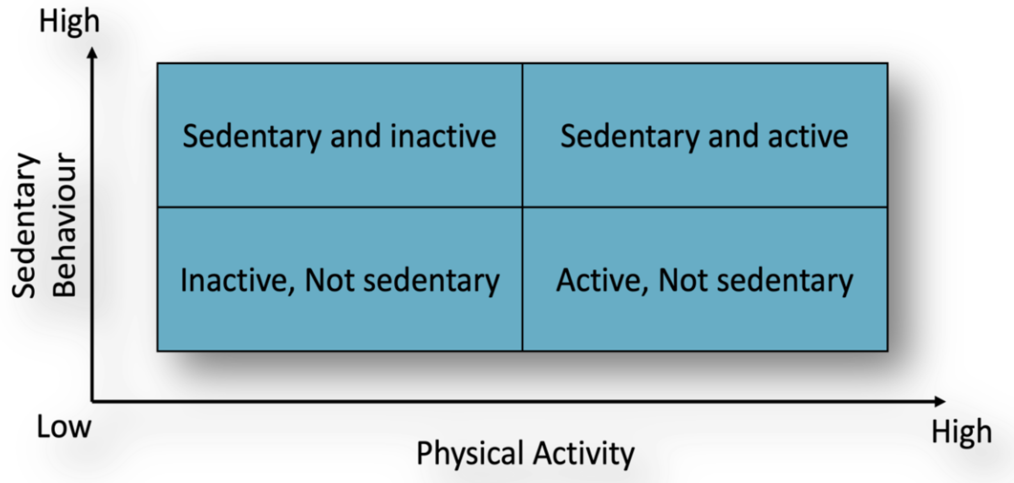

Figure 2.1 Sedentary Behaviour and Physical Activity as Distinct Constructs.
Figure Adapted from (Saunders, Chaput & Tremblay, 2014).

This classification underscores the complexity of SB and PA, highlighting the importance of considering both constructs independently when assessing risks and intervention strategies.

2.2.2 Different Methods to Measure Physical Activity and Sedentary Behaviour

The accurate measurement of SB is essential, as it forms the basis for linking SB to various health outcomes and the development and evaluation of behaviour change interventions. Reliable and valid assessments of total sedentary time, along with context-specific SB measurements and their potential correlations, are vital for designing and implementing effective interventions (Atkin, et al., 2012; Busschaert et al., 2015). Robust measurement techniques provide the foundation for understanding the relationship between SB, PA, and health, ultimately informing strategies and policies aimed at reducing sedentary time and improving health outcomes.

Measurement methods can be broadly classified into either subjective or objective approaches. Device-based methods, such as accelerometers, are often described as objective measurements, while self-reported tools, including questionnaires, recall methods, and activity diaries, are considered subjective measurements. Both approaches have inherent strengths and limitations (Prince et al., 2008). While an integrated use of both methods can offer a more comprehensive understanding of PA and SB, each can be employed independently, depending on the specific research requirements (Troiano et al., 2012).

2.2.2.1 Subjective Measurement for Physical Activity and Sedentary Behaviour:

The development of PA research and its importance have historically been based on self-reported data (Troiano et al., 2012). These methods provide an efficient and cost-effective way of gathering information from large populations. However, self-reported measurements are inherently limited by their reliance on participants' recall ability and accuracy in estimating the frequency, duration, and intensity of activities. Despite these limitations, self-reported assessments remain useful and sufficiently valid tools and can provide essential information in many different research settings (Shephard, 2003; Troiano et al., 2012).

Tools designed to measure PA do not necessarily capture SB (Sedentary Behaviour Research Network, 2012). Sedentary behaviour is typically accumulated throughout the day, making accurate assessment particularly challenging (Bakker et al., 2020). To assess these challenges, Dall et al. (2017) developed the Taxonomy of Self-reported Sedentary Behaviour Tools (TASST) framework, which aids in identifying the most appropriate self-reported tool for SB studies in population surveillance. The TASST framework categorises self-reported tools in two ways:

1. Singular measures – which assess SB using a single item (e.g. one question about total sitting time).
2. Composite measures – which are composed of multiple questions capturing different aspects of SB, allowing the researchers to calculate total sedentary time over a specified recall period.

The limitations of self-reported SB measurements have been highlighted in a systematic review and meta-analysis by Prince et al. (2020), which compared self-reported and device-measured SB in adults. The study found significant inconsistencies between these two methods, with self-reported measurements frequently underestimating sedentary time. This discrepancy emphasises the limitations of subjective measurement tools and reinforces the need for more accurate self-reported instruments. Additionally, it highlights the importance of incorporating device-based measurements into research to improve accuracy and reliability in assessing SB and PA.

2.2.2.2 Objective Measurement of Physical Activity and Sedentary Behaviour

Due to their reliability and accuracy, objective measurements for PA and SB are increasingly utilised in research and intervention planning. Tools such as accelerometers, particularly the Axivity AX3 (Axivity Ltd, Newcastle upon Tyne, UK), provide precise, continuous, and unbiased data regarding movement patterns, allowing researchers to overcome many of the limitations associated with subjective measurements (Troiano et al., 2008; Dowd, Harrington & Donnelly, 2012). A key difference between objective and subjective measurements is that objective methods diminish recall bias and social desirability bias, which could lead to inaccurate estimations of activity levels. As a result, objective measurements facilitate a more accurate evaluation of an individual’s true activity level (Shephard, 2003; Prince et al., 2008).

One major advantage of objective measurements is their ability to capture continuous, high-resolution data, providing researchers with a detailed understanding of a participant’s movement patterns. This granular data enables differentiation between various activity intensities, which is essential for investigating the dose-response relationship between SB, PA, and other various health outcomes (Atkin et al., 2012). The ability to capture precise activity intensities strengthens the evidence base for designing effective interventions that are aimed at reducing SB and increasing PA (Kim et al., 2015; Tremblay et al., 2017).

Additionally, objective methods enable longitudinal data collection, allowing researchers to track an individual's movement patterns over an extended period. This long-term monitoring facilitates the identification of trends and behavioural patterns that may not have been apparent from subjective methods (Cain et al., 2013). Furthermore, accelerometers can highlight periods of prolonged inactivity, which may be associated with specific health risks (Healy et al., 2008).

Despite their numerous advantages, objective measurements have their own unique challenges. One drawback is often the cost and the complexity of these devices. High-quality accelerometers and the necessary software used to process the data collected can be expensive, and this could result in financial constraints on large-scale studies (Esliger & Tremblay, 2007). Furthermore, the technical know-how often required to analyse the raw data can be a further barrier for some researchers, potentially limiting the accessibility and usage of these tools (Migueles et al., 2017). Another limitation is participant non-compliance, which can lead to incomplete data readings. Examples of participant non-compliance would be removing the device during certain activities, forgetting to wear it, or finding it inconvenient or uncomfortable (Matthews et al., 2012). Regardless of the reason, non-compliance can introduce bias, as the recorded data may not be an accurate reflection of the participant's actual activity.

While objective methods can provide the researcher with high-quality detailed quantitative data, they often lack the contextual insights that subjective methods can provide. For example, an accelerometer can record that a participant was sedentary for an extended period, but it cannot determine why that inactivity occurred. In order to design effective interventions, it is important to understand the reasoning behind the lack of PA or prolonged SB periods – this requires the use of qualitative data obtained through various self-report methods (Prince et al., 2020).

2.3 The Impact of Sedentary Behaviour

Prolonged sitting is associated with a shorter life expectancy and an increased risk of developing chronic NCDs, with SB linked to approximately 30 of these conditions (Hu et al., 2001). Non-communicable diseases are defined as non-infectious, lifestyle-related chronic diseases, typically require a long-term management plan and are frequently addressed through various lifestyle modifications. They are often slow to progress and are associated with an increased risk of CVD, various types of cancers, chronic respiratory disease, metabolic dysfunction, and T2DM (South Africa: Department of Health, 2013).

The global burden of NCDs remains alarmingly high, and its prevalence continues to climb (South Africa: Department of Health, 2013). In 1990, the number of NCD deaths was approximately 8 million, by 2013, that number had increased to around 52.8 million, which accounted for 65% of all deaths globally (GBD 2013 Mortality and Causes of Death Collaborators, 2015). According to the WHO (2023), NCDs are one of the leading causes of global mortality rates. In 2023, the annual death toll for NCDs was estimated to be around 41 million, which accounted for around 74% of all deaths.

While NCDs are a global issue, their impact on low- and middle-income countries (LMICs) is more prominent, with around 77% of all deaths attributed to NCDs in these regions. This presents these countries with a vast number of social, economic, and healthcare-related challenges (Alwan et al., 2010). In SSA, the burden of NCDs has increased almost twofold among women (Yaya et al., 2018). The risk of developing obesity will increase by 5% for every two hours an adult sits, whereas the risk of developing T2DM will increase by 7% (Hu et al., 2003). It is estimated that obesity is responsible for approximately 4 million deaths worldwide, with over two-thirds of these fatalities resulting from CVD (Ortega, Lavie & Sui, 2017).

2.3.1 Type 2 Diabetes Mellitus

Diabetes mellitus is one of the top ten causes of death among the adult population globally. In 2017, diabetes-related mortality rates were estimated to be around 4 million deaths globally (Cho et al., 2018). Since 2000, the International Diabetes Federation (IDF) has been reporting on the number of reported cases in terms of regional, national, and global prevalence. The IDF Diabetes Atlas includes estimates for all three types of diabetes mellitus – Type 1 Diabetes Mellitus, T2DM, and Gestational Diabetes Mellitus – out of all the reported cases, approximately 90% are T2DM-related (Saeedi et al., 2019). In 2017, the IDF Diabetes Atlas estimated that 8.4% (roughly 451 million people) of adults between the ages of 18-99 were diagnosed with some form of diabetes mellitus. The IDF projected that by 2045, the number of reported diabetes mellitus cases could rise to 9.9% (roughly 693 million people) (Cho et al., 2018). In 2019, the IDF revised their future projections, estimating that by 2045 the global prevalence of diabetes mellitus would increase to 10.9% (roughly 700 million people) (Saeedi et al., 2019). By 2021, the IDF reported that approximately 10.5% (roughly 536.6 million people) were living with diabetes, with their projections set to rise to 12.2% (roughly 783.2 million people) by 2045. The most recent report suggests that over half a billion people globally are currently living with some form of diabetes mellitus, with future predictions far exceeding previous IDF forecasts. When comparing the statistics of the 9th and 10th IDF Diabetes Atlas reports, the global prevalence of diabetes has increased by 12.9% (Sun et al., 2022). The economic burden of diabetes is also significant. In 2021, it was estimated that the cost of treating diabetes-related conditions was 966 billion USD globally. This cost is projected to surpass the 1 trillion USD mark by 2045 (Sun et al., 2022).

In South Africa, it is estimated that 15% of adults aged 25 and older exhibit some symptoms suggestive of T2DM (Pheiffer et al., 2021). Furthermore, among those already diagnosed, 70% are believed to have uncontrolled glucose levels, blood pressure (BP), and lipid readings (Webb, Rheeder & Van Zyl, 2015; Stokes et al., 2017). This issue is not unique to South Africa, the IDF Diabetes Atlas estimates that approximately half of all individuals globally currently living with diabetes remain undiagnosed (Cho et al., 2018; Saeedi et al., 2019).

The prevalence of diabetes increases with age, as illustrated in Figure 2.2. In individuals aged between 25-69 years, men exhibit a higher prevalence of diabetes compared to women. However, in individuals aged 70 years and older, women show a higher prevalence of the disease.

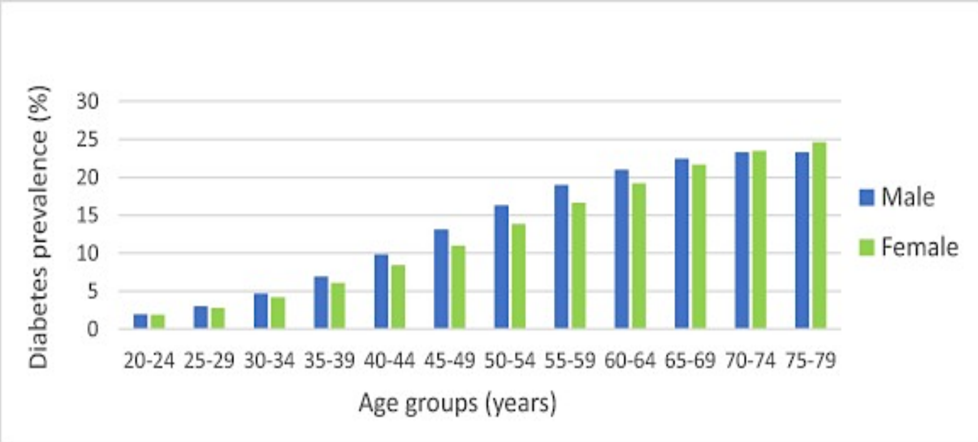

Figure 2.2 Prevalence of Diabetes by Age and Sex in 2021. Graph adapted from 2021: IDF Diabetes Atlas (Sun et al., 2022).

2.3.2 Cardiovascular Diseases

Cardiovascular diseases represent a broad spectrum of diseases that affect the heart and blood vessels, including coronary heart disease (CHD), heart attacks, strokes and other vascular diseases. According to the WHO (2021), CVDs are the leading cause of death globally, accounting for approximately 17.9 million deaths annually and 32% of all premature deaths (i.e. death occurring before the age of 70 years).

Middle-aged and older adults who are either overweight or obese have a significantly higher chance of developing CVD, especially those who engage in high levels of SB with lower levels of PA. The relationship between prolonged SB and insufficient PA levels is a critical indicator for increased CVD and ACM risk (Zhang & Liu, 2024).

Current health guidelines focus primarily on achieving MVPA guidelines, however, Chaput et al. (2014) argue that only focusing on MVPA may limit other opportunities to improve movement behaviours. The benefits associated with MVPA are undeniable – in a typical 24-hour day, less than 5% of the day goes toward meeting MVPA guidelines, with sleep and SB each accounting for around 40%, with light physical activity (LPA) accounting for the remaining 15%, as illustrated in Figure 2.3. Given these time proportions observed in adults, replacing SB with more LPA allows for a more achievable goal than simply increasing MVPA alone.

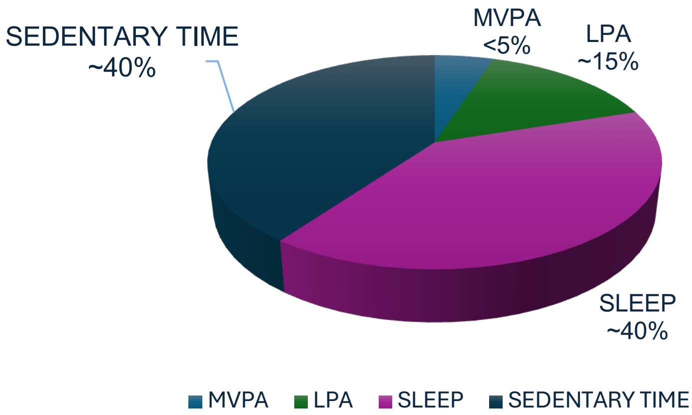

Figure 2.3 Approximate Percentage of the Daily Proportion of Movement Behaviour in Adults, based on a 24-hour period (Chaput et al., 2014).

Another key factor in the prevention of CVD is daily step count it has been shown to provide many health benefits. For individuals with higher levels of SB walking between 4,000-10,000 steps per day has been showed to lower CVD risk by 10-21% (Ahmadi, Rezende, et al., 2024). The Nord-Trøndelag Health (HUNT) Study found that when individuals reported sitting for more than 10 hours per day they had significantly higher CVD risk markers, including an increased body mass index (BMI), waist circumference, systolic and diastolic BP, triglycerides, and non-fasting glucose levels when compared to those who sat for less than 4 hours per day (Chau et al., 2014).

New observational studies have found a strong link between high sedentary behaviour and an increased CVD mortality rate, regardless of PA levels. The research found that prolonged periods of inactivity can affect key cardiovascular risk factors, while frequent interruptions to prolonged sedentary periods, even with light movement, could improve cardiovascular health outcomes. The negative effects of SB on the cardiovascular system are thought to be driven by mechanisms such as venous blood pooling in the lower limbs and impaired glucose and lipid metabolism.

Interventions that aim to break up sitting with short walking breaks have been found to improve cardiovascular risk markers more effectively than standing breaks alone. However, more long-term interventions are needed to determine whether these studies result in sustained CVD prevention (Bell et al., 2022). A systematic review and meta-analysis including seventeen prospective cohort studies and two cross-sectional studies further reinforces the association between high levels of SB and increased CVD risk. This comprehensive analysis found that sitting for more than 10-11 hours per day and screen time exceeding 5-6 hours per day were associated with similar levels of CVD risk, even after adjusting for PA levels (Jingjie et al., 2022). As CVD remains a leading cause of mortality, the broader implications of prolonged SB extend beyond cardiovascular health, contributing to an increased risk of ACM.

2.3.3 All-Cause Mortality

All-cause mortality is the total number of deaths caused by a specific disease or condition in a particular group of individuals over a certain time period (National Cancer Institute, 2024). Individuals who engage in prolonged periods of vocational sitting have an increased risk of ACM compared to their non-sedentary counterparts (Hervieux, Tremblay & Biron, 2021). A large-scale meta-analysis that used data from 595 086 participants examined the relationship between total sedentary time and ACM. The findings showed that for each additional hour of sitting, ACM risk increased by 2%, even after adjusting for PA levels. Notably, the relationship between SB and ACM was non-linear. After adjusting for other key covariates, including PA, adults who sit for more than 7 hours per day increase their risk of ACM by 5% for each additional hour of sitting thereafter (Chau et al., 2013).

In a large Australian study by van der Ploeg et al. (2012), it was estimated that sitting-related ACM accounted for approximately 7% of all deaths among individuals aged 45 years and older. The study found that the relationship between sitting and ACM appears to be consistent across gender, age, anthropometric measurements, PA levels, and healthy individuals when compared to those already diagnosed with CVD or diabetes mellitus. The researchers concluded that sitting is an independent risk factor for ACM, regardless of PA levels. While prolonged SB has been linked to an increased risk of ACM, its impact extends beyond just systemic health outcomes. The biomechanical consequence of sedentary behaviour contributes to issues such as musculoskeletal strain, postural discomfort, and long-term functional impairments. Two independent factors that can protect against all-cause mortality are reducing total sitting time and increasing PA levels. These protective factors extend beyond the healthy individual but also to those individuals who have already been diagnosed with CVD, T2DM, overweight, and obesity (van der Ploeg et al., 2012).

2.3.4 The Biomechanical Consequence of Sedentary Behaviour

Prolonged sitting can place a considerable static load on the musculoskeletal system, particularly in the lumbar-sacral region, this increases the risk of developing postural discomfort and chronic musculoskeletal disorders (Todd, Bennett & Christie, 2007).

Due to prolonged static posture, many office-based workers frequently report lower back pain, neck stiffness, and discomfort in their upper and lower extremities (Janwantanakul et al., 2008). A study by Waongenngarm et al. (2020) found that four hours of uninterpreted sitting can significantly increase musculoskeletal discomfort, particularly in the lower back, buttocks, upper back, thighs, and neck. Figure 2.4 illustrates how postural adaptations over time can contribute to pain and dysfunction.

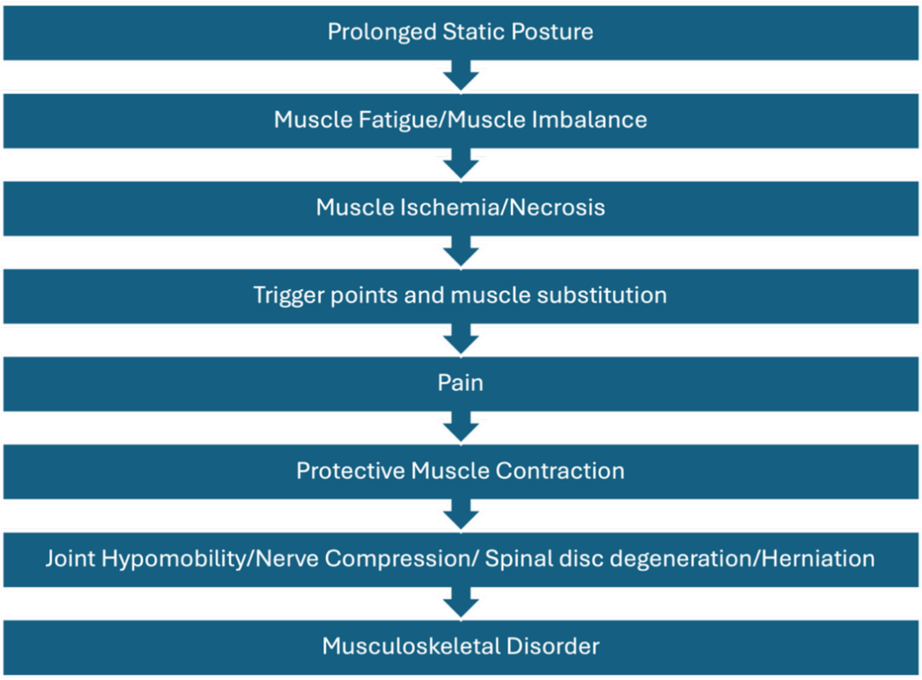

Figure 2.4: Flowchart demonstrating how prolonged static posture can progress to pain or musculoskeletal disorder. Image adapted from Valachi and Valachi (2003).

Individuals who remain seated for an extended amount of time, are at an increased risk of injury if they were to suddenly attempt full flexion movements after a prolonged period of sitting (Beach et al., 2005). Furthermore, individuals who are classified as either overweight or obese could be at a higher risk of musculoskeletal strain, due to their altered gait mechanisms and increased joint loading, which could contribute to a higher risk of osteoarthritis development (Nantel, Mathieu & Prince, 2011). Reducing SB through frequent movement breaks can help mitigate these biomechanical risks, yet workplace barriers often limit adherence. Interventions that encourage periodic standing or light physical activity could help alleviate some postural strain and improve long-term musculoskeletal health (Cheung, Zhang & Chow, 2003).

2.3.5 Mental Well-Being in the Workplace

Mental health and physical activity are closely linked. The consequence of increased SB extends beyond physiological health, there is a strong correlation with the psychological aspect of health too. In the workplace, there are numerous factors that contribute to stress and mental health, including job roles, opportunities for career progression, co-worker relationships, and the work environment (Nash & Thebarge, 2006). The research indicates that individuals with depression and/or anxiety are less likely to engage in PA (Stubbs et al., 2017). Furthermore, non-occupational SB has been linked to poorer mental well-being among working adults (Atkin et al., 2012). Employees who do not meet recommended PA guidelines are three times more likely to experience high levels of perceived stress (Dėdelė et al., 2019).

2.4 Employee Presenteeism and Workplace Sedentary Behaviour

Employee presenteeism (EP) is referred to as "*reduced workplace productivity due to health-related impairments, despite being physically present at work*" (Chapman, 2005). Presenteeism occurs when employees remain at their desks, even when they are experiencing diminished cognitive and physical performance. Unlike absenteeism, which involves missing work entirely (Hemp, 2004). Presenteeism is usually measured through self-reported tools, such as the Work Limitation Questionnaire, the Stanford Presenteeism Scale, or general productivity questionnaires (Arumugam, MacDermid & Grewal, 2013). While widely used, they are subject to participant recall bias and may not capture the full complexity of EP (Kigozi et al., 2017).

Presenteeism has been linked to prolonged SB, as employees in high-pressure environments can often feel discouraged from taking breaks (Hadgraft et al., 2021). The workplace culture often plays a crucial role, with employees perceiving that staying seated at their desks equates to hard work, thus reinforcing their sedentary habits (Zhang & Liu, 2024). This is particularly true for office-based employees, who report feeling uncomfortable leaving their desks due to managerial and peer expectations (Brown et al., 2013).

Intervention studies that promote workplace movement, such as sit-stand desks and eHealth movement prompts, have shown that these interventions may help mitigate presenteeism by improving physical comfort and cognitive performance in employees (Dietz et al., 2020; Hadgraft et al., 2021). However, organisational barriers, such as meeting schedules and perceived productivity demands, can often limit adherence to these types of interventions (Brown et al., 2013).

To design effective workplace interventions, it is essential to consider the influence of organisational culture, leadership expectations, and workplace norms on employees' willingness to break up prolonged SB during their usual workday (Kazi et al., 2014). Without addressing these barriers, workplace interventions may be met with some resistance or hesitation, potentially reducing their effectiveness in changing workplace behaviour (Bailey, 2021).

2.5 Section Two: Sedentary Behaviour in the Workplace

2.5.1 Sedentary Behaviour and the Office Worker

Research by Rosenberg et al. (2015) highlights that individuals with higher SB levels are more likely to be overweight or obese and have a greater risk of developing T2DM and CVD. Modern populations have become increasingly sedentary due to less physically demanding occupations, particularly with the rise of office-based work, as demonstrated by Figure 2.5 (Church et al., 2011). The workplace is often considered a major contributor to total daily sedentariness. Desk-based workers, in particular, are susceptible to prolonged bouts of SB (Pedersen, Cooley & Mainsbridge, 2014).

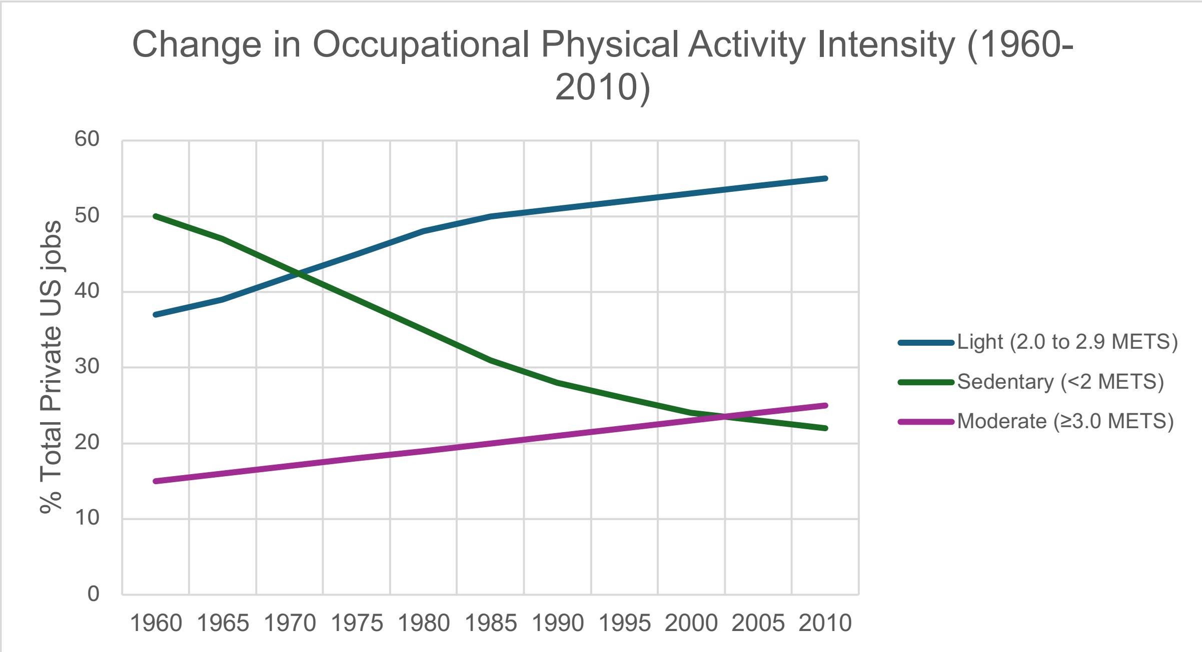

Figure 2.5 Changes in the Prevalence of Sedentary, Light, and Moderate-Intensity Occupations between 1960 to 2008. Graph adapted from Church et al. (2011)

The workplace is one of the primary sources of SB among adults, and it is frequently identified as a key target area for interventions aimed at modifying health and lifestyle behaviours. With office-based workers face a particularly high risk due to the excessive demands of their roles (Wolf et al., 2018). As workplace demands have increased globally, there has been a resultant increase in SB, particularly among desk-bound employees.

Sedentary behaviour in the workplace has several negative implications, including reduced productivity, increased sick leave, and adverse mental health effects (Gradidge et al., 2020). However, systematic reviews and meta-analyses suggest that SB can be reduced effectively through interventions such as active workstations, standing desks, health and lifestyle coaching, and movement prompts. These studies show a reduction in SB that ranges from 22 to 91 minutes per day (Prince et al., 2014; Martin et al., 2015). One promising intervention approach is the use of eHealth movement prompt apps, which have been shown to be effective in reducing overall sedentary time among office-based workers (Mainsbridge et al., 2014; Carter et al., 2020; Morris et al., 2020).

An international panel of experts recommended that office workers should aim to accumulate at least two hours of standing and LPA (e.g. light walking) during their office hours, progressively increasing it to four hours per day. Additionally, alongside other health promotion goals (e.g. reducing smoking, alcohol and stress), businesses were also encouraged to implement policies that would reduce prolonged sitting. Prolonged occupational and leisure sitting has been found to independently increase the risk of cardiometabolic diseases and premature mortality (Buckley et al., 2015). However, evidence suggests that these recommendations are not being met by the majority of office-based workers. Studies that used objective measures, such as accelerometers, showed that office workers spend approximately 6-7 hours per workday seated (Parry & Straker, 2013; Chau et al., 2016). This falls significantly below the suggested target of 2-4 hours of standing or light activity.

The role of management and leadership is also an important factor in workplace SB. As the modern workforce evolves, there is an increasing expectation of employees to always be available and perform in professional settings. Research suggests a link between supportive workplace leadership and improved employee well-being, mental health, and physical health (Arnold, 2017; Montano et al., 2017). Encouraging proactive leadership strategies that promote movement-friendly workplaces and cultures could contribute to reducing occupational SB.

2.6 The Benefits of Breaking Up Prolonged Sedentary Behaviour

There is growing evidence to support the benefits of replacing SB with PA. A study observing individuals aged between 50-85 years found that substituting sedentary behaviour with just 30 minutes of LPA resulted in a 14% reduction in their mortality risk. More strikingly, when replacing SB with MVPA, it resulted in a 50% reduction in mortality risk (Schmid et al., 2016).

A recent cross-sectional meta-analysis by Ahmadi et al. (2024) examined the relationship between PA and cardiometabolic health markers. They used data from six large cohort studies and utilised the most extensive dataset of thigh-worn accelerometer measurements to date. It included activities such as walking, running, and stair climbing, as well as postural behaviours (e.g. sitting or standing). Their findings showed that walking for 64 minutes per day, stair climbing for 5 minutes, and standing for 2.6 hours were all associated with improved cardiometabolic health markers. Conversely, sitting for more than 12.1 hours per day was associated with significantly worse cardiometabolic outcomes.

Recent research from the University of Sydney further reinforces the importance of movement, particularly for individuals with high levels of SB. The study found that achieving a daily step count of between 9,000-10,500 reduced the risk of mortality and CVD, even among highly sedentary individuals. Importantly, individuals who walked at least 2,200 steps per day already experienced some reductions in mortality and CVD risk, highlighting the critical role of incorporating more movement into daily routines (Ahmadi et al., 2024). This finding is particularly relevant for office workers, who spend most of their working hours seated and may benefit from structured movement interventions.

2.6.1 Factors Influencing Prolonged Sedentary Behaviour in the Workplace

There are several factors that can influence sedentary behaviour in the workplace. It is important to understand these factors in order to design interventions that effectively reduce SB, promote PA, and help foster a healthier work environment.

In a small mixed-methods study that looked at workplace SB, they were able to determine that individuals spent approximately 76.9% of their total workday engaging in sedentary activities, with most LPA occurring on non-workdays (Waters et al., 2016). These findings show the need for workplace interventions that encourage more physical activity during the typical workday. Several barriers to reducing sedentary behaviour in the office environment have been identified, including cultural norms, personal factors and preferences, job responsibilities, and the physical layout of the office or building. Addressing these barriers could help create more movement-friendly workplace interventions.

2.6.1.1 Workplace Culture and Policies

Workplace culture and policies play an important role in how employees' behaviour, including employees' sedentary behaviour. Office norms can influence how employees interact in their environment; this can often affect productivity and their health.

Many workplaces often promote a strict work-only culture, that prioritises productivity and longer working hours, this inadvertently leads to prolonged desk-based work (Hadgraft et al., 2021). In these settings, continuous sitting is often associated with being productive, thus reinforcing sedentary habits further (Such & Mutrie, 2017). There is often an inferred expectation that employees should remain at their desks in order to be productive and appear hard-working. The workplace culture and norms can either worsen or mitigate the amount of SB that takes place. Organisations that promote PA and implement health-promoting policies, such as frequent breaks, can help the employee to reduce their overall sedentary time. Conversely, if the workplace discourages frequent breaks or encourages desk-based work, employees' SB tends to increase (Buck et al., 2019). A cultural shift in workplace attitudes and beliefs towards more movement flexibility is essential for change. Having managerial and colleague support can help create an environment where movement is normalised. Strategies such as educational programmes, behavioural change techniques, and goal-setting can all be effective tools to reduce SB (Gardner et al., 2016).

While workplace culture and norms set the environment that influences SB, the social and psychological aspects in an office can further shape an employee's willingness to engage in more movement breaks. It's important to consider things like peer requirements and individual perceptions.

2.6.1.2 Social and Psychological Factors

Prolonged sitting is often considered the norm in many office settings, and deviations from this, such as taking frequent breaks or standing, may be discouraged or perceived negatively (Hadgraft et al., 2021). Employees may feel pressured to conform to these norms to avoid drawing unwanted attention to themselves (Kazi et al., 2014). Having both managerial and colleague support can encourage more movement, but managers and peers who prioritise desk-based work and efficiency could result in fewer movement breaks in the office (Owen et al., 2011).

The beliefs, attitudes, and perceptions of the individual also have a significant impact on workplace sedentary behaviour. If the individual recognises the benefits of engaging in some form of PA and is aware of the risks associated with increased SB, they are more likely to incorporate daily movement into their routine (Ekkekakis, 2009). However, if there are perceived barriers to movement, such as time pressure, high work demands, or pressure to appear productive, they may remain seated despite knowing the risks (Bailey, 2021; Safi et al., 2022). The physical design and layout of the office space can also play a central role in shaping movement patterns and opportunities for reducing SB.

2.6.1.3 The Physical Work Environment

The physical design of the office space can have an impact on movement habits (Buck et al., 2019). The design can either help or hinder prolonged bouts of sitting. Several workplace designs have been shown to help reduce SB, including sit-stand desks, access to staircases, and a dedicated space to move. However, many traditional offices have fixed desks, limited space to move, and closed cubicles. When we compare this design to open-plan offices, the designs tend to lend themselves more towards movement (Chau et al., 2016). Having common areas and a shared workspace has been shown to encourage more face-to-face communication between employees, by reducing the need to rely on emails and phone calls for communication, it inadvertently promotes more LPA. Various strategies, such as environmental prompts and cues that encourage stair use, standing or movement breaks, a designated movement zone, and height-adjustable desks, have all been effective tools for reducing SB in the workplace (Gilson et al., 2012).

Technology can also be an effective tool to reduce sedentary time. The use of computer software and mobile phone apps that encourage regular movement and standing breaks is another effective tool to consider (Tudor-Locke et al., 2014). These apps often allow for more customisable reminders that can be tailored to suit the schedules and preferences of those using them, often making them easier to integrate into the typical workday.

2.6.1.4 Individual Perception and Behaviours

An employee who understands the benefits of increasing their PA levels and incorporates other healthier habits into their life is more likely to have a positive attitude to taking short breaks, utilise standing desks available to them and engage in LPA throughout their workday (Kallings et al., 2021). A qualitative study by Landais et al. (2022) looked at an office worker's perspective on PA and SB. They determined that employees are often aware of the negative effects associated with physical inactivity, but certain barriers, such as a demanding workload or a lack of time, stop them from engaging in some form of movement. This shows that workplace interventions need to account for these types of issues in order to effectively promote more movement within the workplace. Additionally, they found that educating employees about the health consequences of physical inactivity and SB could motivate them to move more and sit less.

Motivation to change is also a key determinant for reducing overall sedentary behaviour. Intrinsic motivation, which is driven by personal satisfaction and healthy results, is more likely to lead to a sustainable change in behaviour. Extrinsic motivation, which is things like reward and external pressure, is less likely to result in long-term reductions in SB (Deci & Ryan, 2000). Understanding how different motivational factors influence employee behaviour is an important step in designing a successful intervention programme for the workplace.

2.7 Alternative Options to Reduce Sedentary Behaviour in the Workplace

A systematic review by Morton et al. (2022) examined twenty-two studies that included twenty-nine different types of intervention methods and found that they all resulted in a positive impact on SB levels. The most frequently used intervention strategies were training programmes (n = 21), environmental restructuring (n = 21), educational intervention (n = 15), and enablement (n = 15). Within these intervention studies, several behavioural change techniques were utilised, including providing recommendations on how to perform the behaviour (n = 21), incorporating objects into the environment (n = 20), and modifying the environment (n = 19). The perceived ease of an intervention influenced the outcome of how likely an employee was to engage in a programme to improve PA at work and reduce sitting behaviour (Hadfield et al., 2020).

2.7.1.1 The Role of Prompts in Reducing Sedentary Behaviour

This dissertation falls in line with previous research using similar interventions for the same duration to reduce SB (Pedersen, Cooley & Mainsbridge, 2014; Corder et al., 2020; Morris et al., 2020). In a previous study that used this type of eHealth intervention, it was established that a sixty-minute movement prompt was the optimal duration to reduce total sedentary time during vocational hours, compared to a thirty-minute prompt or no prompt comparison group (Morris et al., 2020). The findings from this study highlight the importance of timing when using movement prompts to help modify workplace behaviour. A study investigating the acceptability and feasibility of an e-prompt system in a similarly designed study reported a 78% retention rate, with participants' reasons for withdrawals being unrelated to the study (i.e. job change or pregnancy). This study had high compliance from participants, providing 100% of the data required to measure outcomes (Carter et al., 2020).

There is growing evidence to suggest that SB occurs largely at the subconscious level. This means that intervention techniques need to not only change the subconscious behaviour but also make the participant aware of their sedentary habits that need to be developed. Interventions that require participants to self-monitor their behaviours have been found that it was a useful method for reducing sedentary behaviour (Compernolle et al., 2019). Permitting individuals to self-track habits and behaviours through mobile technology allows for a better understanding of their own health and general well-being (Liang & Ploderer, 2016).

2.7.1.2 Sit-Stand Workstations

The use of sit-stand workstations is not a new concept, this intervention method is often implemented independently or as part of a multicomponent intervention. A study by Danquah et al. (2016) found that participants using sit-stand workstations reduced their overall sitting time by 71 minutes per 8-hour workday after one month. Similarly, a multicomponent intervention study by Healy et al. (2013) reported that participants made nearly two additional sit-to-stand transitions per hour, reducing prolonged sitting by approximately one hour per day. However, these interventions predominantly replaced sitting with standing, with no significant increase in the number of steps taken.

While interventions that replace sitting with standing have shown benefits for lipid and glucose biomarkers, results have been inconsistent (Alkhajah et al., 2012; Healy et al., 2013; Danquah et al., 2016). A cross-sectional isotemporal analysis by Healy et al. (2015) demonstrated that reducing sitting through standing alone positively impacted cardiometabolic markers, particularly lipid profiles and fasting plasma glucose, however, the effects were stronger when sitting was reallocated to ambulatory movement. After adjusting for confounders, replacing sitting with stepping was associated with an 11% reduction in BMI and a 7.5 cm reduction in waist circumference.

Similarly, Winkler et al. (2018) found that replacing sitting with non-ambulatory activities (i.e. standing) improved cardiometabolic markers, though greater benefits were observed when SB was replaced with walking. While cardiometabolic studies highlight the benefits of standing, a systematic review of musculoskeletal outcomes by Coenen et al. (2018) suggested a potential trade-off: prolonged occupational standing (more than four hours per day) was associated with increased lower back discomfort. This finding suggests that workplace interventions should incorporate movement breaks, ensuring a balance between cardiometabolic and musculoskeletal health.

In South Africa, research on sit-stand workstations remains limited. The *Ukumela Impilo Trial* (Phaswana & Gradidge, 2023) was a randomised controlled trial that evaluated the effectiveness of a 12-week intervention using height-adjustable sit-stand desks among South African office workers. Small improvements in BMI, BP, and cholesterol levels were found. It was concluded that even a short-term intervention is effective in reducing overall sedentary behaviour in the workplace and that it could have a positive effect on selected health outcomes. A qualitative study by Gradidge et al. (2022) studied the perceptions of sit-stand desk usage among university-based office workers in South Africa. The participants reported perceived health benefits, improved concentration, and increased productivity. However, physical discomfort from prolonged standing and concerns around the affordability and desk designs were raised as potential barriers, despite these concerns, most participants were willing to continue using the sit-stand desks if made available. The limited number of studies in this area further highlights the critical gap in local evidence-based research. It reinforces the need for further research in this area that is feasible and effective.

2.7.1.3 Active and Dynamic Seating

Active or dynamic seating aims to reduce the time spent in a constrained posture that is often seen with a traditional office chair. Making use of an unstable surface or sitting in a higher position than normal is thought to promote movement and encourage better posture (Pearse et al., 2024).

Dynamic seating, as defined by O'Sullivan et al. (2013), refers to "*the increased motion in sitting is facilitated by the use of specific chairs or equipment*". Dynamic chairs are often designed to reduce static muscle behaviour, spinal load, fatigue, and minimise pain and discomfort (Pynt, 2015). However, O'Sullivan et al. (2013) concluded that dynamic seating did not result in significant changes to trunk muscle activation, so it is not an effective or beneficial intervention.

An active chair helps facilitate movement. As the user moves in the chair, its mechanisms adjust to help engage different muscle groups and boost blood circulation (Pynt, 2015; Cardenas et al., 2024). Cardenas et al. (2024) determined that using an active chair did not replace the benefits of interrupting prolonged sitting with other activities such as standing, walking, and stretching, it simply provided a different position for the static sitting posture

2.7.1.4 Accountability

In a study conducted by Hadfield et al. (2020), it was concluded that group-based physical activity programmes could increase the frequency of movement among employees during vocational hours. The study results highlight that group dynamics offer another potential aspect to consider when trying to reduce SB in the office environment. Peer support and accountability may serve as encouraging factors that urge employees to integrate more movement into their workday.

2.7.2 The Use of Health Messages to Improve Health

Health messages have been shown to be an effective tool in influencing behavioural change, particularly in increasing physical activity (Latimer, Brawley & Bassett, 2010). These messages can be delivered in various forms, including email, text messages, and printed material. Health messages are typically framed in one of two ways:

1. Gained-framed messages – Highlight the benefits of adopting positive behaviour (e.g. the advantages of breaking up prolonged sitting).
2. Loss-framed messages – Emphasise the negative consequences of inactivity (e.g. the risk associated with prolonged sitting) (Ratcliff et al., 2019).

Research consistently shows that gain-framed messages are more effective in promoting PA, as individuals who receive these messages report a higher level of physical activity compared to those who receive no message. The effectiveness of gain-framed messages can be explained by their ability to motivate behavioural change without supporting avoidance behaviours (Latimer, Brawley & Bassett, 2010).

2.8 Section 3: The Role of Technology

According to a recent report by Electronic Hub, the average South African spends 56% of their waking hours looking at a screen – this is equal to approximately 9 hours and 24 minutes per day. South Africa ranks the highest globally for cell phone usage, with 31% of waking hours (roughly 5 hours and 15 minutes) spent on a mobile device. Social media usage accounts for 22% of daily awake time, while TV viewing occupies 24% (approximately 4 hours and 5 minutes per day). South Africans rank second globally for TV viewing, behind the United States, where TV viewing accounts for 28% of waking hours (Navarro, 2024).

These findings suggest that screen-based sedentary activities are a substantial part of daily life in South Africa, further highlighting the need for a workplace intervention that is aimed at reducing screen time and increasing movement throughout the day.

2.8.1 Technology and Sedentary Behaviour

The rise in SB over the past few decades has been attributed to several factors, including advancements in technological innovations in both the workplace and home environment (Church et al., 2011). Television (TV) viewing has remained stable over the last two decades (Marshall, Gorely & Biddle, 2006). However, the increased use of personal computers, tablets, gaming consoles and smartphones has led to a marked increase in overall sedentary behaviour (Katzmarzyk et al., 2009). Within the workplace, technological advancements have worsened employee sedentary behaviour, as employees now spend even more time seated behind their computers (Bennie et al., 2015).

A meta-analysis conducted by Grøntved and Hu (2011) studied the relationship between TV viewing and mortality rates. Their findings concluded that prolonged TV viewing was associated with an increased risk of T2DM, CVD, and ACM. For every two hours of additional TV viewing per day, there is an increased 13% danger of ACM. The HUNT study (2014) examined the cross-sectional association between total sitting time, leisure screen time and cardiometabolic risk in adults. They were able to determine that more than four hours of TV per day is linked to increased BMI, waist circumference, triglycerides, systolic blood pressure and lower high-density lipoprotein cholesterol (HDL-C) levels. In addition, any leisure computer usage for more than one hour per day demonstrated worse BMI, increased diastolic blood pressure, and triglyceride levels when compared to non-computer users.

These findings highlight the need for interventions that not only target screen-based sedentary behaviour but also encourage light physical activity.

CHAPTER 3: METHODS AND MATERIALS

3.1 Research Design

This study design is an intervention study using a mixed-methods approach at the Vetro Media Offices, located at 382 Jan Smuts Avenue, Craighall, Johannesburg. All participants completed a series of assessments, which included cardiometabolic health assessments, anthropometric measurements, and the completion of questionnaires during the first visit to their office.

This study used a 12-week intervention design with a non-randomised, two-group comparison. The participants were allocated into either the intervention group or the control group based on their personal smartphone (iPhone or Android). The intervention group received hourly prompts via an eHealth app and gain-framed health via email, while the control group had access to a basic self-monitoring app without the hourly prompts. Repeated measurements were taken at baseline, the mid-point, and the end of the 12-week period using both objective and subjective tools.

3.2 Study Procedure

At baseline, participants were asked to complete a subjective questionnaire regarding their perceived PA levels and time spent engaging in sedentary behaviour. During that same session, they were asked to complete the Satisfaction with Life Scale questionnaire. To establish an objective baseline for future comparisons, each participant was asked to wear an Axivity AX3 (Axivity Ltd, Newcastle upon Tyne, UK) monitor for 7 days. Participants were then allocated into either a control or intervention group (Figure 3.1).

All participants in the intervention group (Group 1) were required to download the *Stand Up!* mobile phone app. The participants were then instructed on how to set up the app, with a movement prompt set to be delivered every hour. When the prompt was delivered, they were required to stand up and walk around their office space for 3 minutes before returning to their desks. Participants in the intervention group also received health-related motivational emails to encourage movement during the intervention duration.

Participants in the control group (Group 2) were required to download the *WorkBreak* mobile phone app, which was a non-prompt self-monitoring tool. These participants were free to configure the app according to their preferences, with most opting for a movement prompt set for every two hours with a 5-minute walk. No additional instructions were given to these participants, and they did not receive any health-related motivational emails. In this study, the term “control group” refers to the participants who received no behavioural input or any researcher interaction. While the participants were required to download a basic eHealth app, they were not given specific instructions, prompt guidelines or messaging, it was not designed to modify their behaviour.

Both groups used the apps for 12 weeks, with all assessments repeated at 6-week and 12-week follow-ups. All assessments took place at the Vetro Media Offices during normal working hours. Participants were instructed to interrupt their sedentary time only during vocational hours on weekdays, with no group required to use the apps over the weekends.

After the intervention period, the participants from Group 1 took part in focus group (FG) discussions. To ensure that the FG discussions were as concise as possible, the eligible participants were divided into two small, manageable groups. The purpose of these discussions was to evaluate the success of the intervention. The participants were invited to the discussions via email, with the assistance of the Human Resources (HR) department.

The qualitative aspect was included in this dissertation to help gain insight into the participants’ overall experience with the eHealth intervention, an element of the intervention that could not be fully captured through the use of quantitative methods alone. While the use of quantitative methods allowed for the objective measurements of change, the focus groups explored the participants’ perspectives, challenges and the perceived impact of the intervention. This combination helped provide a more cohesive picture.

The study was not blinded. The group allocation was determined by smartphone type, which was only confirmed by the participant on the day of baseline testing. Although the research did not influence group assignment and was unaware of the phone type of the individuals during the recruitment process, both the researcher and the participants were aware of the group allocations after the baseline assessment. This could have introduced the possibility of performance or detection bias; however, objective tools (Axivity AX3) and standardised protocols were used to help mitigate such bias.

Assigning the participants to the intervention group or the control group was chosen due to the compatibility constraints of the intervention app, which was only available on iOS at the time of the study. While convenient and cost-effective, it is important to note that this non-randomised allocation could present a potential limitation, as smartphone type could be a socio-economic factor in some cases that could affect the intervention's responsiveness. Before recruitment, HR was consulted on the general distribution of smartphones throughout the company to ensure a relatively balanced mix.

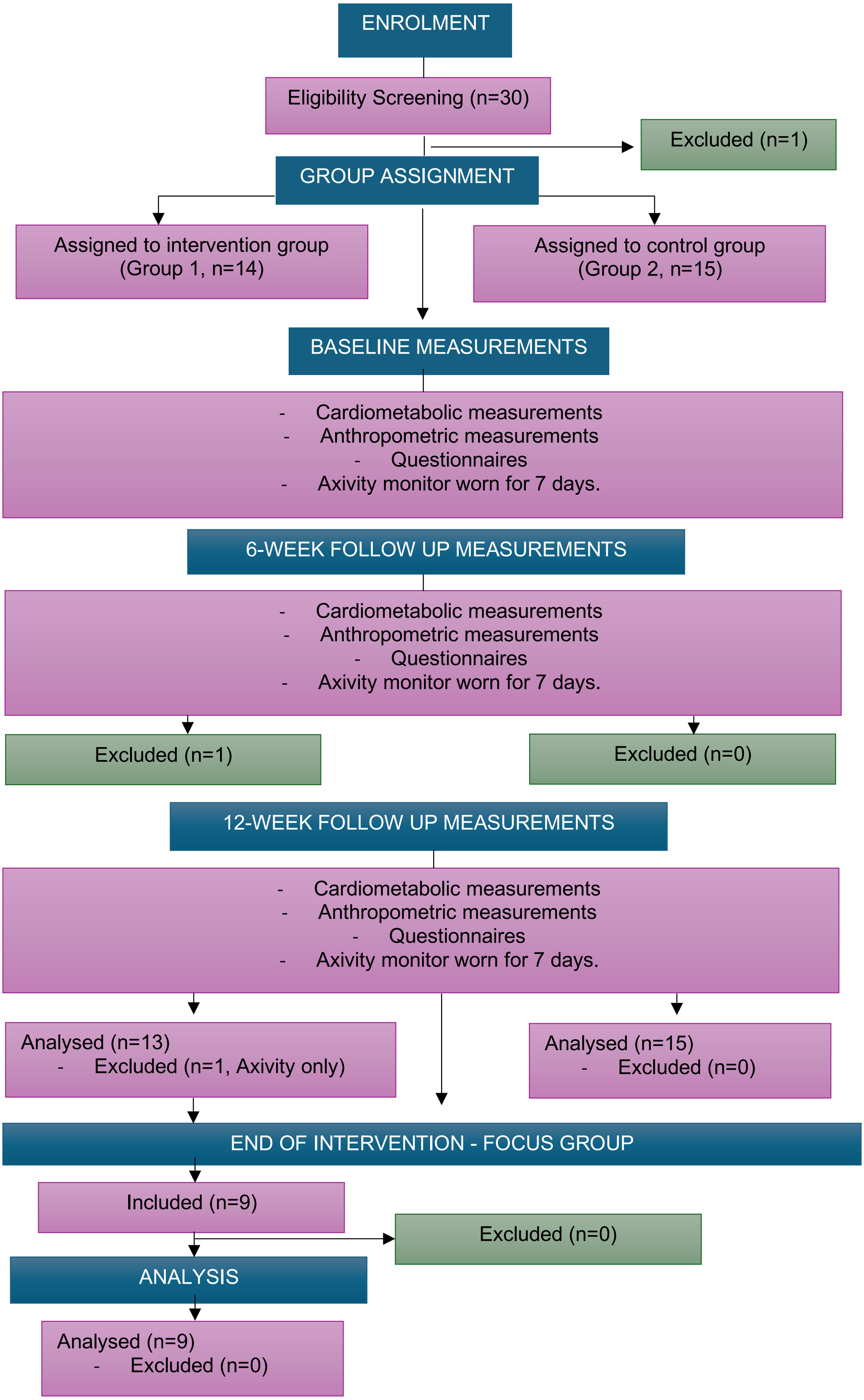

Figure 3.1: Flow Diagram of Participant Recruitment, Group Assignment and Procedure over Intervention Period.

3.3 Participants Selection

The participants for this study comprised of men and women with predominantly desk-based, sedentary occupations, all recruited from Vetro Media. Recruitment was aided by the Chief Executive Officer (CEO) (Appendix B) and the HR manager, as well as through direct email communication from the researcher (Appendix C). This particular population was selected due to the nature of their work (e.g., social media managers, designers, account directors, etc), which typically involves prolonged periods of sitting for the majority of the workday. Participants were eligible to participate if more than 50% of their workday was spent engaging in some form of SB. All testing was conducted at Vetro Media in a dedicated office space by the researcher. Participants were instructed not to exercise before testing sessions, and although the bloodwork was conducted in a non-fasting state, participants were advised not to eat or drink anything for at least an hour before testing.

Participants were included in the study if they were aged between 18-65 years and were considered to be in good general health. They were required to have access to a smartphone capable of receiving emails and downloading the required mobile phone app. Additionally, the participants needed to be ambulatory and walk at least 10 metres.

Exclusion criteria included pregnancy, non-ambulatory, or any chronic medical condition that prevented the participant from walking more than 10 metres. Participants' overall health, medical history (including medication usage and previous hospital admissions), smartphone type (i.e. iPhone or Android), and level of education were all determined using the general questionnaire.

A total of thirty (n = 30) individuals initially expressed interest in participating in the study. However, one individual was ineligible due to pregnancy. Participants were then assigned to two groups based on their smartphone type: iPhone users were allocated to Group 1 (n = 14), and Android users were assigned to Group 2 (n = 15). Although the sample size for the study was small, it is important to note that this number represents the majority of employees at Vetro Media during the data collection period. The sample is a nearly complete representation of the target population – this high participant rate enhances the relevance and contextual validity of the findings in this specific office setting, even though it hinders the generalisability to broader populations may be limited.

All the participants who remained in Group 1 (n = 13) at the end of the study were invited to participate in the focus groups. The thirteen participants were then separated into two groups – Focus Group 1 (FG1) and Focus Group 2 (FG2). The participants from Group 2 did not participate in any focus group discussions, as these were designed to assess the intervention experience.

3.4 Ethical Considerations:

All of the procedures involving human participants were conducted in accordance with the ethical standards set by the Human Research Ethics Committee (Medical) at the University of the Witwatersrand (certificate number: M210823).

Participants were informed of the study procedures and were required to sign an informed consent form (Appendix D) before commencing the study. A separate form was required if the participant was part of the focus group discussions. The participants were informed of their right to withdraw from the study at any time without prejudice or cost to them. Confidentiality and anonymity were maintained throughout the study. No identifying information was used in the analysis or the reporting of findings.

3.5 Procedures and Measurements

3.5.1 General Questionnaire, SIT-Q-7d and Satisfaction With Life Scale Questionnaires

Participants were asked to complete a general questionnaire (Appendix E) before taking part in the study, this was used for sociodemographic information and to assess overall health, hospital admissions or surgeries from the past two years, and any chronic medication use. The overall health score was not a valid or standardised assessment tool, it was included as a single self-rated health item to capture a broad, subjective perception of the participants' own health and to observe whether this perception shifted over the duration of the intervention. Those with chronic conditions or on regular medication engaged in further discussions with the researcher to determine their eligibility. No participants were excluded based on their general health.

The Last 7 Days Sedentary Time questionnaire (SIT-Q-7d) (Appendix F) was administered to assess subjective sedentary behaviour. This questionnaire covered five sections:

1. Sleeping and napping
2. Meals
3. Transportation
4. Work, study, and volunteering
5. Screen time and other activities

Additionally, the Satisfaction with Life Scale (SWLS) (Appendix G) was also completed. A brief questionnaire that allowed the participants to assess their overall life satisfaction using a seven-point Likert scale. All questionnaires were administered at baseline, 6 weeks, and the end of the intervention period.

3.5.2 Measurements

All data were collected at baseline, 6 weeks and 12 weeks, using standardised assessment tools. All assessments took place at the participants' workplace. The participants were sent an email a week in advance to confirm their availability. If they were unavailable, an alternative appointment was scheduled. All assessments were conducted in a private room for privacy.

3.5.3 Anthropometry: Standing Height, Body Mass, and Body Composition

For the measurement of anthropometric values, the participants were requested to wear light clothing and were asked to remove their shoes. Standing height was measured to the nearest 0.1 cm using a portable stadiometer (Seca 213, Hamburg, Germany). Total body weight (kg) was recorded using a digital weighing scale (Seca 874, Hamburg, Germany). All measurements will be conducted by a trained Biokineticist. All data were recorded on a data collection sheet (Appendix H).

The measurements from the standing height and the total body weight were used to calculate BMI ($kg{\cdot}m^2$). World Health Organization (2021) BMI classifications guidelines were followed: underweight (<18.5 $kg{\cdot}m^2$), normal weight (between ≥18.5 kg/m^2 and 24.9 kg/m^2), overweight (between 25.0 kg/m^2 and 29.9 kg/m^2), or obese (>30.0 kg/m^2).

Equation 1 - Calculation of BMI using kilograms and metres[1]

$$BMI = weight(kg)/ [height\ (m)]^2$$

Horizontal waist circumference measurement was taken using an inelastic but flexible measuring tape at the narrowest portion of the torso (American College Of Sports Medicine, 2014). A hip/buttocks circumference measurement was taken at the maximal circumference of the buttocks – this measurement is used to determine waist-to-hip ratio (WHR). Each measurement was taken twice, provided there was not a difference of more than 5 mm. If a difference of more than 5 mm was recorded, then a third measurement was taken and recorded.

The average between the measurements was used to determine the WHR of the participants (Heart and Stroke Foundation of Canada, 2020). A WHR of >0.95 for young men and a WHR of >0.86 for young women is considered to be high risk (American College Of Sports Medicine, 2014).

Equation 2 - Calculation of WHR:

Waist circumference (cm) divided by hip circumference (cm) (Baioumi, 2019).

3.6 Cardiometabolic Markers

3.6.1 Blood Pressure and Heart Rate

Blood pressure (BP) was measured using an Omron HBP-1100 (OMRON Healthcare Co., Ltd., Kyoto, Japan) automatic sphygmomanometer, which recorded the brachial BP using the participant's left arm. To ensure an accurate BP reading, participants were instructed not to smoke, consume caffeine, or exercise more than thirty minutes before BP measurements were taken. Neither the participant nor the researcher was

[1] All height measurements were converted from cm to m. (Centers for Disease Control and Prevention, 2019)

permitted to speak during or between the measurements (Unger et al., 2020). Participants were required to rest for three to five minutes in a seated position before their BP measurements were taken.

With their arm supported at heart level, two BP measurements were taken, with a one-to-two-minute interval between each measurement. The average of the two measurements was used. However, if there was a difference of more than 5mmHg between the two measurements, a third BP reading was taken, and the mean was calculated (Seedat, Rayner & Veriava, 2014). A heart rate (HR) was recorded from each BP reading, with the average used for analysis. Hypertension was classified as having a systolic blood pressure (SBP) of ≥140 mmHg and/or a diastolic blood pressure (DBP) of ≥90 mmHg (Rayner et al., 2019) or if the participant was prescribed regular anti-hypertensive medication. If the participant had undiagnosed hypertension, they were advised to seek medical attention from their healthcare provider.

3.6.2 Blood Analysis

The non-fasting finger-prick capillary blood collection procedure (World Health Organization, 2010) was followed, with approximately 0.3-1 µL of blood collected from the participant (Rajendran & Rayman, 2014). The point-of-care testing CardioChek Plus Analyzer (CCPA) was used (Polymer Technology System, Inc., Indianapolis, USA). In a study conducted by Ferreira et al. (2015), the CCPA was found to have good clinical agreement with a range of 94.6%-97.7%.

From the CCPA finger-prick test, the following blood measurements were obtained: total cholesterol (TC) (mmol/L), high-density lipoprotein cholesterol (HDL-C) in mmol/L, TG (mmol/L), glucose (mmol/L), calculated low-density lipoprotein cholesterol (LDL-C) (mmol/L), TC:HDL ratio, LDL:HDL ratio, and non-HDL cholesterol in mmol/L. All measurements were taken in a non-fasting state.

Total cholesterol was defined as the overall level of cholesterol in the blood (Heart UK, 2022). An abnormal TC measurement was classified as ≥5.2 mmol (≥201 mg/dL[2])

[2] Conversion for total cholesterol: mg/dL= 38.67 x mmol/L (National Center for Biotechnology Information, 2004)

(Mayo Clinic, 2024) or if the participant was prescribed regular use of medication for hypercholesterolaemia.

Calculated LDL-C, often used in patient care, is the concentration of an individual's LDL-C, often suggested to be one of the strongest indicators for assessing coronary heart disease and atherosclerosis risk (Vujovic et al., 2010). Friedewald's Formula - a commonly used equation to calculate estimated values for LDL-C concentrations: Friedewald Formula: LDL-C = TC-HDL-C (TG/5).

Equation 3 – Calculation of LDL-C using Friedewald formula:

Total cholesterol minus high-density lipoprotein cholesterol (minus triglyceride divided by 2.2) (Vujovic et al., 2010).

Equation 4 – Calculation of LDL-C in mg/dL using Friedewald formula:

Total cholesterol minus high-density lipoprotein cholesterol minus (triglyceride divided by 5 (Lee et al., 2020).

HDL-C is often referred to as an individual's "good" cholesterol. Women often have a slightly higher HDL measurement when compared to men. HDL-C measurements of up to 1.4 mmol/L are ideal. However, a measurement above 1.2 mmol/L (46 mg/dL) for women and above 1.0 mmol/L (39 mg/dL) for men was considered adequate to offer the protection often associated with HDL-C (Heart UK, 2022).

TC:HDL ratio was calculated by comparing HDL to TC levels. With the TC:HDL ratio, it is accepted that the lower the ratio the better – however if a ratio was over 6, that was considered high risk.

Equation 5 – Calculation of TC:HDL ratio:

Total cholesterol divided by HDL cholesterol (Heart UK, 2022).

Non-HDL-C: all "bad" cholesterol added together, including LDL-C measurement. Lower values were considered more favourable.

Equation 6 – Calculation of non-HDL cholesterol:

TC minus HDL-C (Heart UK, 2022)

A measured non-fasting TG level of below 2.3 mmol/L was desired (Heart UK, 2022). Non-fasting glucose measurement: A random glucose test measurement of ≥11.1 mmol/L (≥200 mg/dL[3]) or regular use of diabetic medication prescribed by a doctor was sufficient for a diagnosis of diabetes (American Diabetes Association, 2018). LDL:HDL ratio was found to be a better predictor for coronary atherosclerotic heart disease, the higher the LDL:HDL ratio, the greater the significance of developing coronary atherosclerotic heart disease (Sun et al., 2022). Cardiovascular disease and stroke risk are associated with higher levels of LDL-C and lower levels of HDL-C, with the optimal range for LDL-C/HDL-C between 1.67 and 2.10 (Yu et al., 2020).

Equation 7 – Calculation for LDL:HDL ratio

LDL-C divided by HDL-C

3.7 Axivity Accelerometer

To objectively evaluate the physical activity and sedentary behaviour of the participants, raw data from the Axivity AX3 accelerometer were analysed. The Axivity AX3, is a small (dimensions: 23 x 32.5 x 7.6 mm), lightweight (weight: 11g), triaxial accelerometer and Flash-based onboard memory device that can be used to collect all necessary free-living data relating to the participant's movement behaviours, it is typically worn on the wrist, thigh, or lower back, depending on the requirements of the study. The high-resolution triaxial acceleration data that was captured can be processed to distinguish between different levels of activity intensity, ranging from SB to vigorous physical activity (Steele et al., 2010). This level of detail was critical in understanding the patterns that emerged and the context in which an individual engaged in SB or PA.

[3] Conversion factor for blood glucose: mg/dL = 18.018 x mmol/L (Conor Seery, 2019)

The Axivity AX3 accelerometer had a battery life of thirty days at 12.5 Hz or 14 days frequency at 100 Hz. The Axivity AX3 accelerometer had a range of ±2/ 4/ 8/ 16g reconfigurability. In a multi-axis shaker table test, the Axivity AX3 demonstrated equivalent signal vector magnitude output compared to the GENEActiv accelerometer (Ladha et al., 2013). The Axivity AX3 device enabled transparent data processing and analysis by utilising open-source firmware and unbiased raw data sampling (Doherty et al., 2017). These monitors have shown high validity in assessing PA energy expenditure (White et al., 2016).

In a 2021 study that aimed to assess the validity of the ActiGraph GT3X+ and Axivity AX3 accelerometers, both accelerometers obtained parallel accuracy, with the Axivity AX3 monitor achieving a slightly higher balanced accuracy (~4% higher) when distinguishing between postures and PA intensity changes in both adults and children (Hedayatrad, Stewart & Duncan, 2021). A particular advantage of using the Axivity AX3 was its ability to capture data for an extended period, without the need to frequently recharge the device or download the captured data. This facilitated the collection of representative data that often reflected typical movement patterns, rather than a small snapshot influenced by short-term variations (Edwardson et al., 2017).

Participants were instructed to wear the Axivity AX3 accelerometer on their non-dominant wrist continuously for seven days, including during sleep at baseline, 6-weeks and 12-weeks. Data from individuals who wore the device for at least four days (a total of ninety-six hours) were included in the analysis. One participant was excluded from the analysis due to incomplete wear time. The Axivity AX3 accelerometer was placed inside an adjustable silicon strap that allowed the participants to wear the monitor on their wrists (Figure 3.2).

Figure 3.2: Example of Wrist Band – Image taken from website Axivity | Product

Each Axivity AX3 accelerometer was set to record at a sample range of ±8g and with a frequency of 100 Hz. The accelerometers were set up for each individual when they met with the researcher for their anthropometric, cardiometabolic and questionnaire sessions; the accelerometer devices were collected after seven days. The participants were informed that if they were unable to meet with the researcher after seven days, the device would turn itself off after a set time, and they were free to stop wearing the device. Participants were told to only exclude activities that are not considered water-resistant (i.e. Diving and the use of sauna/steam rooms). When comparing wrist and hip-worn accelerometers, user compliance was higher in wrist-worn devices compared to hip-worn devices. This was due to participants stating that the wrist-worn device was less annoying (Pavey et al., 2016) and more comfortable (Scott et al., 2017), based on these findings, wrist-worn accelerometers were selected for this study.

Raw accelerometer data, initially recorded in .cwa format, were converted to .csv files using OpenMovement software (Open Lab, Newcastle University, U.K.). This software enabled the precise conversion of the Axivity AX3 monitor data into a format that was suitable for further analysis while ensuring retention of the timestamped triaxial acceleration values. The data included metrics such as total sedentary time, number of breaks to prolonged sedentary behaviour and the duration and intensity of any physical activity (Welk, 2005).

Data were aggregated into 1-minute time epochs using the lubridate and dplyr packages in R statistical software, version 4.4.0 (R Foundation for Statistical Computing, Vienna, Austria) (https://www.r-project.org). The Euclidean Norm Minus

One (ENMO), a validated measure of movement intensity (Hildebrand et al., 2014; Bakrania et al., 2016), was calculated using the open-source GGIR package (Version 3.1-5) in R. The activity levels were then categorised based on ENMO thresholds.

Data were then filtered to analyse for total wear time (in hours) and workday wear time between the hours of 08:00 and 18:00 hours, which allowed for some level of flexibility due to the flexible work hours of the participants. The total time spent in each activity level (hours and percentage) was calculated for the entire week and weekdays during working hours. Breaks to sedentary behaviours were defined as transitions from a sedentary state to an active state lasting longer than one minute – the frequency of these breaks was identified.

3.8 Assessment Tools

Participants were asked to complete a questionnaire (to help describe the sociodemographic characteristics of the sample group (i.e., age, gender, etc.). Participants were asked to complete the SIT-Q-7d for self-reported SB. A study conducted by Wijndaele et al. (2014) found the validity of the SIT-Q-7d ranges from 0.22 to 0.76, making it an acceptable assessment tool.

The Satisfaction with Life Scale (SWLS), also known as the Satisfaction with Life Questionnaire, was used to assess the participants' subjective well-being. It is a five-question measurement tool that utilises a seven-point Likert Scale; the participants were asked to judge each statement on a scale from 1 (strongly disagree) to 7 (strongly agree), with the total scores ranging from 5 to 35 (Diener et al., 1985). Higher scores could indicate greater life satisfaction. The SWLS has reliability when compared to other measurement tools for satisfaction with life (Pavot & Diener, 2008).

Each questionnaire was handed out to the participants during their data-capturing sessions. Each questionnaire was graded accordingly. The scoring system then allowed for a score to be assigned to each participant. These scores then provided data that could be compared at baseline, the mid-point, and at the end of the intervention.

3.9 Phase 1 of the Intervention

Following baseline assessments and questionnaires, all participants with iOS mobile devices (Group 1) were instructed to download the application called *Stand Up! The Work Break Timer*. Once the app was installed on their smartphones, these participants received instructions regarding app setup with the correct break frequency. Participants were instructed to set their break frequency to every 60 minutes, with a three-minute break duration. During their three-minute break, participants were required to get up and engage in a quick, purposeful walk around their office space. Participants were then instructed to set their average workday time; this was based on the average time they arrived at and left the office. This ensured the prompts were only received during those times (i.e., Monday to Friday, 08h00 to 18h00), as the intervention was set primarily within the workplace. This feature also allowed the participant to alter their start and end times should their schedule have changed during the duration of the study.

The *Stand U*p*!* app delivered a pop-up notification when it was time for the participant to get up and walk. The pop-up notification simply read *"Time to stand up. We want you to live longer"*. To log a break the participant needed to manually click on the notification. If the participant was unable to take their break immediately, they had the option to delay the prompt by either 30 minutes, 60 minutes, or 90 minutes. If no manual break was logged within the hour, the app would automatically log it as a missed break, at which the app automatically began a new hourly prompt cycle.

The app did not remotely store the break information; however, it did provide a quick activity snapshot from the past seven days. This snapshot allowed participants to see how many breaks were logged or missed on any given day of the previous week. Once the three-minute break duration had been completed, the app would inform the participant with another pop-up notification that read "*Congrats on the healthy break, time to get back to work*". This would then automatically schedule the next prompt. The app was unable to detect whether a participant was walking or standing, so each participant was provided with a log sheet (Appendix I) on which they were asked to simply mark off the sessions as either completed or missed.

Participants in the non-prompt control group (Group 2) were instructed to download the *WorkBreak* app for Android smartphones. This app required participants to manually enter their desired break duration, they could decide how often they wanted to receive the prompt and the duration they wanted to engage in a movement break around the office. Once the participant had entered their desired break, a clock interface appeared within the app, and this allowed the participant to self-monitor their breaks. No additional information about break frequency or duration was provided to these participants these details were all self-determined by the participants.

Only the prompt intervention group participants (Group 1) received health-related emails from the researcher - these emails were sent out to encourage healthy behaviour, increase the participants' awareness of the risks associated with SB and increase PA. These messages were sent out via email at random once a week. All non-prompt control participants received no weekly email from the researcher and continued as normal.

Although the mobile prompt app used for this intervention delivered hourly movement prompts, it did not provide backend analytics or usage metrics. Because of this, participant engagement with the mobile app was not measured quantitatively but rather qualitatively in the post-intervention FG discussions.

3.10 Phase 2 of the Intervention - Focus Group Discussions

All remaining participants from the intervention group (n = 13) who had not dropped out of the study were invited to participate in the focus group discussions post-intervention (Appendix J). If 60% of participants responded to the invitation, this would have been seen as a positive response rate. This was to account for the fact that not all participants were available or willing to participate in the discussions. Of the thirteen eligible participants, nine said they were willing to take part, with the other five unable to join due to previous work commitments.

The FG discussion had five primary topics that were discussed. Numerous quotations from the FGs were then used in the qualitative section of the study. However, no identifying information regarding the participant was used. Each participant was allocated a unique code that was used alongside the quotations. The participants were divided into two different groups (Focus Group 1: n = 4 and Focus Group 2: n = 5). The FG discussions took place at the participants' place of work, at a time set by the HR department that best suited the work schedules of most participants. This ensured that the participants felt comfortable taking the time out of their workday and felt supported in their decision to participate. The researcher was not involved with the allocation of participants into their specific FGs.

3.11 Data Analysis

3.11.1 Quantitative Data Analysis

Quantitative data analysis was used on all the participants' measurements. Qualitative data analysis was used only for participants who participated in Phase 2.

Descriptive statistics were calculated as means and standard deviations. Independent t-tests were used to determine the difference between measurements for baseline, during and after the intervention. The main dependent variables included SB, light physical activity (LPA), MVPA, break frequency and SWLS scores. The independent variable was the allocation of groups across the time points (baseline, midpoint, and end). The relationship between SB, SWLS scores and break frequency was analysed using Pearson's correlation coefficient. Pearson's correlation was selected to measure the strength and direction of linear relationships between the variables. Fisher's combined probability test was used to summarise the statistical significance of these relationships across the three time points. A repeated ANOVA test was used to evaluate changes in SB, LPA, MVPA and break frequency across the duration of the intervention. Significant interaction effects indicated differing patterns of change between the groups. Data was analysed using STATA/BE software (Version 18, StataCorp, United States of America).

3.12 Qualitative Data Analysis

3.12.1 Data Collection

The FG discussions took place in person at the Vetro Offices over a two-week time frame at the end of the participant's typical workday. Each discussion was guided by the same set of semi-structured questions (Appendix K), and the discussions were all conducted in English by the researcher. The two discussions lasted between twenty-one and eighty-six minutes. All the information gathered during these sessions was included in the qualitative data analysis process. The FG sessions continued until each participant felt they had given an accurate account of their unique experience, and all the guiding questions had been fully answered. Once no new additional information was being provided, the researcher confirmed with the participants if they were happy with all the information provided or if they had something else to add. If nothing else was included, the researcher ended the sessions. To ensure comprehensive coverage of each session, two iPhones were placed on opposite sides of the table. This ensured that the audio was captured from multiple angles, on the off chance that the audio was unclear on one device. All the recordings were gathered using Otter AI Pro (Otter.ai Inc.), an app with a high level of accuracy for automated speech recognition (Simpson, 2022). The participants involved in the FG sessions were asked to sign another informed consent form stating their willingness to participate in the FG discussions (Appendix L), and they gave separate consent for the session to be recorded (Appendix M).

3.12.2 Thematic Analysis

The qualitative data analysis was a multi-staged process that followed the guidelines of Braun and Clarke's (2006) six-step framework for thematic analysis. This approach provides a flexible and easy cyclical method for identifying, analysing, and reporting patterns or themes within the dataset. The six steps included are: 1. Familiarisation of the data, 2. Generation initial codes, 3. Searching for themes, 4. Reviewing potential themes, 5. Defining and naming themes, 6. Producing a report. While the FG discussions were guided by predetermined questions that aligned with the study objectives, the themes that emerged during the analysis were not predetermined and emerged during the analysis process. Each of these stages was then applied systemically to ensure the analysis remained grounded in the data and was a true reflection of the participants' experiences and perspectives.

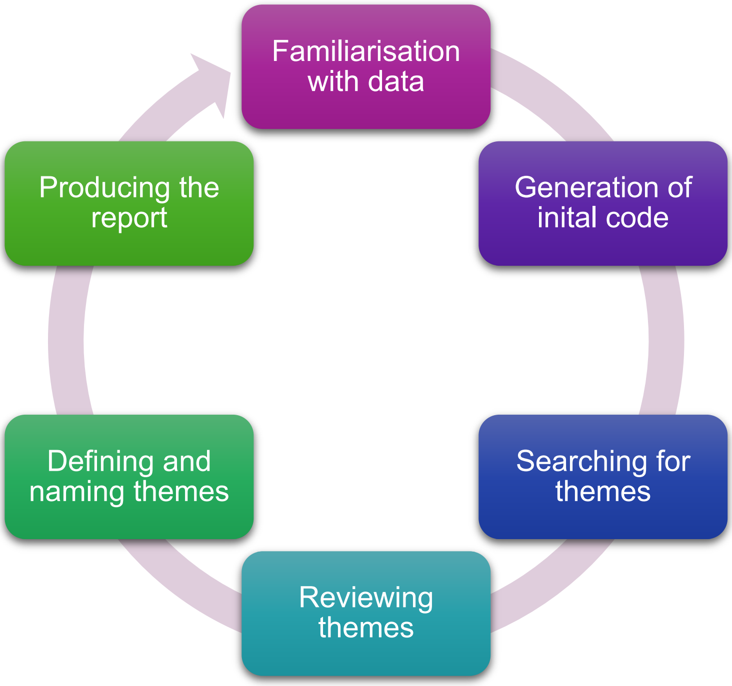

Figure 3.3 Circular Diagram Depicting the Theme Generation Process.

3.12.2.1 Step 1: Familiarisation with the Data

Following the data collection, the FG discussions were automatically transcribed by the Otter AI Pro app. Once completed, the research was manually verified to ensure that the sessions were transcribed accurately and verbatim. This process involved multiple playbacks of the recorded audio, checking to ensure that all overlapping speech, dialect variations, and any possible transcription errors were identified and then corrected.

The researcher kept a notebook at hand during the verification process in which initial ideas, possible themes and recurring talking points were noted (Appendices N, O, P). If the participants had contrasting or conflicting opinions about certain points raised during the sessions, it was noted. This allowed for a more comprehensive understanding of the dataset. This familiarisation process helped guide the analysis and coding process for the qualitative results by ensuring that the emerging themes were data-driven rather than predetermined.

Step 2: Generating the Initial Codes

Given the small size of the sample group, manual analysis of the data set was selected over computer-based software, which helped ensure that the researcher was engaged in the qualitative process. Following on from the familiarisation phase, early manual coding was conducted by using an inductive approach where the codes were generated directly from the data rather than a predetermined framework. Key actions included colour-coding each participant in the discussion transcripts. By carefully labelling each participant with a unique identifier (e.g. BP1, DN1), the researcher was able to maintain the anonymity of the participants. Any relevant or useful information was assigned an initial code. To help with the systematic organisation of data, the initial codes were transferred into Microsoft Word documents. The themes from Focus Group 1 and Focus Group 2 were each recorded separately. The themes from both groups were then transferred into a single Excel Spreadsheet, which was used to compare emerging themes in Step 3.

3.12.2.2 Step 3: Searching for Themes

Once the initial generation of codes was completed, recurring themes from FG1 and FG2 were then systematically compared. The comparison process was followed. The initial codes were listed in an Excel spreadsheet, and possible codes from FG1 and FG2 were compared side-by-side in a single Excel document. The side-by-side comparison allowed for common insights that overlapped between the two groups to be identified. It also highlighted unique themes raised by the participants; this allowed for the identification of differences between the groups. In certain cases, contrasting ideas were also identified. If similar themes emerged, they were consolidated under larger theme categories.

3.12.2.3 Step 4: Reviewing Themes

To help improve credibility and reliability, a structured review method was used. This involved cross-checking themes against the entire dataset to ensure it reflected the participants' unique and individual feedback. Refining the themes and subthemes helped maintain cohesion throughout the analysis process. By refining and gaining an in-depth understanding of the data, a thematic mind map was designed (Figure 4.15), which illustrated the relationship between themes and subthemes. At this stage, the researcher shared everything with the research supervisors to ensure correct transcription and check thematic framework development.

3.12.2.4 Step 5: Defining and Naming Themes

This step involved the finalisation of themes and subthemes into a structured thematic framework and the visual mapping of key insights. The themes were finalised through an iterative review of transcripts, relevant researcher notes, and thematic mapping. Relevant quotes from participants were then assigned to each theme. The themes were cross-checked with the study objectives, ensuring that only relevant information was used in the qualitative analysis. By using participant quotes, the researcher was able to tie their unique perceptions with existing literature. After the final analysis, the final themes and subthemes were used to report on the Results and Discussion Chapters.

3.12.2.5 Step 6: Producing the Report

An overlap between Step 5 and Step 6 may have occurred, as the write-up and analysis are often interwoven in qualitative research. Bandura's (1977) Self-Efficacy Theory was used to provide a deeper understanding of the previously identified themes and subthemes. By integrating the thematic analysis and the Self-Efficacy Theory, the researcher was able to provide context to participant behaviours. This has offered a deeper insight into the facilitation and barriers often faced by employees and researchers aiming to reduce workplace sedentary behaviour.

3.12.3 Self-Efficacy Theory

The Self-Efficacy Theory (Bandura, 1977) provided an explanatory lens for understanding the observed behavioural changes that were observed. This theory suggested that an individual's belief in their ability to successfully perform or complete a task would most likely affect the likelihood of them accepting or maintaining that specific behaviour. This theory is shaped by four factors:

1. Mastery of Experiences – The most prominent factor of self-efficacy. When a task is successfully performed, it reinforces the belief in one's ability. Whereas repeatedly failing at a task can weaken this belief.
2. Vicarious Experiences – Observing your peers performing a task successfully can enhance self-efficacy. This allows the observer to believe that they can achieve the same outcomes.
3. Verbal Persuasion – This factor involves verbal reinforcement through positive encouragement, constructive feedback and motivational prompts. This can lead to a sense of confidence, while negative feedback undermines that confidence.
4. Emotional and Physiological States – A positive emotional state can enhance self-efficacy (i.e. such as feeling calm or motivated), while a negative state can reduce it (i.e. such as anxiety, stress or fatigue).

These four key factors were used to help integrate the quantitative and qualitative results. The Self-Efficacy Theory has been widely used in other interventions to highlight how seemingly small behavioural wins, supportive feedback, and reduced anxiety can contribute to sustained behavioural changes.

CHAPTER 4: RESULTS

4.1 Quantitative Results

This section of the chapter aims to discuss the results of the quantitative data analysis from all the datasets. The aim is to provide a comprehensive summary of the research results by identifying any significant trends or relationships that may have emerged.

The quantitative and qualitative results are presented separately in Chapter 4 to help maintain clarity. However, they are later integrated into Chapter 5 to help explore how the qualitative insights help provide context for the quantitative outcomes.

4.1.1 Descriptive Characteristics and Anthropometric Measurements

A total of thirty (13 male, 17 female) otherwise healthy participants agreed to participate in the study. The mean age of the control group was 34.93 (±6.67), and the intervention group had a mean age of 32.46 (±6.04). One participant was excluded due to not meeting the inclusion criteria. Another participant withdrew due to a change in employment before the mid-intervention measurements. The data from twenty-eight participants (intervention group, n=13 and control group, n=15) completed the study. Table 4.1 presents the demographic characteristics of the participants, including age, weight, and BMI. No significant differences were observed between the groups regarding weight ($p = 0.46$) or BMI ($p = 0.89$), with both measurements remaining relatively stable throughout the intervention period. The average effect size for weight was negligible ($d = 0.008$), showing no meaningful difference between the two groups, while the effect size for BMI was small ($d = 0.011$), further confirming minimal practical impact. These findings suggest that the intervention had no significant influence on overall body composition.

4.1.2 Overall Health Score

The participants' self-reported overall health scores helped determine whether the intervention influenced how participants viewed their overall perceived health. The overall health scores showed no significant differences between the intervention and control groups at any time point ($p = 0.95$) during the study. Despite some fluctuations, these scores remained somewhat stable, indicating that the intervention had no significant effect on self-perceived health.

Table 4.1 Participants' Descriptive Characteristics, Blood Pressure and Overall Health Scores.

	CONTROL (Android) (n=15) (7 male; 8 female)			INTERVENTION (iPhone) (n=13) (5 male; 8 female)			
	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	Interaction p-value
Age (years)	34.93 (6.67)	34.93 (6.67)	34.93 (6.67)	32. 46 (6.04)	32.46 (6.04)	32.46 (6.04)	
Overall Health Score	7.2 (1.57)	7.23 (1.74)	7.33 (1.68)	6.92 (1.85)	7.0 (1.83)	6.92 (1.89)	0.95
Height (m)	1.68 (0.09)	1.68 (0.09)	1.68 (0.09)	1.68 (0.12)	1.68 (0.11)	1.68 (0.11)	
Weight (kg)	78.61 (21.05)	78.68 (21.71)	79.12 (22.48)	78.27 (18.39)	79.0 (18.0)	78.66 (17.34)	0.46
BMI (kg/m^2)	28.02 (7.25)	27.91 (7.26)	28.09 (7.24)	27.85 (6.12)	28.03 (6.18)	27.91 (5.99)	0.89
DBP (mmHg)	78.52 (8.19)	82.58 (8.51)	82.44 (9.39)	81.47 (10.57)	85.15 (8.39)	84.54 (11.27)	0.02
SBP (mmHg)	125.89 (15.44)	129.34 (13.70)	131.16 (13.04)	129.64 (17.58)	131.55 (15.94)	129.59 (12.29)	0.46

All values are mean (±SD). BMI – Body Mass Index; DBP – Diastolic Blood Pressure; SBP – Systolic Blood Pressure.

4.1.3 Cardiometabolic Outcomes

Cardiometabolic markers provided key insights into the physiological impact of the intervention. This section focuses on the observed changes in BP and blood biomarker measurements across the intervention period. For consistency, the terms 'mid-term' and 'post-intervention' are used throughout this dissertation to refer to the assessments conducted at week 6 and week 12, respectively.

4.1.3.1 Blood Pressure

No significant interaction effect was observed for SBP ($p = 0.46$), despite a slight increase for both groups over time. The effect sizes for between-group differences were consistently very small ($d = -0.085$). In contrast, a statistically significant interaction was found for DBP ($p = 0.02$), and the effect size was small to moderate ($d = -0.274$). Diastolic blood pressure measurements for both groups increased over time, with the intervention group going from 81.47 ±10.57 mmHg at baseline to 84.54 ±11.27 mmHg post-intervention when compared to the control group went from 78.52 ±8.19 mmHg to 82.44 ±9.3 mmHg post-intervention (Figure 4.1). These results indicate an unexpected response within the intervention group, necessitating further exploration in the discussion of the results.

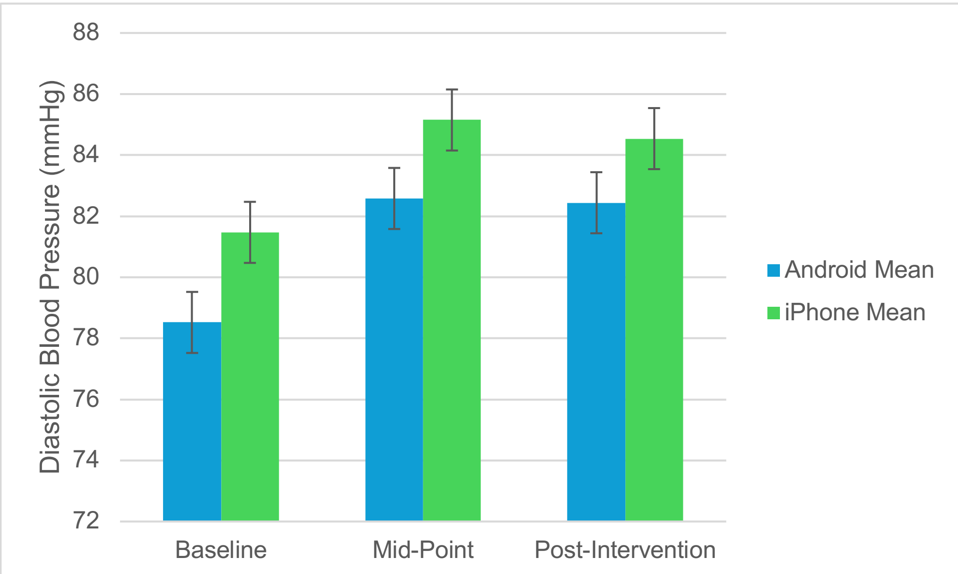

Figure 4.1 Trends in Diastolic Blood Pressure Over Time by Group

4.1.3.2 Blood Biomarkers

No statistically significant differences were observed between the control and intervention groups for total cholesterol, HDL-C, or TG levels. Low-density lipoprotein cholesterol ($p = 0.06$) and glucose ($p = 0.07$), the intervention group demonstrated slight improvements, as shown in Figure 4.2. Low-density lipoprotein cholesterol decreased from 2.39 ±0.68 mmol/L at baseline to 2.16 ±0.54 mmol/L post-intervention. The intervention group. Glucose levels declined slightly from 6.02 ±0.61 mmol/L to 5.78 ±1.10 mmol/L. While these changes did not reach statistical significance, the observed trends may hold potential clinical relevance over time.

Table 4.2 Blood Biomarkers

	CONTROL (Android) (n=15) (7 male; 8 female)			INTERVENTION (iPhone) (n=13) (5 male; 8 female)				
	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	Desired Value	p-value
Total cholesterol (mmol/L)	3.72 (0.93)	3.91 (0.84)	3.69 (0.72)	4.08 (1.00)	4.44 (0.82)	4.25 (0.74)	< 5.0	0.13
HDL cholesterol (mmol/L)	1.20 (0.25)	1.36 (0.32)	1.35 (0.30)	1.36 (0.34)	1.34 (0.35)	1.47 (0.38)	> 1.55	0.48
LDL cholesterol (mmol/L)	2.01 (0.68)	2.01 (0.62)	1.72 (0.51)	2.39 (0.68)	2.51 (0.76)	2.16 (0.54)	< 1.03	0.06
Triglycerides (mmol/L)	1.39 (0.62)	1.30 (0.55)	1.37 (0.66)	1.24 (0.73)	1.29 (0.97)	1.61 (1.56)	< 1.7	0.95
Glucose (mmol/L)	6.22 (1.06)	6.31 (0.96)	6.43 (1.01)	6.02 (0.61)	5.88 (0.62)	5.78 (1.10)	3.9 - 5.5	0.07

All values are mean (±SD). (Desired Values taken from ("High Blood Sugar - Victor Chang Cardiac Research Institute", n.d.; "Patient education: High cholesterol and lipids (Beyond the Basics) - UpToDate", n.d.).

4.1.4 Satisfaction with Life Scale Questionnaire

The following section discusses the analyses of participants' satisfaction with life scores, a key indicator for perceived mental well-being. The results showed an overall increase in satisfaction with life scores, with the intervention group consistently reporting higher scores.

4.1.4.1 Descriptive Statistics

Descriptive statistics comparing the group scores for SWLS across the three different time points are summarised in Table 4.3 and illustrated in Figure 4.2. Both groups showed an improvement in SWLS scores, with the intervention group demonstrating a more pronounced increase when compared to the control group. Notably, the intervention group started out with a higher baseline score (23.85 ±7.06) when compared to the baseline score of the control group (19.47 ±6.03). Figure 4.3 illustrates the comparison between the two groups over the intervention period.

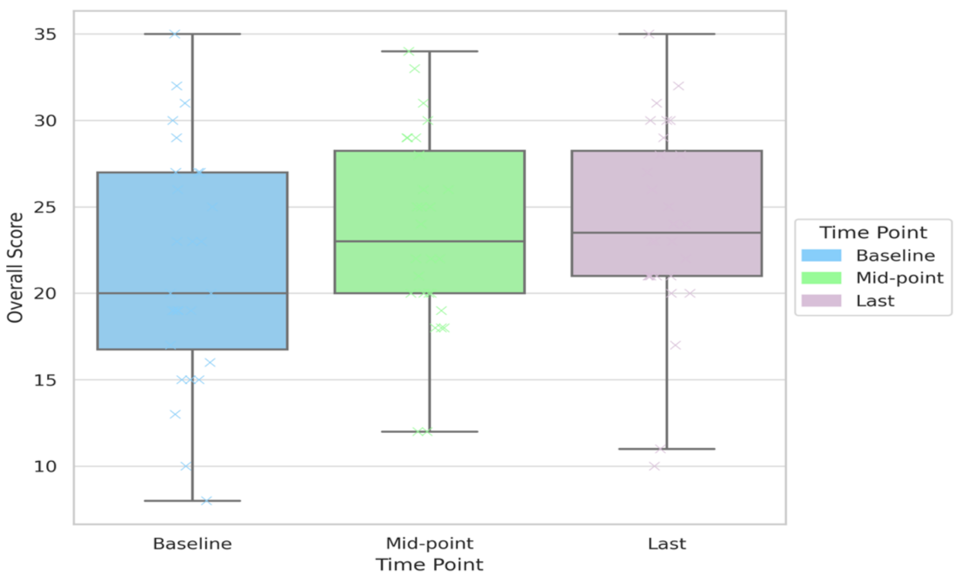

Figure 4.2 Distribution of Satisfaction with Life Scale Scores over Time

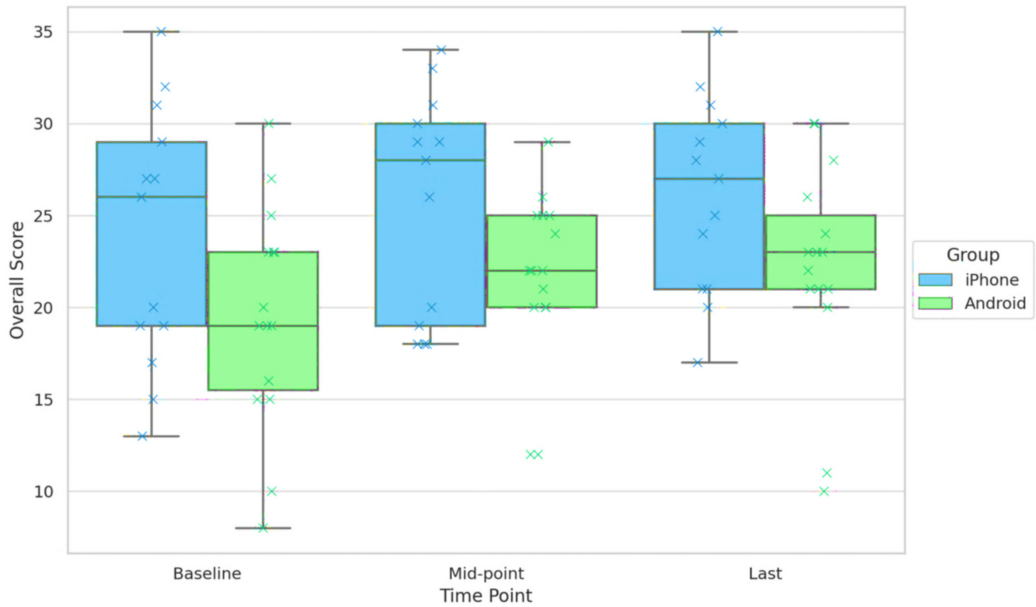

Figure 4.3 Distribution of Satisfaction with Life Scale Scores Over Time By Group

Table 4.3 Descriptive Statistics for SWLS Questionnaire of Participants

	CONTROL (n=15)		INTERVENTION (n=13)	
	Mean (± SD)	Median	Mean (± SD)	Median
Baseline	19.47 (6.03)	19	23.85 (7.06)	26
Mid-point	21.67 (4.69)	22	25.62 (6.13)	28
Post-Intervention	22.2 (5.72)	23	26.15 (5.35)	27

4.1.4.2 Satisfaction with Life Scale Scores Changes Over Time:

Changes in SWLS scores over time for each group are illustrated in Figure 4.3. A paired t-test revealed significant improvements in both groups over time from baseline to midpoint ($p = 0.0060$). However, no further significant differences were observed between the midpoint and the last point ($p = 0.3008$). Cohen's d-effect size test indicated a medium effect for changes within the intervention group ($d = -0.56$), suggesting a meaningful improvement in SWLS scores. These results highlight the psychological benefits of the intervention, especially among the intervention group.

4.1.5 SIT-Q-7D Questionnaire

The subjective outcomes from the SIT-Q-7D questionnaire that looked at participants sedentary behaviour, sleep duration, screen time and break frequency, are shown in Table 4.4. The Sit-Q-7D data provides additional context on SB, screen time and break patterns by offering a more comprehensive view of the participants lifestyle habits.

4.1.5.1 Total Sedentary Time

A repeated measures ANOVA test revealed a significant interaction effect for total sedentary time ($p = 0.03$). The control group's sedentary time increased slightly over the intervention period, while the intervention group showed more stable levels with smaller increases. A post-hoc analysis showed a significant differences between baseline and midpoint for both groups, illustrated by Figure 4.5.

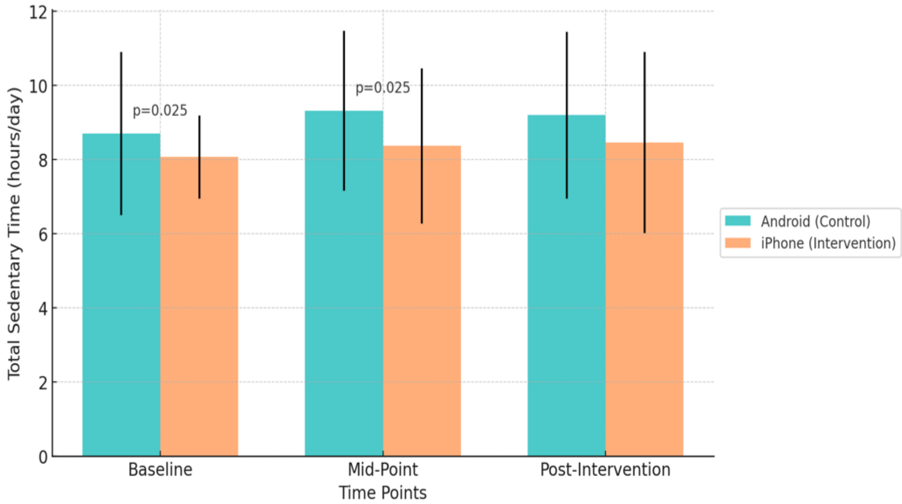

Figure 4.4: Total Sedentary Time Over Time by Group.

4.1.5.2 Weekday and Weekend Sedentary Time

Significant interaction effects were observed for weekday sedentary time ($p = 0.017$), as shown in Figure 4.6. The intervention group demonstrated smaller increases when compared to the control group. However, no significant differences were found for weekend sedentary time ($p = 0.42$), as illustrated in Figure 4.7. This could suggest that the intervention had a limited impact on leisure-time behaviour.

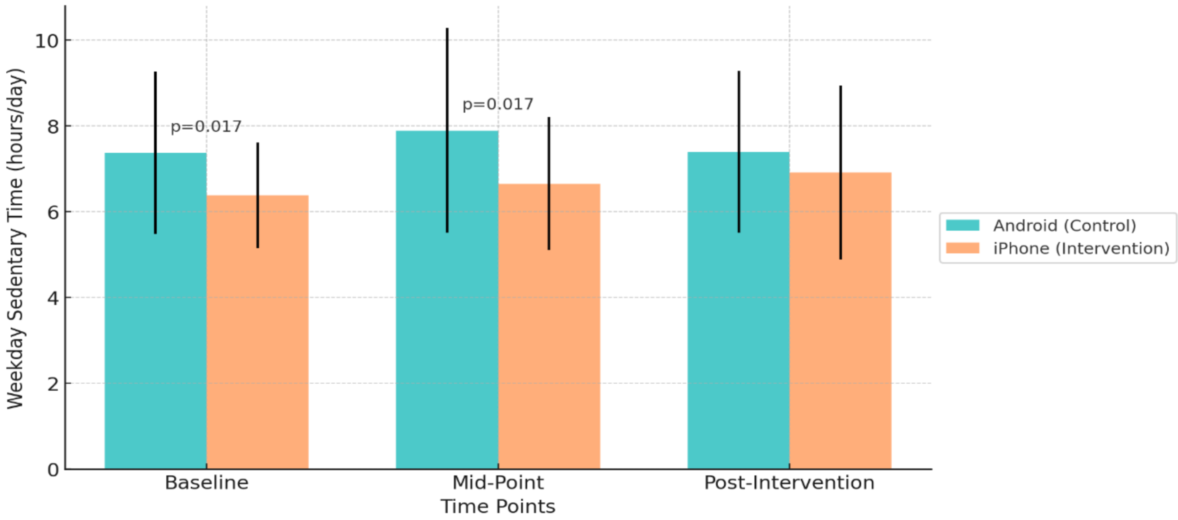

Figure 4.5: Weekday Sedentary Time Over Time by Group.

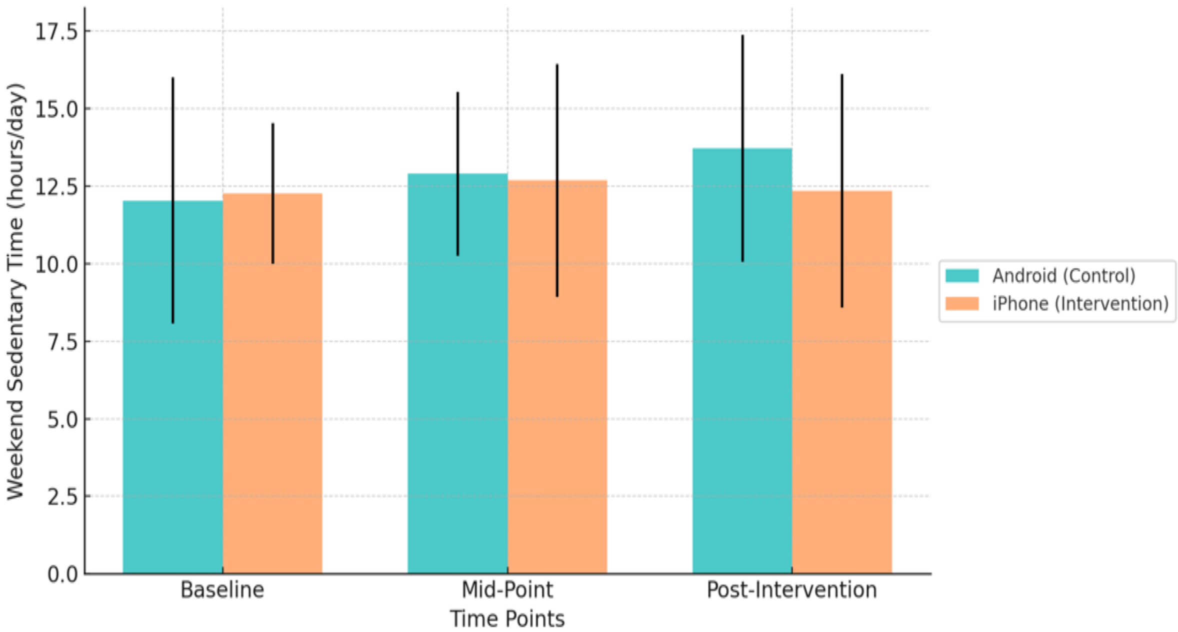

Figure 4.6: Weekend Sedentary Time Over Time by Group.

4.1.5.3 Sleep Duration

Sleep duration is an important factor that can have an influence on overall health and productivity. This section examines changes between weekday and weekend sleep patterns to determine if this had any effect on the intervention results. Weekday sleep duration showed a significant interaction ($p = 0.04$), with the intervention group reporting slightly higher values when compared to the stable levels reported by the control group. Weekend sleep durations showed no significant differences ($p = 0.50$).

4.1.5.4 Screen Time

Weekday screen time showed a significant interaction effect ($p = 0.0002$), with the intervention group reducing their screen time when compared to the slight increase in the control group, as illustrated in Figure 4.8. Weekend screen time also demonstrated a significant differences ($p = 0.005$), although these changes were less pronounced, as depicted in Figure 4.9. Tukey's post-hoc analysis confirmed the differences between the baseline and mid-point measurements.

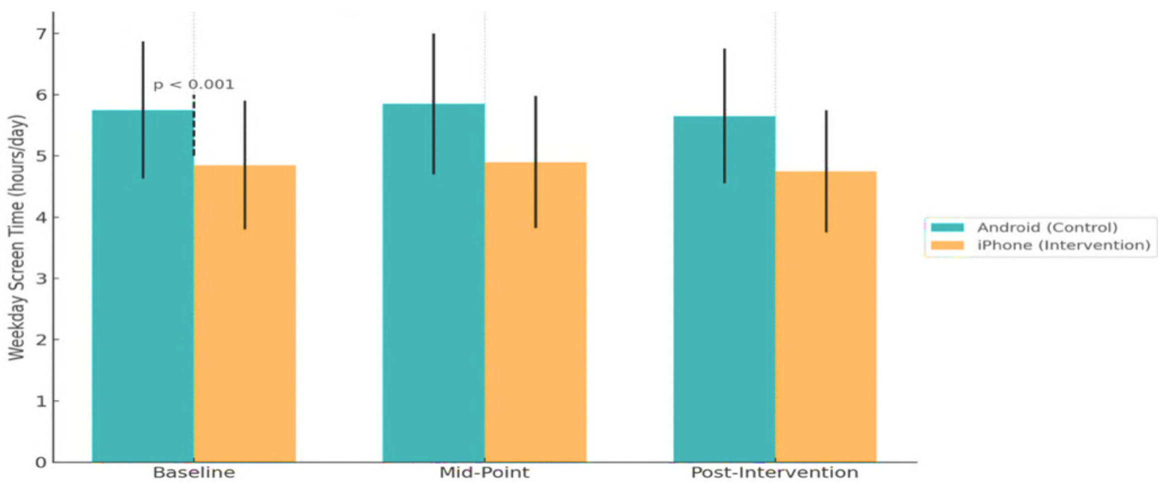

Figure 4.7: Weekday Screen Time Over Time by Group.

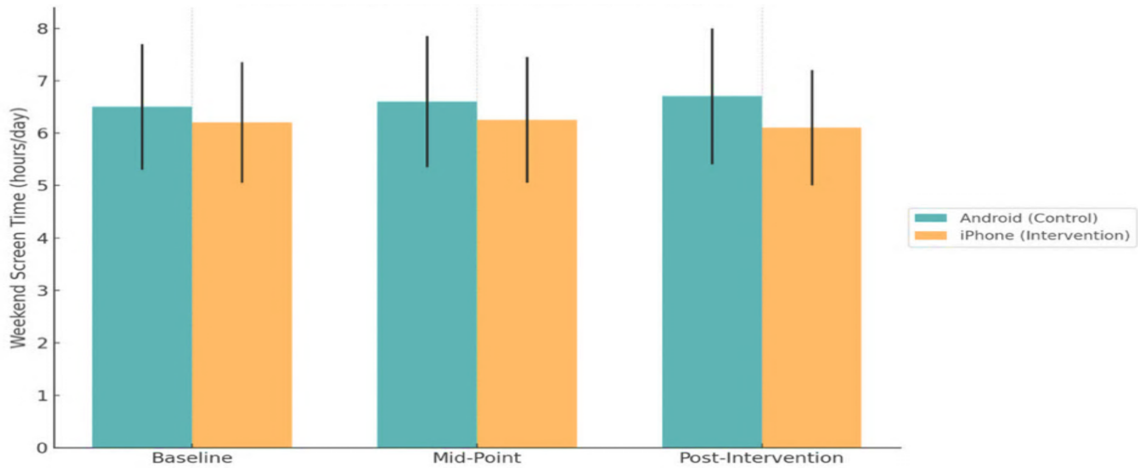

Figure 4.8: Weekend Screen Time Over Time by Group.

The control group reported a slight increase in the number of breaks taken when watching TV, it then decreased post-intervention. The intervention group showed a steady rise in TV viewing breaks. However, no significant interaction effect was found (p = 0.28), indicating that the intervention had a minimal impact on TV viewing break frequency.

4.1.5.5 Occupational Break Frequency

The mean number of occupational breaks decreased in the control group from a reported 12.20 ±9.49 breaks per day at baseline to 7.80 ±7.60 breaks per day post-intervention. In contrast, the intervention group's reported occupational breaks remained relatively stable throughout the study, with a slight increase at the mid-point, followed by a small decrease post-intervention. However, no significant interaction effect was found (p = 0.27), suggesting the intervention did not significantly impact occupational break frequency.

Table 4.4 Summary of SIT-Q-7d Sedentary Behaviour

	CONTROL (Android) (n=15) (7 male; 8 female)			INTERVENTION (iPhone) (n=13) (5 male; 8 female)			
	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	p-value (Group x Time Interaction)
Total Sedentary Time (hrs/day)	8.70 (2.20)	9.32 (2.16)	9.20 (2.25)	8.07 (1.12)	8.37 (2.09)	8.46 (2.44)	0.03
Weekday Sedentary Time (hrs/day)	7.37 (1.89)	7.89 (2.39)	7.39 (1.88)	6.38 (1.23)	6.65 (1.55)	6.91 (2.02)	0.02
Weekend Sedentary Time (hrs/day)	12.04 (3.397)	12.90 (2.64)	13.73 (3.66)	12.27 (2.27)	12.69 (3.76)	12.35 (3.77)	0.42
Weekday Screen Time (hrs/week)	5.75 (1.12)	5.85 (1.15)	5.65 (1.10)	4.85 (1.05)	4.90 (1.08)	4.75 (1.00)	0.0002
Weekend Screen Time (hrs/week)	6.50 (1.20)	6.60 (1.25)	6.70 (1.30)	6.20 (1.15)	6.25 (1.20)	6.10 (1.10)	0.005
Weekday Sleep Duration (hrs/day)	7.10 (1.21)	7.15 (1.02)	7.20 (1.47)	7.33 (1.32)	7.79 (1.08)	7.53 (1.11)	0.04
Weekend Sleep Duration (hrs/day)	8.70 (2.29)	7.90 (1.23)	10.38 (3.88)	7.85 (1.39)	8.58 (1.27)	8.79 (1.07)	0.50
Frequency of Occupational Breaks (per day)	12.20 (9.49)	9.00 (8.72)	7.80 (7.6)	7.69 (6.59)	8.31 (5.30)	7.85 (5.15)	0.27
Frequency of TV Viewing Breaks (breaks/day)	5.42 (4.17)	6.12 (6.33)	5.69 (3.84)	5.42 (5.09)	6.82 (3.74)	7.09 (3.30)	0.28

All values are mean (±SD).

4.1.6 Axivity Monitors

The Axivity AX3 monitors provided a comprehensive look into the participant's sedentary behaviour, physical activity, and break frequency patterns throughout the study. Descriptive statistics are presented in Table 4.5, alongside graphical representations of the key findings.

4.1.6.1 Full Week (Monday – Sunday)

Total sedentary time, LPA and MVPA levels across a full week are presented in this section. Both groups maintained consistently high levels of SB across the week (130-136 hours per week), with no significant interaction effect found (p = 0.49). LPA levels remained low and stable between both groups, with only minor reductions observed (p = 0.28), as shown in Figure 4.10. MVPA levels showed a slight increase in the control group compared to fluctuations in the intervention group; however, no significant differences were found (p = 0.52). These results indicate that the intervention had a limited impact on the overall physical activity levels and total sedentary behaviour of the participants.

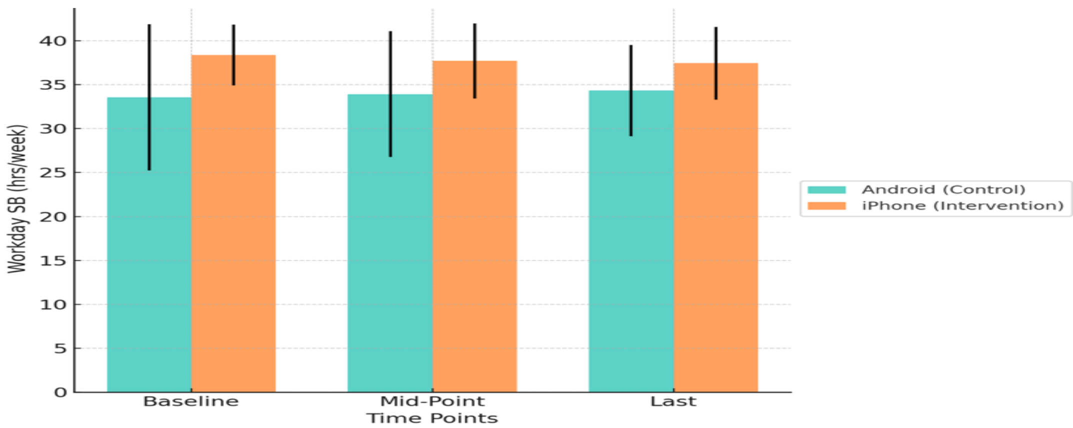

Figure 4.9: Weekday SB Over Time by Group.

4.1.6.2 Vocational Hours (08:00-18:00)

Sedentary behaviours during vocational hours showed minimal variations between the two groups. There was no significant interaction effect observed (p = 0.31). However, there was a significant time x group interaction found for the average breaks taken in the workday (p = 0.04), as illustrated in Figure 4.11. The intervention group showed an upward trend over time in their break frequency, increasing from baseline (24.94 ±8.26) to the last time point (28.38 ±12.12), whereas the control group declined from 30.72 ±12.06 at baseline to 25.9 ±9.04 at the last time point.

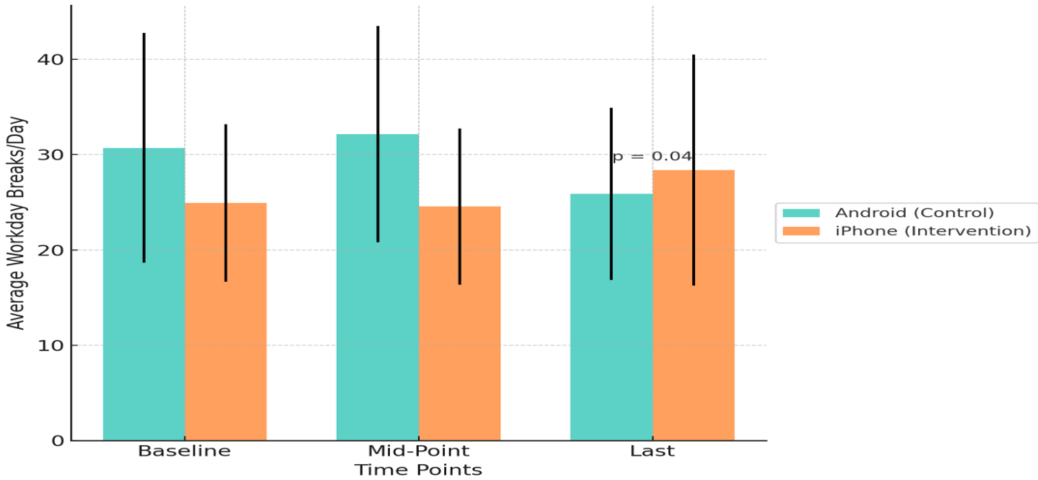

Figure 4.10: Average Workday Breaks/Day Over Time by Group.

Table 4.5 Descriptive Statistics for Axivity Data

	CONTROL (Android) (n=15) (7 male; 8 female)			INTERVENTION (iPhone) (n=12) (4 male; 8 female)			
	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	P-value (Group x Time Interaction)
Monday - Sunday							
Total Wear Time (hrs/week)	167.79 (0.5)	166.74 (1.63)	167.88 (0.34)	167.54 (0.82)	166.85 (1.18)	167.79 (0.66)	0.44
Total SB Time (hrs/week)	129.6 (15.37)	132.57 (13.58)	130.43 (11.89)	136.1 (10.32)	136.58 (9.36)	134.81 (10.11)	0.49
Total LPA (hrs/week)	29.64 (12.83)	25.58 (9.86)	27.34 (9.45)	24.25 (7.3)	23.28 (6.3)	24.23 (6.21)	0.28
Total MVPA (hrs/week)	8.55 (4.85)	8.99 (4.4)	10.14 (4.75)	7.58 (4.63)	6.99 (4.02)	8.77 (5.4)	0.52
Workday Hours							
Workday Total Wear Time (hrs/week)	49.79 (0.5)	49.14 (1.01)	49.88 (0.34)	49.56 (0.83)	48.85 (1.18)	49.79 (0.66)	0.78
Workday SB (hrs/week)	33.57 (8.32)	33.92 (7.16)	34.33 (5.2)	38.38 (3.44)	37.72 (4.27)	37.44 (4.14)	0.31
Workday LPA (hrs/week)	12.4 (6.48)	11.33 (5.06)	11.49 (4.23)	8.77 (2.52)	8.78 (2.93)	9.25 (2.86)	0.24
Workday MVPA (hrs/week)	3.83 (2.78)	3.89 (2.48)	4.06 (1.8)	2.4 (1.55)	2.46 (1.43)	3.1 (1.76)	0.48
Average Total Breaks/Day	45.53 (12.72)	48.88 (13.47)	45.54 (15.65)	40.92 (7.91)	41.93 (9.22)	47 (18.16)	0.37
Average Workday Breaks/Day	30.72 (12.06)	32.17 (11.35)	25.9 (9.04)	24.94 (8.26)	24.56 (8.19)	28.38 (12.12)	0.04

All values are mean(±SD). SB (Sedentary Behaviour); LPA (Light Physical Activity); MVPA (Moderate-to-Vigorous Physical Activity)

4.1.7 Correlation Analysis

A correlation analysis was conducted to examine the relationship between weekday sedentary behaviour, weekday break frequency, and satisfaction with life scale scores, the results are presented in Table 4.6.

4.1.7.1 Satisfaction With Life Scale Scores vs Sedentary Behaviour:

A moderate negative correlation was observed between sedentary behaviour and satisfaction with life scale scores for the intervention group at the mid-point ($r = -0.416$) and the last time point ($r = -0.407$). Although these were not statistically significant ($p = 0.414$), these findings suggest a trend where reductions in SB may be associated with improvement in SWL over time. In contrast, the control group showed a weak correlation between SB and SWLS scores across all the time points, with no significant relationship identified ($p = 0.916$). Figures 4.12, 4.13 and 4.14 visually illustrate these relationships, highlighting the emerging negative trends over time.

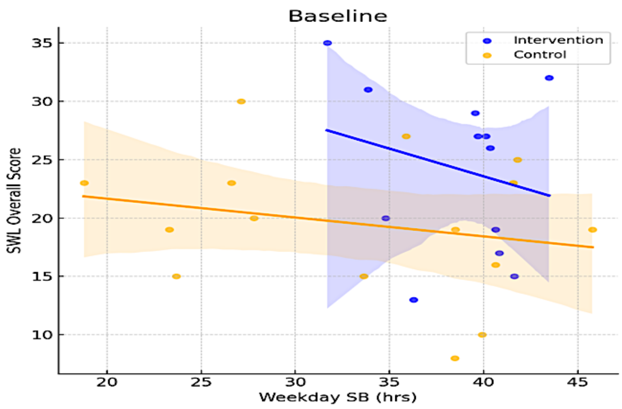

Figure 4.11: Scatterplot of SB vs SWLS at Baseline.

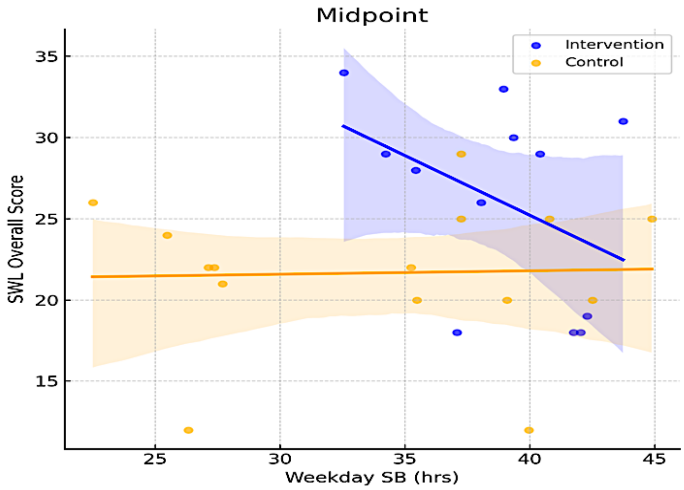

Figure 4.12: Scatterplot of SB vs SWLS at the Mid-Point

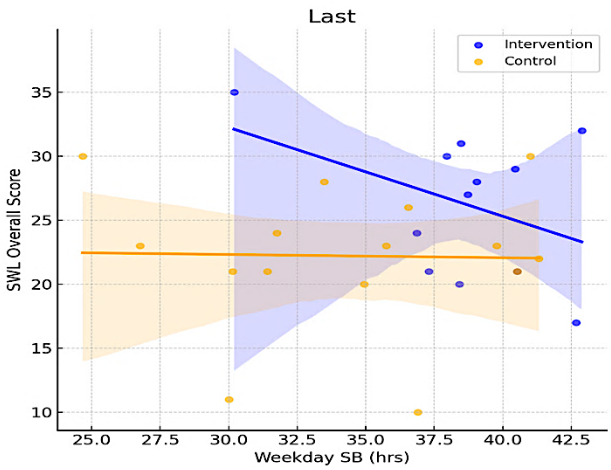

Figure 4.13: Scatterplot of SB vs SWLS Post-Intervention.

4.1.7.2 Satisfaction With Life Scale Scores vs Break Frequency

The relationship between SWLS and weekday break frequency varied between the two groups. The control group showed a moderate positive correlation (r = 0.458) at baseline, suggesting that a higher break frequency was associated with a greater overall life satisfaction score. Towards the end of the intervention, this relationship had weakened to a low positive correlation (r = 0.162), suggesting a decline in the impact of the break frequency over time, these findings were also not statistically significant (p = 0.216). For the intervention group, the correlations between weekday breaks and satisfaction with life were consistently weak across all (from r = 0.024 at baseline, to r = 0.035 at the last measurement) these measurements were not statistically significant (p = 0.993).

Table 4.6 Correlation Coefficient (r) Value for Weekday SB vs SWLS and Weekday Break Frequency and SWLS.

	CONTROL (Android) (n=15) (7 male; 8 female)				INTERVENTION (iPhone) (n=12) (4 male; 8 female)			
	Baseline (week 0)	Mid-point (week 6)	Post-Intervention (week 12)	p-value	Baseline (week 0)	Mid-Point (week 6)	Post-Intervention (week 12)	p-value
Weekday SB vs SWL	-0.223	0.032	-0.023	0.916	-0.234	-0.416	-0.407	0.414
Weekday Breaks vs SWL	0.458	0.004	0.162	0.216	0.024	0.082	0.035	0.993

SB (Sedentary Behaviour); SWLS (Satisfaction with Life Scale)

4.2 Qualitative Results

This section of the chapter discusses the results of the Focus Group discussion held with the participants from the intervention group. These findings aim to provide valuable insight into how the participants found the intervention. The discussions held with the participants revealed several key themes and subthemes. The findings highlight the successful aspects of the intervention; they also bring to light contrasting opinions and barriers faced in the workplace. The aim was to highlight the participants' voices in the description of the themes.

The participant's engagement with the movement prompt varied throughout the study. While some participants described initial enthusiasm and increased awareness, others admitted to ignoring the prompts or becoming less reliant on them over time. The themes below reflect these different experiences.

4.2.1 Focus Group Data - Emerging Themes

The qualitative data were analysed using reflexive thematic analysis, following Braun and Clarke's six-step approach. Five main themes and accompanying subthemes emerged through the thematic analysis. Some overlap between the themes was to be expected, as many participants touched on more than one area during the FG discussions. In the case where a quote could be used for multiple themes, it was included in the theme that best captured the main point being made by the participant or where it added the most value to that specific theme. Each theme is discussed under the following headings: the five themes and subthemes are:

1. Impact of the intervention:
    a. App usage
    b. Health message emails
    c. Non-communicable diseases
2. The role of sedentary behaviour and its impact on overall health:
    a. The influence of technology
    b. Stressors in the workplace

3. Workplace culture and barriers:
    a. The role of management
    b. Individual image in the workplace
4. Accountability:
    a. Competitive nature in the workplace
    b. Incentives
5. Recommendations:
    a. Movement recommendations
    b. Intervention and app recommendations for future studies

The diagram below (Figure 4.15) illustrates the main themes (blue) and subthemes (in purple and green)

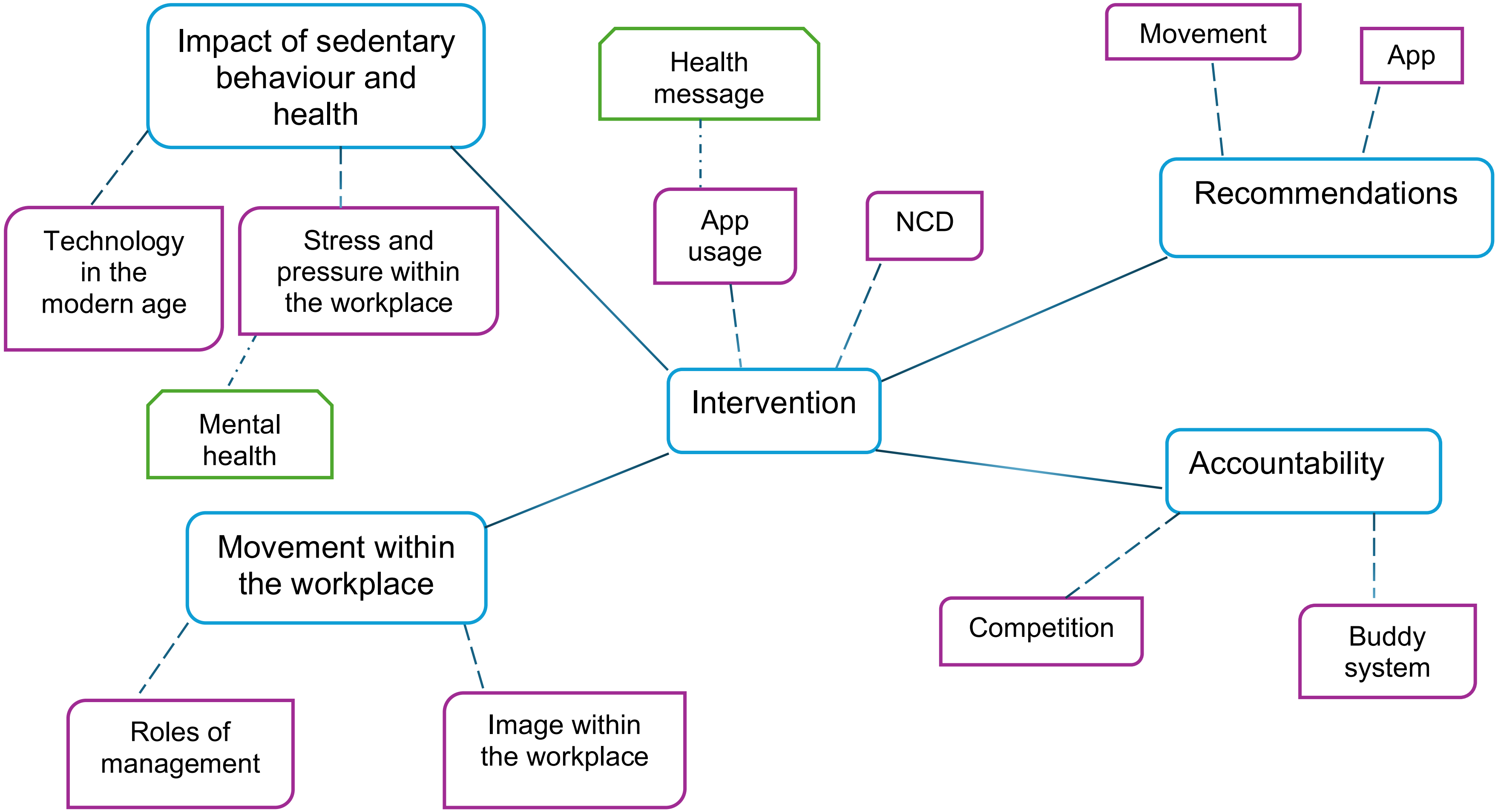

Figure 4.14 Thematic Map Illustrating Key Themes that Emerged from Focus Group Discussions.

4.3 Theme 1 – The Impact of the Intervention

Participants frequently reported that they had significantly underestimated the amount of time they spent sitting before the intervention. This increased awareness often prompted lifestyle changes, such as taking more breaks and incorporating more movement into their routines.

> *"Yeah, that was also a big realisation for me. I never really thought about like how long I sit for and when I started like actually analysing it a bit more it was shocking to me how many hours I just sit all day. It's actually quite terrifying. So, it definitely made me more aware"* (AS1, Female, 31).

A few participants also remarked on the lifestyle changes they had implemented to include more movement in their lives outside of the intervention parameters.

> *"My favourite part is the fact that I'm now incredibly conscious about how much I sit and how bad it is for me. The intervention I've made outside of this is now I smoke and stand. I know that sounds strange, but it's better than sitting. The other thing I've started doing is trying to take the stairs as much as possible. And I noticed I can suddenly do the stairs easier"* (MF1, Female, 33).

One surprising point that the participants noted was that towards the end of the intervention, if they engaged in large amounts of time being seated, they felt that they would get more body aches due to the lack of movement.

> *"It would be like because I would sit for so long, I was like my knees are like sore. And then I'd have to move it and things like that"* (ER1, Female, 26).

The impact the intervention had on some participants was greater than expected in certain aspects, from helping them gain confidence to tackle new challenges, helping them realise the effects of small changes to their routine or even helping them realise that their relationship with themselves wasn't as positive as they had thought it to be.

"For me, this intervention is very, very smart. Because it's very easy to jump on and off things like diets, exercise plans, whatever. This is a lifestyle choice in the true sense of it, right? Movement is how I see it. For me, I feel I've gotten a lot fitter, which is insane. Because of how little effort I put in to get this much fitter. That's crazy for me. I mean I would have never even known, movement is that important" (MF1, Female, 33).

"It actually gave me some self-confidence to take on new challenges, because what's happened to me a lot over the past few years, I've been so busy, day to day, focusing on work. That I haven't prioritised myself or anything I do for myself. So, I'd literally spend money to be part of, I don't know, a six-week challenge at the gym or this or that and I'd literally fail at it and I've had like a lowered self-esteem from it because I'm like not a person who can follow through on anything for myself. Then with the study, it was something sustainable. I was like, okay, I can do something. I can finish something. And I feel like now I can maybe take something on again, maybe in a smaller scale for now, but I can take on a challenge and finish it" (AS1, Female, 31).

A few participants also noted that the intervention played a role in their sleeping habits. Even though the duration was changed, the quality of the sleep seemed to improve, and with that, the ability with which they could take on the day seemed to improve as a result.

"What I noted very quickly is how much better I was sleeping. That was quite interesting. I still sleep the same amount. Well, actually it will look less. I started waking up earlier. I slept less and felt less tired when I woke" (MF1, Female, 33).

4.3.1 App Usage

Another participant elaborated on how the intervention became a habit, and the need for the app to remind them to get up and move was no longer as necessary as at the beginning of the intervention.

> *"So even though the app was telling me when to stand, what I'd sometimes find is that I would have been standing and walking around, and then the app told me to afterwards, so it was more of a conscious thing to walk around and stand more than following the app"* (MF1).

> *"It started to become a habit in a way, so it kind of made me aware of my patterns"* (EN1, Male, 34).

Even though the general experience surrounding the app was positive, some participants found that it could be distracting at times, and they would often distract others around them by talking to them.

> *"It depends on if people spoke to me, by talking to me then I would be a bit distracted but if I just went for a walk to like the bathroom or went upstairs and then came back down the. I was like okay, cool, fresh-headed"* (BP1, Female, 28).

The participants also noted the impact the intervention had on the company as a whole and how the camaraderie and group participation were something they enjoyed.

> "*I think something that's quite cool is like a bit of a ripple effect as well. Like, if I had to go and speak to someone on something, I would stand while I'm talking to them. And then they'd often stand you know, instead of us sitting down*" (AS1, Female, 31).

> *"I would say the camaraderie was nice because then people's app went off at the same time and we would all get up together, walk circles around or everyone was like we'll walk to the bathroom together"* (BP1, Female, 28).

4.3.2 Health Message Emails

Regarding the gain-framed emails that were sent out, informing the participants about the benefit of breaking up prolonged SB and encouraged them to be more physically active. The participant feedback was that they didn't feel the healthy messaging had a meaningful impact on their behaviour, what was noted as important was the time at which the email was sent out. Participants felt that if the email had been sent to their work email address instead of their personal they might have taken the information more seriously.

> *"It was informative, but I think depending on the time, I'll just scan and then I'll respond. But I think just because of the time… if that email would have come through while I'm at the office, I will definitely read it but because you're at home there's a lot of unnecessary distractions"* (EN1, Male, 34).

> *"I did also find that what you were saying was something that you kind of would already know but it's kind of like reinforcing it. But I don't know if it had like a positive or neutral effect"* (BP1, Female, 28).

Another participant noted that if they were paying for the intervention, they may have acted differently:

> *"I think if we were paying you, then I'd read every single piece of communication you sent, and I'd make sure I knew exactly what you were saying. Because it was an add-on to this. It was almost like it's very beneficial from your side to give us that information, but because we got no skin in the game. I think that probably, that for me would be the reason that, at least this group doesn't seem to follow that so much"* (MF1, Female, 33).

Even though the participants did not find the emails regarding SB and PA to have a great impact on them, talking to the researcher and engaging in conversation about the topics greatly impacted them.

> *"Your one-on-ones with you were* way *more beneficial than any article, email anything you could have sent us"* (MF1, Female, 33).

> *"And they were very impactful. So, like physically doing the study and speaking with someone in person. Having you interact with us here, like let's say you*

weren't ever in the office, and you were just like having email comms with us, it wouldn't have been as impactful" (AS1, Female, 31).

4.3.3 Non-Communicable Diseases

The conversation around NCD was interesting, with the participants feeling that there needs to be more of a physical intervention being made, and many participants were not aware of the link between increased SB, lack of PA and NCDs.

> *"No. I wasn't aware before I saw it. No"* (BP1, Female, 28).

Many participants believe that education is the best to help spread awareness about the risks of NCDs.

> *"Education. Education is key"* (MF1, Female, 33).

> *"I mean, even in schools, if I had known that from school, but I don't think they really ever said anything like that [regarding the 150 minutes of exercise]. Like they told you to do PE or whatever. They don't tell you why it's beneficial. You just resent it"* (BP1, Female, 28).

Another important conversation that should be noted is how the participants feel about the medical treatment they receive from primary health providers, with the consensus being that they could do more for their patients and make them aware of alternative treatment options.

> *"Something that's frustrated me as well with my lupus. Like when things are starting to go bad, we are immediately reactive on my treatment. Like increase this, increase that, but when things are going well, my doctor is like 'Okay, I don't have to see you for like a year' you know what I mean. Because you are in remission, but there's nothing preventative being done in that healthy period for me to prevent like my next flare up"* (AS1, Female, 31).

"It sounds stupid, but like truly if you knew 'oh my gosh' if I was healthier or fitter or thinner or whatever, and that would stop me from having flare-ups with my issues, whatever it may be. I know that sounds stupid and simple, but it isn't. It seems like such a quick solution. No one wants to be sick. No one wants to have any issues" (MF1, Female, 33).

4.4 Theme 2 – The Role of Sedentary Behaviour and its Impact on Overall Health:

This theme explores how eHealth and other technologies can influence an individual's overall sedentary behaviour, with participants describing both positive and negative consequences and challenges.

4.4.1 The Influence of Technology

Whilst the participants acknowledged the negative impacts of technology, such as increased screen time and reduced physical activity, they also recognised the potential benefits of technology-enabled interventions. As one participant noted:

"Technology also enables medical intervention from a distance. My boyfriend's got sleep apnoea, so he wears a CPAP, and his doctor adjusts the machine" (MF1, Female, 33).

Participants also highlighted the need to address the overuse of technology in their daily lives:

"It's definitely my biggest health concern. Like, I constantly complain, I don't have time to train. That's my concern. My excuse constantly. I've started making time for my walks, but I'm still like 'Ahh, now I don't have time to enrol in anything', but then I get these lovely screentime reports for every week and I literally realise. No, I spent nine hours at work on my laptop. I spent an hour and a half watching Netflix *with my partner in the evening. I spend four hours a day on my phone"* (AS1, Female 31).

Participants also shared how technology can have an impact on mental health in various aspects. Some participants stated that cell phone usage caused increased levels of stress, while another participant said that they use it as a tool to reduce their anxiety. With others stating the benefits of using it to connect with loved ones has its own positive benefits.

> *"I think, yes, because you are sitting on it [technology] longer or you're doing things longer and then you get more stressed. So, even if you are sitting on your phone, you're stressing about what you're not doing*" (BP1, Female, 28).

With regard to allowing people to experience aspects that might not be afforded to them without technology, one participant noted:

> *"Things like, like Netflix and whatever, while it might just be entertainment, not a lot of people have budgets for serious entertainment, in the sense of being able to go to restaurants or go to places and what Netflix has done is brought you closer to that experience"* (MF1, Female, 33).

Participants also discussed how technology provides access to vast amounts of information and tools to make life easier and could improve health and fitness through various apps and online resources.

> *"I think technology has allowed us better and clearer access to healthcare information. Which has a positive impact on our lives"* (MF1, Female, 33).

4.4.2 Stressors in the Workplace:

The participants identified several work-related tasks and demands, such as design work, meetings with clients and task deadlines, as barriers to standing and moving consistently throughout the day.

> *"I think the only issue was that sometimes it would pop up when you are in a meeting, and then you don't get up and walk around. It's just those days when you are in back-to-back meetings"* (DN1, Female, 29).

“The problem is with our kind of work, like execution work like we do in the design team, like you get very focused on like the task at hand and you literally just don’t realise that hours are like ticking by. And like, sort of on the days where I really got into the zone, I just did terribly. So, it sort of feels like it’s tough to integrate with the nature of my work sometimes” (AS1, Female, 31).

The need to meet deadlines was another talking point among the participants, and how they will often do so to their detriment.

“We’re all deadline-driven. We all like being under stress and pressure. That’s why we chose this industry. We like that. We thrive under it. But sometimes we don’t know that we’re slowly killing ourselves or making things or doing things to ourselves that are more detrimental than we know” (MF1, Female, 33).

4.5 Theme 3 - Workplace Culture and Barriers

The participants raised fears about staying at their desks throughout the day, they often work late and sacrifice their mental and physical well-being. In the advertising and marketing industry, desk-based productivity is often praised, despite its negative effects. Several participants referred to this as part of a ‘toxic’ workplace culture.

“We have a very toxic idea of what it means to work hard. And to everybody’s point here, working hard here, working in this industry means not moving away from your desk. We have timers. We sell every minute of every day in this business. Time is our currency. And the more someone is seen to be sitting and not moving, the better they are seen as an employee. So, it’s a complete opposite to what we should be doing” (MF1, Female, 33).

“You see someone away from their desk for a long, long time and you’re like ‘oh, they’re not being productive” (AS1, Female, 31).

“There is no balance” (EN1, Male, 34).

A few participants also raised the topic about the industry as a whole and the experiences other individuals outside of their office have been through.

> *"You'll notice that a lot of us that have been in this industry for a long time are desperately unhealthy. And you'll notice that the fatter and more unhealthy we are, generally the more successful we are in this industry. There's a direct correlation"* (MF1, Female, 33).

Another barrier that was mentioned by the participants is a lack of dedicated space to meet their movement goal, whether that is a standing desk or a more active option such as sit-to-stand desks, walking pads or stationary bicycles. They often felt that when the movement prompt went off, they had nowhere to go within the office.

> *"I think a standing desk will really help"* (TK1, Male, 27).

> *"That is a big thing for me. I struggle with, I don't know where to go when I stand up because sometimes, I am feeling overwhelmed by work. Like I don't know where to go. So maybe if there's like a space where I can like stand and just take a moment for myself"* (AS1, Female, 31).

4.5.1 The Role of Management

All participants felt that management and their eagerness and willingness for the employees to participate in the study played a great role in the commitment they showed to the intervention.

> *"To be honest, when your study started, I literally completely ignored it because I was like, I'm overwhelmed. I don't have time for anything extra. Then [name redacted] came walking around the office. [name redacted], himself, and he was like guys 'This thing is going on, are you guys participating? I just signed up'. And literally, the moment [name redacted] said that I was like 'Oh awesome!' and I went to sign up"* (MF1, Female, 33).

Feeling like they had permission and were actively encouraged by the business and its stakeholders, was a major hurdle all felt they needed to overcome

> *"Whatever you do, you need to get the permission of the business. And everybody needs to feel like they've got the permission to do it"* (MF1, Female, 33).

> *"It's like how we have permission to come for your focus group, things like that. We were very comfortable when we got the call"* (ER1, Female, 26).

Management should be aware of the "cost" to their business by requiring staff to work past their breaking point. It was recommended that businesses should be proactive about the need for staff rather than reactive, as this is a more effective way of making money.

> *"It's very reactive versus proactive. And I think proactive intervention is important. Because I know for example when I get sick, I got health issues, it's not gonna be pretty"* (MF1, Female, 33).

4.5.2 Individual Image in the Workplace

Interestingly, some participants felt hesitant to stand up and move during meetings, especially if they were in more junior roles within the company.

> *"I know this is going to sound weird, but the reason why you, [names redacted] could do it, is because it was almost like that's fine because you are seniors in what you do"* (ER1, Female, 26).

The personal preferences of the group regarding moving around during the interventions were different, with some seeing the moving around as a personal choice to improve their health and not being conscious because the whole company was involved and were aware of why others were walking around, while others saw the movement as awkward and self-conscious.

"*I also felt a bit awkward in meetings"* (AS1, Female, 31).

"No, my whole thing, I was being selfish about this, Uhm, this was my personal health intervention and I'm gonna stand up when I need to. If I need to, I need to. Sorry" (MF1, Female, 33).

Surprisingly, when questioned further about the anxiety around moving around during meetings, even with those taking part in the study, the majority in both groups stated that even if their timer went off and both people were taking part in the intervention they would have simply declined the prompt for movement and continue to stay seated, this includes not moving even if someone got up and moved with the prompt.

4.6 Theme 4 – Accountability

Accountability was a strong theme of focus throughout both focus group sessions. Many participants felt that being accountable – whether to themselves, the app or the researcher – made them more likely to adhere to movement prompts, even if that adherence wasn't perfect.

"You putting that little thing on my wrist to monitor. The fact that I knew somebody else was checking what I was up to. That was the big-time infiltrator for me. That was mine. Nothing else, the fact that I knew you were gonna look and see how long I sit" (MF1, Female, 33).

"Because you want that accountability. You know like your trainer is going to be disappointed if you don't show up or something" (AS1, Female, 31).

"Yes, say like an accountability partner" (DN1, Female, 29).

They also mentioned that if they knew that someone was offering a service (i.e. exercise class/movement activity) to them at a more convenient time that works more within their schedules (i.e. lunchtime break), they would go along with that more so.

"I'm coming on this journey with you. I want to be accountable to you. And you say to me, it's time, get up we're going XYZ place then I'll be more willing to do so" (MF1, Female, 33).

"I think even if we had like a buddy. Like someone who you did it with. That would be cool" (BP1, Female, 28).

4.6.1 Competitive Nature in the Office

The participants all felt that if there were a way to increase movement within the office, it would be to turn the movement goal into some form of competition, as they are all competitive by nature, and this would play into their personality traits.

"If it was a competition, this whole team would be like CrossFit ready or whatever" (MF1, Female, 33).

It was also recommended that various options be available for different people and how they might approach health and movement.

"Maybe you know, gamify for the people that are competitive or have a different approach for everyone" (MF1, Female, 33).

"But the problem was the hours. Like for me, I'm just not a morning person. Like I would have preferred an evening class. So, I was like struggling so much, because in the morning I just dragged myself to it [talking about yoga classes that were offered in workspace]*"* (AS1, Female, 31).

4.6.2 Incentives

Some participants felt that if there were incentives (i.e. gift cards) to move more, it might motivate them to be more active, similar to how the *Discovery Vitality Rewards* work.

"I also think that if they did Discovery incentives, like if you guys had like a smartwatch or whatever and you can prove that you did this much then you get like a lunch or coffee or whatever at Kauai, you know those type of things" (BP1, Female, 28).

4.7 Theme 5 – Recommendations

Participants made several recommendations, such as improving notification timing and increasing customisation, that they believed could have made the intervention more effective. These suggestions could help future interventions better reflect real-life scenarios.

4.7.1 Movement Recommendations

Many participants felt that they would take advantage of movement opportunities if they were given the options within the office space. The suggestions made varied from a wide range of movement options to group activities to incentives. Many participants felt that a designated space to stand and move within the office environment would also be something that they would find beneficial and enjoyable.

Participants who suffer from more chronic conditions feel that having time to move would help with the challenges they face. Having management aware of the "cost" of sick leave etc. on the business would be a good way to get businesses to make the health of their employees more serious, whether that be mental or physical health.

A call was made that the approach to health within the business should include both physical and mental health interventions, as participants view the two points as interconnection, with the one having a bearing on the other.

"I think it's very important that at a business, like an agency, that there is a dual approach. Both psychological, you know, your mental health as well as your physical health. And those two work hand in hand. That'd be great" (MF1, Female, 33).

Some participants felt that having the option to schedule a few minutes into their workday, via their online diary, would be useful.

> *"It'll be nice if you can plan focused time into your diary. It would've been cool to have some 'get up, move' time. Put in micro-meetings"* (MF1, Female, 33).

> *"You know what would be nice? On our diaries, like if we want to see if someone's available, we literally look at their diary, and we see they're not available for the business. Like schedule a time we were like standing or something"* (AS1, Female, 31).

When the conversation continued regarding the multiple meetings being set at once, a lot of the participants didn't know that they could reschedule meetings that better suited them as long as they gave an alternative option. Some also referred to how personal experiences concerning anxiety dictated how they handled that situation.
When presented with the idea of an active meeting, participants noted that they did not think it would work.

> *"No, if you're having any conversation without your computer, that's a meeting that shouldn't be happening. That could be an email. If you don't have to take notes down, we're trying to make sure everybody in the business takes notes, pays attention that what's going on in the meeting. And believe me, without a laptop, everyone switches off"* (MF1, Female, 33).

4.7.2 Intervention and App Recommendations for Future Studies

When the participants were asked how they would improve future studies of a similar nature, some indicated that they would like access to their data/results to compare it to their previous results.

> *"I love looking at data. It would be nice to actually see if maybe last week was better compared to this week and see if maybe there's any improvements or whether if things have gone south or anything like that"* (EN1, Male, 34).

"Because I'm built on praise. I need to get that praise. I need to earn it, in order to continue. That's what I'm saying" (ER1, Female, 26).

Interestingly, this was not a unanimous decision, some participants felt it would discourage them if they were not performing as well as expected.

"To this theory right, if that means that if you had seen your results every week, then every single Weigh-Less *person should have been successful every time. Because seeing failure should have motivated them, depends. It would have demotivated me. Like what's the point? Like it's getting worse"* (MF1, Female, 33).

When asked what they would develop a little further, some participants voiced that they would have enjoyed it if the app could be personalised more.

"I think it could have been developed more in terms of personalisation. You could add in that personal touch of even tracking it with your phone, so I know that with the Health App, *it tracks your steps"* (ER1, Female, 26).

"I disagree. Your app was there for a singular experience – stand!" (MF1, Female, 33).

The participants also mentioned how the Axivity monitor was a struggle to "use" due to its lack of features. Many participants felt that if they could see their data, it would have encouraged them to move more. They suggested perhaps having a display similar to that of a basic Fitbit, etc. The participants also noted how the monitor could be uncomfortable at times.

"I would get better watches that we can see the feedback on. I found the watch difficult because it had no feedback" (MF1, Female, 33).

"It would have been so nice because I feel like this office is very competitive. And if you were able to count your steps everyone would have been like 'I've done 10,000. How about you?'" (ER1, Female, 26).

"So maybe just something in terms of the physical watch, but I would have preferred something that integrated more with my system I already have. I find I'm using my standing feature much more on my Apple watch now, so it's really nice that it's like, you know, integrated more with my own system again" (AS1, Female, 31).

Some participants noted that they would have enjoyed a bit more praise for their efforts from the app, instead of the simple message they received after completing the movement prompt.

"This is going to be a weird one, but also including some type of, this may be a personal thing, but some type of praise, if that makes sense. For it to be like, you know, congratulations, you hit this many steps or you've stood this many times" (ER1, Female, 26).

While distinct, these themes collectively highlight the complex ways in which workplace culture, technology and accountability interact to shape SB. The intervention successfully raised the participants' awareness of their SB and inspired several of them to make positive changes to their daily routines. Many participants reported an increase in their physical activity, greater mindfulness of their health habits, and an improved understanding of the risks associated with prolonged sitting. However, the study also revealed critical barriers, particularly those related to workplace culture, which often prioritised desk-bound work over movement. This cultural dynamic, coupled with the need for a more structured accountability system, limited the long-term effectiveness of the intervention.

The interaction between personal and organisational factors suggests that any future interventions aimed at reducing sedentary behaviour must not only focus on individual awareness and motivation but also on creating a supportive workplace environment. Providing movement-friendly spaces, addressing cultural perceptions around productivity, and integrating health promotion into organisational structures will be key to sustaining long-term behavioural changes. Additionally, technology-based interventions should be carefully designed to complement rather than exacerbate SB and should be customisable to fit the individual and their workplace needs.

Overall, this highlights the importance of both the individual and the systemic approach in addressing SB in the workplace. By fostering a more supportive work environment and embedding health-conscious practices into daily routines, future interventions can achieve more sustainable outcomes, ultimately promoting better physical and mental health for employees.

CHAPTER 5: DISCUSSION

This chapter will consist of three different sections. Section one will discuss the quantitative results. Section two will discuss the qualitative results from the Focus Group sessions, and the final section will provide an integrative discussion based on the first two sections.

5.1 Quantitative Discussion

This section critically discusses the quantitative findings presented in Chapter 4. It focuses on the intervention's impact on sedentary behaviour, cardiometabolic health, satisfaction with life scale scores, and associated correlations.

5.1.1 Descriptive Characteristics

5.1.1.1 Overall Health Score

Self-reported overall health scores showed no significant differences between the groups over time, indicating that the intervention did not substantially change the participants' perceptions of their overall health. This aligns with findings by Reiner et al. (2013), which suggest that longer interventions may be required to elicit measurable changes in self-perceived health. Interestingly, the control group exhibited an upward trend, while the intervention group reported a temporary improvement at 6 weeks, returning to baseline by 12 weeks. This suggests a possible placebo effect, where the participants perceived improvements in health due to increased awareness from participating in the study rather than the intervention itself.

5.1.1.2 Anthropometric Measurements

Baseline characteristics showed no significant differences in BMI measurements. This aligns with previous literature suggesting that short-term interventions rarely produce significant changes in body composition (Smith et al., 2020), particularly when no dietary modifications were included. While weight trends varied, the control group demonstrated a steady increase in weight. In contrast, the intervention group showed a mid-intervention increase followed by a return to their baseline measurement at 12 weeks. These fluctuations suggest that prompt-based movement interventions may have helped prevent more weight gain, even if they did not lead to any weight loss directly. The small sample size may have limited the generalisability of the findings and reduced the statistical power needed to detect subtle but meaningful differences between the groups.

5.1.2 Cardiometabolic Outcomes

5.1.2.1 Blood Pressure

A statistically significant increase in diastolic blood pressure was observed between both groups, contradicting previous studies that associated decreasing levels of SB with improved BP outcomes (O'Brien et al., 2024). Although the group difference reached statistical significance, the small to moderate effect size may suggest that while the change was measurable, its practical impact may be limited. One possible explanation is that the movement prompt intensity was not sufficient to elicit the necessary physiological changes required for BP reduction to take place. This theory is supported by a study by Ekelund et al. (2016), who noted that while MVPA improves cardiometabolic health, LPA may have a more limited effect.

In contrast, SBP measurements remained unchanged, which is consistent with previous workplace intervention studies that reported modest or non-significant SBP changes (Wang et al., 2020; Xia, Zhao & Nianogo, 2022). However, trends differed between the groups - SBP steadily increased in the control group, while the intervention group experienced an initial rise at 6 weeks, followed by a slight decrease below baseline measurements at 12 weeks.

Elevated levels of stress have been shown to mask the effects of physical activity on cardiovascular outcomes (Steptoe & Kivimäki, 2012). It is possible that external factors, such as workplace stress or personal stress, could have contributed to the increased BP results. This emphasises the need for more interventions that address both movement and stress management in the workplace. More research is needed to confirm this.

5.1.2.2 Blood Biomarkers

While no significant differences were observed in TC, LDL-C or glucose results, trends approaching statistical significance for LDL-C and glucose measurements suggest a possible long-term metabolic benefit if the increased movement behaviours are sustained. Both groups followed a similar trend with their total cholesterol results - an increase at 6 weeks followed by a decline at 12 weeks. This may simply reflect shorter metabolic fluctuations rather than a direct result of the intervention (Zaid et al., 2024).

LCL-C trends differed between the groups. The control group remained stable until a decrease at 12 weeks. However, the intervention group showed an increase at 6 weeks, followed by a marked decline to below baseline measurements by 12 weeks. The GLU levels followed opposing trends. The control group showed a steady increase over time, with the intervention group showing a consistent decrease throughout the study. This could potentially be due to increased glucose uptake by the skeletal muscles (Richter & Hargreaves, 2013; Bird & Hawley, 2017). These findings underscore the potential cardiometabolic benefits of light physical activity on the postprandial response (Bailey & Locke, 2015).

Triglyceride levels showed variable patterns throughout the intervention. The control group levels decreased between baseline and 6 weeks, returning to near baseline levels by 12 weeks. The intervention group showed a gradual increase, with a pronounced rise from week 6 to week 12. It is important to note all the cardiometabolic measurements were taken in a non-fasting state, introducing potential variability. As Zaid et al. (2024) highlighted, TG levels are particularly sensitive to postprandial changes, with fluctuations of up to 0.3 mmol/L within 1-4 hours post-meal. In contrast, TC and LDL-C are less affected by non-fasting status, typically showing a mean change of ~0.2 mmol/L within 2 hours of food intake. Even though the participants were advised not to eat or drink for an hour prior to their blood sampling, it is not always possible to measure adherence. Inconsistent compliance, along with different types of meals and drinks, could have influenced the TG levels.

A low-fat meal would have less of an effect on the results compared to a high-fat, high-sugar option. These uncontrolled variables may explain the different trends observed.

The increase in TG levels observed by the intervention group during the later part of the study could be explained by unconscious changes in dietary behaviour, perceiving the increase in movement as compensation for poorer food choices. This phenomenon is sometimes referred to as compensatory health beliefs, which refers to the tendency of an individual to offset one health-promoting behaviour (i.e. increased physical activity) with a less healthy one (i.e. poorer dietary choice). These choices may have contributed to the increase in TG levels despite improved movement patterns. These theories are supported by recent research that examined the effects of exercise and food-consumption patterns (Koehler et al., 2021; Flack et al., 2023; Reily et al., 2023), which found that post-exercise eating frequently involved larger portions or more immediate food consumption and in certain instances, the food was more energy-dense.

5.1.3 Satisfaction with Life Scale Questionnaire

Satisfaction With Life Scale scores significantly improved in both groups over time, with a more noticeable increase found in the intervention group. This finding is supported by Stubbs et al. (2018), who demonstrated that PA interventions positively impact mental health, particularly by reducing symptoms of depression and enhancing overall quality of life.

One possible explanation for this improvement is that the participants in the intervention group felt they had greater autonomy and control over their health and life due to the intervention. Increased self-efficacy has been linked to enhanced psychological well-being (Bandura, 1977). However, the lack of significant difference between 6 weeks and post-intervention may suggest that participants may have adapted to the intervention by 6 weeks, with that initial reported benefit decreasing again over time.

Future studies could explore ways to sustain engagement for longer periods, such as introducing different types of movement prompts or accountability programmes to continue reinforcing active participation over time.

5.1.4 SIT-Q-7D Results

The intervention's impact on self-reported sedentary behaviour was observed across several areas, including total sedentary time, workday and weekend SB, sleep duration, screen time, and break frequency. The significant interaction effect for total sedentary time suggests that the intervention may have contributed to maintaining current SB levels, though the trends observed did differ between the groups. While the control group had fluctuations in their SB over time, the intervention group displayed a gradual increase. There are two possible explanations: either the intervention group became more aware of their sedentary behaviours as the intervention progressed and reported it as such, or the intervention was not as effective at reducing sedentary behaviour.

The weekday SB findings showed a significant reduction in the intervention group when compared to the control group. This reinforces the idea that movement prompts could be an effective tool in an occupational environment. However, sedentary behaviour over the weekend did not differ significantly, suggesting that the interventions' main focus on workplace movement prompts may not have trickled over into leisure time. This aligns with research showing that occupational interventions often fail to influence personal time (Parry & Straker, 2013; Neuhaus et al., 2014; Keadle et al., 2017). Weekend SB is likely influenced by social and familial commitments, making it a less controllable variable compared to vocational SB (Safi et al., 2022). Future interventions should explore strategies that extend movement habits into non-occupational settings.

An unexpected secondary result of reduced SB by the intervention group was its impact on sleep duration. The intervention group reported a slight increase in weekday sleep duration, which aligns with research from Saunders et al. (2020), who emphasised the role between SB and sleep quality. Interestingly, though weekend sleep durations showed no significant difference, this may suggest that external factors, such as family commitments, social events, or irregular sleep patterns, may play a larger role in weekend sleep patterns.

Another key area of observed change was screen time. Where significant differences between groups were observed for both weekday and weekend screen usage. The intervention group reported lower screen time overall, particularly towards the end of the study - this supports the idea that reducing screen-based activities could create more opportunities for movement. In contrast, the control group showed a consistent increase in weekend screen time, reinforcing the challenges of managing leisure activities. These findings align with research indicating that screen-based SB is often more difficult to modify without a structured intervention or plan (Pedersen et al., 2022).

Despite these changes, break frequency did not reach any statistical significance, suggesting that participants may lack self-awareness of their break-taking habits. While the intervention group initially showed an increase in break frequency at 6 weeks, it declined towards the end of the study – this reflects patterns seen in previous studies that look at workplace interventions (Parry et al., 2019; Jenkins et al., 2024). This may be due to the novelty effect, which can lead to an initial surge of positive engagement with interventions such as movement prompts, followed by a decline in engagement as the intervention continues and the novelty begins to wear off. In a study that looked at activity trackers, they determined that user engagement was higher at the beginning of the intervention but had declined by the three-month mark (Shin et al., 2018).

Interestingly, break frequency during TV viewing showed an upward trend in the intervention group but declined in the control group, suggesting that the intervention may have been more effective in a specific context rather than across all activities (Kozlowski & Ilgen, 2006; Heath et al., 2012). This is in line with findings from Healy et al. (2008), who determined that breaks in SB were more likely to occur during unstructured time than during the weekday. This is consistent with habit formation theories, which suggest that behavioural patterns are influenced by environmental cues (McMillan, Milyavskaya & Burns, 2023).

5.1.5 Axivity Accelerometer Data:

The Axivity accelerometer data provided an objective view into SB, LPA, MVPA levels, and break frequency of the participants over the 12-week intervention period. The consistency in wear time between the control and the intervention group supports the reliability of these findings by showing that the differences observed in the movement patterns were not due to inconsistency from the Axivity monitors.

5.1.5.1 Sedentary Behaviour and Movement Patterns

When examining total SB time across the week, no significant differences were observed between the groups. However, trend analysis showed that the control group had an initial increase in SB at 6 weeks, followed by a slight decrease again at 12 weeks. The intervention group maintained stable SB levels initially, followed by a small decline at 12 weeks. This suggests that factors beyond the intervention, such as sleep routines and leisure activities, could have influenced total SB. This finding reinforces the need to analyse vocational hours separately from non-vocational hours to accurately assess the intervention's true impact on workplace behaviours.

A specific workplace result emerged when analysing workday SB. The control group showed a gradual increase in their SB patterns, while the intervention group showed a steady decline in their SB patterns from baseline to 12 weeks. These findings support the research indicating that structured work environments may provide a more controlled setting for reducing SB (Hutcheson, Piazza & Knowlden, 2018). The intervention's potential for a lasting behavioural change is implied by the consistent downward SB trend observed past the vocational hours, potentially indicating increased awareness about sedentary behaviour patterns. However, no significant changes were found in total weekly SB, further reinforcing the importance of multi-modal strategies that extend beyond occupational settings (Commissaris et al., 2015; Danquah et al., 2016). Multi-modal strategies could include a combination of interventions such as behavioural counselling, goal setting, mobile phone health apps, environment reshuffling, or education on lifestyle choices that target the effect of sedentary behaviour in both work and leisure environments. For example, Danquah et al. (2016) incorporated a multi-modal intervention that used tailored motivation sessions and text message reminders alongside sit-stand desks.

5.1.5.2 Light and Moderate-to-Vigorous Physical Activity

The influence of the intervention on LPA and MVPA was mixed. Total weekly LPA showed no significant interaction effect, but the trend analysis revealed a gradual decline in LPA by the control group. Whereas the intervention group maintained stable LPA levels throughout the intervention. This suggests that the intervention was effective in increasing movement specifically during work hours, but these benefits did not translate into overall weekly improvements. Interestingly, workday-specific trends differed from the total weekly LPA patterns. While total weekly LPA remained stable, workday LPA increased in the intervention group over time, whereas the control group showed a continuous decline, this suggests that the intervention was effective at increasing movement specifically during vocational hours.

Similarly, MVPA showed no significant difference between the two groups. The control group showed an upward trend in total MVPA, possibly reflecting incidental physical activity outside of work (e.g. sporting or social events). While the intervention group declined initially it increased again by the 12-week mark. The delayed MVPA increase shown by the intervention group could suggest a potential adherence consequence, where participants became more engaged with the movement prompt over time. These findings are supported by previous research that shows that LPA improvements are more consistent than MVPA in workplace interventions, with MVPA outcomes often being inconsistent (Hall et al., 2021; Michalchuk et al., 2022).

5.1.5.3 Break Frequency

Break frequency varied between total daily breaks and working hour breaks. No significant changes were observed in total break frequency. However, the difference between working hour break frequency was significant between the two groups. Trend analysis showed that the control group initially increased their number of breaks at 6 weeks, followed by a decline to baseline levels again at 12 weeks. Whereas the intervention group maintained their break frequency early on, they significantly increased their number of breaks taken between week 6 and week 12. The increase in vocational break frequency observed by the intervention group aligns with past research that found that workplace movement interventions can effectively increase break frequency and improve LPA and MVPA (Parry et al., 2013). This increase may be due to the regular eHealth prompts, which served as an external cue to interrupt SB and engage in short movement breaks. It is important to note that even small breaks from prolonged sitting have been shown to improve cardiometabolic markers, highlighting the value that small, modest changes in behaviour can have in reducing vocational sitting (Ekelund et al., 2016; Dempsey et al., 2020; Phaswana & Gradidge, 2023).

5.1.6 Correlation Between Satisfaction with Life Scale, Sedentary Behaviour and Breaks

The relationship between SB, break frequency, and SWLS scores was examined to assess if there was any psychological impact from the intervention. A moderate negative correlation was observed between weekday SB and SWLS scores in the intervention group, particularly at the midpoint and the 12-week point of the intervention period. This suggests that reducing SB during the workday can be connected to a higher overall SWLS score, supporting the hypothesis that breaking up prolonged SB could improve the participants' overall well-being.

In contrast, the control group showed a weak or negligible correlation between the baseline and the final assessment, reinforcing the fact that natural variations in SB were not indirectly associated with overall life satisfaction in the absence of intervention. These findings highlight the effectiveness of using movement prompts to help reduce weekday sedentary behaviour and improve overall mental well-being.

The scatterplots (Chapter 4, Figures 4.12 - 4.14) shown earlier further highlight these findings. At baseline, both groups had a weak negative relationship between SB and SWLS scores, suggesting an already pre-existing relationship. However, at the 6-week mark, a notable difference had emerged - the intervention group showed a moderate negative correlation, meaning that as the SWLS score improved, sedentary behaviour was reduced. The control group had no meaningful relationship, reflecting the absence of a structured intervention. At the 12 week mark, these patterns persisted, with the intervention group maintaining their moderate negative correlation, possibly suggesting a sustained psychological benefit from the movement prompt.

These findings support previous research that links reductions in SB with improvements in well-being. Maher et al. (2015) found that increased SB was associated with lower life satisfaction in older adults. While Chen et al. (2021) found that higher levels of PA were positively correlated with social well-being. Similarly, Pengpid and Pelter (2019) examined university students across 24 countries and found that higher SB levels were linked to lower life satisfaction. Teno, Silva and Júdice (2024) further highlighted the negative impact of occupational SB on well-being, emphasising the important role of workplace behaviour in shaping psychological health.

Unlike these previous studies, which focused primarily on older adults and university students, this study contributes to the understanding of the relationship between SB and SWLS by examining workplace interventions within the South African context., these findings highlight the potential for relevant, low-cost interventions to improve overall life satisfaction and mental well-being in the South African workplace.

5.1.6.1 The Relationship Between Weekday Break Frequency and Satisfaction with Life Scale Scores

The relationship between the number of weekday breaks and satisfaction with life scale scores shows a clear trend. At baseline, the control group had a moderate positive correlation, suggesting that the natural occurrence of break frequency was already associated with a high SWLS score. However, this relationship declined over time, indicating that the impact of unstructured breaks was reduced without a targeted and structured intervention.

In contrast, the intervention group showed consistently weak correlation results between the number of weekday breaks and the SWLS score across all times. This pattern suggests that the participants in the intervention group could have prioritised more meaningful and sustained activity (e.g. increased LPA or MVPA) during their required movement breaks. The intervention appears to have shifted the participants towards sustainable physical activity.

5.2 Qualitative Discussion

This section aims to examine the qualitative findings presented in Chapter 4. This section is structured according to the study's objectives. It will offer insights into how participants' perceptions and personal experiences align or differ from existing literature. This section aims to explore how the identified themes highlight the effects of the intervention and its future relevance to workplace interventions.

5.2.1 Baseline Measurements of Sedentary Behaviour, Physical Activity, Body Composition and Satisfaction with Life Scale

The first objective assessed the baseline levels of PA, anthropometry and SWLS amongst office-based workers. The qualitative findings show that many participants were initially unaware of their SB habits. Several participants admitted that before the intervention, they had greatly underestimated the amount of time they engaged in various forms of sedentary behaviour. These reflections align with the baseline quantitative measurements.

Whilst the qualitative data does not provide direct numerical evidence about baseline SB, the reflections and quotes provided by the participants support the concept that awareness was low before the start of the intervention, further underscoring the importance of the objective measurements for comparison. This aligns with the findings of Morton et al. (2022), who conducted a review on effective components of interventions aimed at reducing SB in the workplace. The study emphasised the importance of awareness to create behavioural change, supporting the findings from the FG discussions.

5.2.2 Changes in Sedentary Behaviour, Cardiometabolic Health and Satisfaction with Life Scale Post-Intervention

The second objective was to measure whether there were any significant changes to baseline results for SB, PA, anthropometry, cardiometabolic measurements and SWLS scores after the intervention period. The hypothesis stated that the participants would reduce their time spent engaging in SB and show improvements in all measured values. The qualitative data supports this hypothesis. The participants consistently reported positive behavioural changes, such as standing more frequently, including more walking into their daily routine, and consciously interrupting prolonged periods of sitting. These changes suggest that the participants adopted healthier habits, which could have contributed to the improvements in their cardiometabolic health, anthropometry measurements and overall SWLS score.

The participants felt that wearing the Axivity monitors further enhanced their commitment to the intervention, as it added a level of accountability to their actions. Findings from Brown et al. (2013) support this finding in their study of objectively measured SB and its relationship with presenteeism. This suggests that monitoring participants could increase their accountability and further encourage sustained behavioural change. However, the participants also noted that this sense of accountability sometimes conflicted with their workplace culture. A worry highlighted by Dietz et al. (2020) who highlighted the impact of leadership on presenteeism and its impact on employee behaviour. This finding highlights the complicated nature of accountability and workplace culture in addressing SB.

Several of the intervention group participants reported new aches and pains when they reverted back to their previous SB pattern, which may indicate that the participants' bodies were adjusting to the increases in movement throughout the day. This is supported by evidence linking extended periods of sitting with chronic knee pain, low-back pain, neck pain, and diminished joint function even after short periods of inactivity. Sitting for more than 10 hours a day was associated with a 28% higher risk of knee pain (Lee et al., 2020), while a full day of sitting could increase low-back pain by up to 19% (Dzakpasu et al., 2021), and screen-based sitting activities for more than 6 hours nearly double the likelihood of neck pain (Meng et al., 2025).

Although qualitative data cannot correlate these improvements, these insights collected from the focus groups provide a behavioural context to support the quantitative measures.

5.2.3 Association Between Sedentary Behaviour and Mental Health

The third objective sought to determine the relationship between SB and the mental well-being of the participants. The qualitative findings suggest that the intervention could have had a meaningful impact on the participant's mental well-being. The participants frequently highlighted improvements in their self-belief and overall confidence levels. These reflections showed that by reducing SB it could have positively impacted on mental well-being.

The participants identified workplace culture, particularly the "toxic" importance placed on desk-based productivity as a major barrier to reducing their SB. This observation is supported by findings from Zhang et al. (2024), who emphasised how the pressure to perform can often discourage movement. In a study by Hadfield et al. (2020), they highlighted the importance of making healthier lifestyle choices within the workplace. This was confirmed by the participants, who struggled with a lack of dedicated movement space, remarking how it was more challenging to move within the work environment. It is important that management not only supports but actively encourages employees to be more active, a point highlighted by the participants. This was emphasised in a meta-analysis conducted by Montano et al. (2017) who looked at leadership and how it impacted occupational health.

5.2.4 Participants' Perception of the eHealth App

The fourth objective looked to evaluate the participants' perceptions of the eHealth mobile phone app as a tool to help address their SB within the workplace. The participants acknowledged the double-edged nature of technology as a contributing factor and also a potentially mitigating factor for SB. This complex understanding was explored in a study by Zhang et al. (2023) who investigated factors associated with smartphone addiction. Work-related stressors were often identified as barriers to decreasing overall SB. This aligns with research from Dietz et al. (2020) who studied the effects of leader presenteeism on employee behaviour. In a meta-analysis by Grøntved et al. (2011), they were able to determine an increased risk for various health-related conditions associated with prolonged periods of sitting. Feedback from the focus group sessions was generally positive, with the participants acknowledging the role that the app played in increasing their awareness of the time spent engaging in sedentary behaviours. It prompted them to include more frequent and purposeful movement into their day.

The literature discussed in Chapter 2 emphasises the benefits of gain-framed health messages (Latimer, Brawley & Bassett, 2010), but the participants in this study had conflicting opinions. The participants all stated that they preferred in-person chats with the researcher about the impact of SB on their health and found it to be more informative and motivating. This suggests that in-person communication may provide a sense of accountability and connection that digital prompts simply cannot provide.

The participants also noted that the app created some sense of accountability. However, some participants felt that some improvements could be made to the app itself, such as more personalised features and better timing for notifications to avoid interruptions to their meetings. While the app was largely successful in its primary goal, the feedback regarding distractions and timing should be used in any future interventions, as tailoring interventions to individuals may help improve adherence.

5.2.5 Interaction Between Themes

The themes identified in the FG sessions showed a significant overlap and interconnections between the themes. One notable area of overlap between themes was the impact of the intervention and workplace culture, and barriers. The participants noted some increased awareness and behavioural changes, but their workplace culture often hindered their ability to maintain these changes. For example, the participants noted that even though they would receive the movement prompt, the internal pressure they placed on themselves to meet deadlines meant they just ignored it and continued working. This finding highlights how workplace dynamics should be considered in order to create a meaningful impact.

Technology and its role in SB emerged as both a help and a hindrance to intervention success. On the one hand, technology enabled the participants to monitor their SB and prompted them to move. On the other hand, the participants highlighted their excessive reliance on technology in their daily lives.

The recommendations to improve movement and health were echoed throughout all the discussions. While individual motivation and accountability were significant talking points, the internal workplace changes required (i.e. introduction of standing desks or designated movement spaces) were greatly discussed as issues that could enhance the intervention's success. This further supports the interaction between personal responsibility for health and the need for organisational change. Hadgraft et al. (2016) determined that both personal motivation and organisational support (i.e. Leadership encouragement, workload flexibility, or peer support) were important to successfully reduce vocational SB. The workers were more inclined to take breaks or use standing desks when they had visible support from management and a work culture that allowed breaks.

Overall, the qualitative findings support the hypothesis that interrupting prolonged SB would have a perceived positive benefit on the participants. The findings from Waters et al. (2016), discussed in detail in Chapter 2, identified several key themes, such as organisational culture and policies, physical work environment, individual perceptions and behaviours and social and psychological factors, as major barriers to reducing SB. The findings from the previously mentioned Waters et al. study align well with the qualitative results from this study.

The qualitative data does not confirm improvements in cardiometabolic health, anthropometry measurements, or SWLS scores directly, it does highlight the increased awareness and positive trend observed for mental well-being. This shows that the intervention was successful in promoting healthier habits. The FG participants suggested some improvements for future studies, such as personalised app features and a more supportive workplace. Hadfield et al. (2020) discuss various strategies for making easy choices within the workplace. Pearson et al. (2024) review active workstations as a means to encourage more movement. These studies support what the FG participants suggested about creating a more active and supportive workplace.

5.3 Integrative Discussion

This section focuses on integrating quantitative and qualitative results to provide a full understanding of how the intervention impacted SB within the workplace. The integrative section is structured according to the research objectives, with the hope of providing a results section that is rich with data and understanding.

5.3.1 Baseline Measurements of Sedentary Behaviour, Physical Activity, Body Composition and Satisfaction With Life Scale

The quantitative data established that participants from both groups exhibited similar baseline descriptive characteristics, confirming the effectiveness of the randomisation. These findings provided a solid foundation to evaluate the impact of the intervention. Many participants reflected on how they had underestimated the amount of time spent engaging in SB. This highlighted a general lack of awareness about the health risks often associated with prolonged sitting.

These findings suggest that while objective measures are crucial for quantifying sedentary behaviours, it's the subjective data that often highlight the importance of behavioural awareness as a precursor to meaningful change. This finding is supported by previous literature that found that increasing a participant's knowledge about the risks associated with prolonged sitting is more likely to result in them changing and reducing their SB habits (Landais et al., 2022). This supports the need for interventions that not only track sedentary behaviour but also foster more self-awareness regarding health and overall activity patterns.

These reflections help explain the disconnect between participants' perceived and measured activity levels. It underscores the importance of raising awareness at the beginning of the intervention. One plausible explanation for the lower overall health scores recorded by the intervention group is that participants became more aware of the negative effects of prolonged SB as the study progressed, which may have led to a more critical self-assessment compared to the control group. Although this increased awareness resulted in lower self-reported health scores, it also served as a foundation for the participants to adopt healthier habits during the intervention. Participants' initial lack of awareness of their SB may reflect low self-efficacy, as they had not yet built the mastery experiences or received the external reinforcement necessary to believe in their ability to adopt healthier habits. This emphasises the importance of the early phase of the intervention in fostering positive self-efficacy.

5.3.2 Post-Intervention Changes in Sedentary Behaviour, Physical Activity, Body Composition and Satisfaction With Life Scale

The intervention's effectiveness in reducing SB and promoting movement within the workplace may not be evident from the quantitative findings only. However, the trends show that the intervention was heading in the right direction.

Quantitatively, the intervention group demonstrated marked reductions in weekday SB compared to the control group, with self-reported reductions corroborated by the improvements in objective SB metrics during vocational hours. However, there were no significant changes to cardiometabolic markers, such as measured BP, cholesterol or glucose levels. This aligns with previous literature that found that in order to achieve measurable improvements to physiological changes, the changes need to happen at a higher intensity or for a longer duration (Wing et al., 2010; Sagastume et al., 2022; Cifuentes et al., 2023).

Qualitatively, the participants reported adopting new habits, such as standing during meetings, taking the stairs over the elevator, or opting to stand instead of sit during their smoke break, which they attributed to the intervention and the awareness it fostered. As one participant reflected: *"I now smoke and stand, and that has been a huge difference for me. The other thing I've started doing is trying to take the stairs as much as possible. And I noticed I can suddenly do the stairs easier"* (MF1). This reflection helps integrate both sets of data by explaining that while objective measurements of cardiometabolic health did not change, the subjective behavioural changes are moving towards long-term health improvements. Participants' reflections on small achievements, such as choosing to take the stairs instead of the elevator or standing during breaks, align with Bandura's (1977) concept of mastery of experiences, which strengthens self-efficacy by reinforcing belief in one's ability to successfully perform a behaviour.

Participants also noted increased sensitivity to physical discomfort when reverting to prolonged bouts of sitting. This suggests that while measurable health markers may not have changed significantly, the intervention fostered behavioural shifts that were beneficial to long-term health improvements. The inconsistency between objective cardiometabolic outcomes and subjective reports of increased movement and well-being highlights the complexity of measuring health changes over a 12 week period. These findings emphasise the need for sustained longer interventions that combine behavioural prompts with complementary strategies to achieve comprehensive health benefits (Wipfli et al., 2024).

The qualitative findings provide insight into the limited effects of health messages, which cannot be observed in quantitative data. While the statistical analysis did not show significant changes in sedentary time, participants felt that they did not help foster a behavioural change and were less motivating than in-person support. While the participants in the intervention group reported that the gain-framed health messages had little impact on their PA levels, the quantitative findings suggest that overall metrics and SB levels improved compared to the control group, who did not receive any health messages during the intervention period. This finding is a contradiction to the work done by Latimer et al. (2010), who reported the opposite happening. While the participants perceived minimal impact on their PA levels, the quantitative data indicated an upward trend of overall metrics and a reduction in SB within the intervention group compared to the control group, who did not receive any health messages. This discrepancy in findings may indicate that the messages played a subtle role, even if participants do not consciously attribute their behavioural change to these messages. These findings align with the evidence suggesting that health messages may operate through subconscious priming (Latimer, Brawley & Bassett, 2010). The control group, lacking these cues, may have been less prompted to change their sedentary behaviour habits. This suggests that even though an intervention may not always be perceived as impactful by the participants, it can still contribute to positive behavioural changes. Future studies could explore the effectiveness of combining digital messages with additional motivational components, such as personalised feedback or in-person follow-ups.

5.3.3 Association Between Sedentary Behaviour and Mental Health

Quantitative findings showed a moderate negative correlation between SB and SWLS, particularly within the intervention group, indicating that participants who reduced their SB reported improved overall life satisfaction. In contrast, the control group showed weak or negligible correlations, suggesting that without a targeted intervention, variations in SB did not have a meaningful effect on their SWLS scores. Qualitative findings further reinforced this link as the participants within the intervention group reported improved self-confidence and the courage to take on more challenges as a result of the intervention.

The intervention highlighted how reliant and addicted the participants were on their smartphones. Many of the participants expressed anxiety and admitted to being addicted to their smartphones. It is important to note the finding by Zhang et al. (2023), who found that anxiety is positively associated with smartphone addiction.

One important finding that emerged from the focus group sessions is the fear of how you are perceived by co-workers. The idea is that if you are seen having a break or walking around, you are unproductive and not working as hard as expected. This fear of being seen as unproductive could explain why break frequency alone does not correlate with SWL improvements. These fears experienced by the participants have been highlighted in a previous study by Bailey (2021), which highlights that view increased sitting time with increased productivity and work outcomes.

An important finding that goes hand in hand with the previous point was how participants perceived engaging in movement during meetings. While senior employees reported no issue with moving, junior staff noted that they would rather remain seated to avoid being judged or drawing unnecessary attention. This fear of judgment may have reduced self-efficacy, making the junior staff less likely to engage in movement during meetings despite understanding its importance and benefits. This highlights the role of workplace hierarchy in influencing adherence to movement-based intervention. Previous literature found that management and policymakers should be aware of the role they play in promoting sedentary behaviour within their office spaces, with more authoritative leadership styles often resulting in more employee presentism even if it is a detriment to their employees and overall work productivity (Chandrasekaran et al., 2021; Zhang, Wang & He, 2024).

Some participants reported experiencing short-term improvement in sleep quality and having more energy to take on the day during the early part of the intervention.

However, this benefit was only temporary. This suggests that while initial increases in PA could improve sleep, maintaining these improvements may require a greater engagement with movement prompts.

The prompts from the eHealth app acted as a form of reinforcement for the participants, encouraging them to stick to healthier behaviour changes despite any external challenges that may have shown up. Additionally, participants' reflections on feeling more energised during the early stages of the intervention highlight the influence of positive physiological changes on self-efficacy. A study by Sigmundová (2021) found that increased screen time over the weekend may correlate with poorer sleep outcomes, this finding may help explain the weekend sleep patterns of the participants.

5.3.4 Relationship Between Sedentary Behaviour and Satisfaction With Life Scale Scores

Quantitative findings are supported by qualitative insights that highlight the participants' motivations, perceptions and behavioural changes throughout the intervention. Participants frequently described feeling more in control of their well-being as they integrated small changes into their daily routines.

These reflections align with the measured decrease in SB and the increase in SWLS scores, suggesting that the intervention not only promoted more physical activity but also fostered a psychological shift toward prioritising personal well-being. Participants' experiences also underscored the intervention's emotional benefits. This feedback mirrors the quantitative data, as reduced SB was associated with higher SWLS scores. These reflections show that the intervention encouraged participants to engage in more movement, which helped in fostering a sense of accomplishment and self-empowerment.

Accountability also emerged as a key factor in participants' behavioural change. The lack of external accountability and the self-guided nature of the control group intervention may have been one of the key reasons why the quantitative results were greater in the intervention group.

5.3.5 Relationship Between Break Frequency and Satisfaction With Life Scale

The relationship between workday break frequency and SWLS scores revealed a less consistent trend when compared to sedentary behaviour. The quantitative analysis showed that in the control group, a moderate positive correlation was observed at baseline, suggesting that the participants who naturally engaged in more breaks during the workday reported a higher SWLS score. However, this relationship decreased over the 12 weeks, with correlations decreasing to near zero at the midpoint and showing only a weak positive association at the end. In contrast, the intervention group showed a consistently weak correlation across the 12-week time frame, indicating that break frequency alone was not a strong predictor for SWLS. As mentioned earlier, the fear of judgement and being perceived as unproductive or lazy by their peers could offer further insight into the non-significant result in break frequency and SWLS, as participants moved less than required, especially during meetings.

Participants often drew attention to the fact that workplace constraints would restrict their ability to respond to the movement prompt and further elaborated on the difficulty of integrating movement into their workday. The participants also frequently mentioned the need for infrastructure changes to further support movement within the work environment, including standing desks and dedicated spaces for movement. The lack of supportive infrastructure may have further reduced the impact of the intervention on weekday break frequency and SWLS. This finding is supported by Michalchuk et al. (2022) who found that if office spaces were designed to promote more movement, there was an increase in activity.

5.3.6 Perceptions of the eHealth App to Address Sedentary Behaviour

The participants’ perceptions of the eHealth app were generally positive, with many acknowledging its role in increasing their awareness regarding the risks associated with increased SB and promoting more frequent movement.

The qualitative findings emphasised the app’s significance in fostering a sense of accountability, which participants described as motivating them to incorporate more movement into their daily lives, including more movement outside of the work environment. However, some participants noted limitations, such as the timing of notifications during meetings and the lack of personalised features. These insights highlight the need for workplace interventions that not only balance functionality with the demands of the profession but also allow for personalised movement prompts that work with the individual. Future adaptations of the app could benefit from customisable features that allow users to tailor prompts to their schedules, minimising disruptions while maintaining the intervention's effectiveness.

The quantitative findings corroborated participant reports of increased movement, as the objective data showed higher break frequency and reduced workday SB in the intervention group. This alignment between subjective feedback and objective measurements reinforces the app's potential as an effective, low-cost tool for promoting movement within the office setting. Participants described feeling more motivated and confident in their ability to incorporate movement due to external prompts. While the intervention did appear to increase the participant's awareness of SB, engagement with the app was not consistent throughout the intervention. Without an in-app tracking system, it was not able to quantify their engagement.

Further alignments with Bandura's Self-Efficacy Theory were reflected in the camaraderie created within the office during the intervention period. As the participants observed their peers engaging in movement, it may have strengthened their belief in their ability to adopt similar behaviour changes. While external reinforcement played a key role, participants small achievements also fostered mastery experiences that reinforced their self-confidence. The reflection on camaraderie is supported by previous studies that found that adults are more likely to engage in physical activity when it is done within a group setting rather than when they need to complete it on their own (Hadfield et al., 2020).

CHAPTER 6: CONCLUSION

6.1 Restatement of Study Objectives and Summary of Key Findings:

The primary aim of this study was to investigate whether a simple, cost-effective eHealth intervention could have any real change in reducing the overall sedentary behaviour habits of its participants. It also wanted to assess whether the intervention could lead to improvements in cardiometabolic health, and anthropometric measurements, and if it could influence overall satisfaction with life scores.

The four objectives that drove this research:

- To determine baseline measures of sedentary behaviour, physical activity, body composition and satisfaction with life.
- To measure changes in these variables following a 12-week intervention compared to the control.
- To examine associations between sedentary behaviour and mental health outcomes.
- To explore intervention group participants' perceptions of the intervention through focus groups.

The quantitative data results showed that some of the participants in the intervention group had a small improvement in their workday break frequency and total sitting time. Some of the participants showed slight improvements in their anthropometric and cardiometabolic measurements. There was statistical significance with the intervention group and the self-reported satisfaction with life scores. In contrast, the control group showed few or no significant changes over the course of the intervention period. These findings could highlight the potential success of the eHealth prompt in helping to foster a meaningful change.

The qualitative data provided details that help to provide a deep insight into the intervention group experience. The FG discussions occasionally revealed different perspectives and conflicting opinions regarding some parts of the intervention.

However, all the participants appreciated the fact that the prompt encouraged them to move more and that it was able to highlight their sedentary behaviours. Through talking with the intervention group, the participants were able to help identify factors such as inconvenient timing of prompts, personal anxiety, and a lack of dedicated space to move or any alternative working arrangements as hindrances to the intervention. Despite these issues, many participants found that they no longer needed the app to continuously prompt them to move, it had become a habit as the intervention went on. Many participants also commented on how they had more self-confidence and set small, achievable goals that they didn't think were possible.

6.2 Contribution to Existing Knowledge

This study has shown that even short-term interventions can help raise awareness about the negative consequences linked to sedentary behaviour and help contribute to successful behavioural changes within the workplace.

The quantitative results showed varying levels of changes between the two groups; the qualitative data have helped to provide more context to these objective results. An example of how the qualitative data has helped contextualise the quantitative data would be the participant feedback on their anxiety surrounding getting up and moving when the prompts went off during meetings, which could explain why adherence to the movement prompt was not always successful. To the best of our knowledge, this study represents the first mixed-methods study in South Africa that uses the Satisfaction with Life Scale questionnaire in combination with an eHealth prompt intervention set in an office environment. There have, however, been other interventions studied that have made separate use of the Satisfaction with Life Scale questionnaire or other types of eHealth interventions.

This study adds to the growing body of research that focuses on workplace interventions by focusing solely on sedentary behaviour within the marketing and advertising industry sector. This is a unique sector due to the workplace requirements that often require prolonged sitting and heavy emphasis on screen-based work. Unlike other industries, there are no spontaneous movement opportunities, and the work is not physically demanding. Employees are often required to complete tasks that are cognitively heavy but lack any sort of physical movement. By demonstrating that awareness alone is not enough to drive sustained behaviour change, this study underscores the necessity of an integrated approach to reducing workplace sedentary behaviour in order to have sustained change various aspects need to be combined such as movement prompts, workplace culture and organisational policy.

6.3 Strengths and Limitations

Strengths: A major strength of this study was the use of both objective and subjective measurements to assess sedentary behaviour throughout the day. This allowed for a more well-rounded understanding when it came to individual sedentary behaviours and movement patterns. There was an added benefit from using subjective self-reported questionnaires, with many of the participants reflecting that it was filling out these subjective assessments that truly highlighted the extent of their sedentary behaviours and warranted them to make a change. It is through the use of qualitative research that useful information like this can be added to the objective nature of quantitative data.

Limitations: Despite its strengths, there are several limitations that must be addressed. The limited sample size and making use of a single office space may limit the generalisability of the findings to larger office spaces or even on a global scale. To mitigate this issue, the study included employees from various departments and different job roles within the company to try and have a wide base to capture data from. To further address this, future studies should aim to include a larger sample size that is not restricted to one company. Even though the duration of this study was sufficient to see initial behaviour change taking place, its duration may not have been sufficient to create long-lasting behavioural changes.

Making use of a mobile app that did not allow for objective tracking of participant engagement has limited the ability to assess adherence quantitatively. This issue is addressed through participant reflections in the FG discussions, future studies would benefit from using movement prompt apps that allow for usage analytics.

Another limitation was having to exclude participants for not wearing their accelerometer monitors continuously for the required 7-day time frame. This could have introduced bias into the objective measurements of the study. To minimise this, the participants were thoroughly briefed on the importance of continuous wear at each session and reminded not to remove the monitor. Future studies could use alternative strategies to improve participant adherence, such as allowing participants to remove the monitors whilst sleeping or over weekends. The researcher could then send out an email or SMS to remind them to wear the accelerometer monitors again.

While most people have access to a smartphone, some businesses do not allow employees to bring them into the office, making this a practical concern. Future studies should then offer alternative ways for the eHealth prompts to be sent out. Even if employees are permitted to bring their smartphones into the office, some individuals might not want their devices used for the intervention.

While the FG discussions were conducted only with participants who completed the intervention, it is important to note that no participant formally withdrew from the 12-week intervention. As such, the qualitative insights reflect the experiences of those who remained engaged throughout the intervention. This may have limited the inclusion of potentially valuable perspectives from those who disengaged. Future studies should aim to include these individuals, as their insight could help shed light on barriers to adherence and long-term commitment to interventions.

6.4 Recommendations for Future Research and Workplace Practice

Any future research should consider a larger sample size and a longer study duration to see if the changes observed are a result of the intervention or not. Allowing the participants to customise the eHealth app and its features could help enhance participant adherence, as it will align more closely with their typical workday and avoid it going off during meetings. Feedback gathered from the focus group highlights that one-on-one interactions with the researcher have a more impactful effect on the participants compared to just sending out an email. This highlights the need for some sort of accountability when it comes to making a behavioural change, by including options like a peer-led walking challenge or competition it is possible that a more sustained change might take place.

The role senior management plays should not be overlooked. Having the support of management and the business owner can significantly enhance participant adherence to the intervention protocol. This is even more true when the junior staff observe the senior staff taking an active role in the intervention or even encouraging a little friendly competition amongst the employees. It is important to remember that staff members in more junior positions may not have the same flexibility as those in more senior positions.

There are practical implications from this study that could help future intervention studies wanting to explore the impact of prolonged sitting in the sector of advertising and marketing. Given that numerous employees reported an increased awareness of their sedentary habits but still struggled to implement more movement during vocational hours due to workplace culture and work demands, organisations should consider integrating movement prompts into their pre-existing systems to try and encourage more sustainable behavioural changes. Encouraging workplace environments that are not only movement-ready but also movement-friendly through initiatives like standing or active meetings, friendly competitions or including active breaks during meetings, could help enhance adherence to these types of workplace interventions.

6.5 Take Home Message

- Workplace sedentary behaviour is still a challenge for South African advertising and marketing firms, with high workload and demands of the job often resulting in limited movement opportunities.
- The movement prompts helped encourage movement, but that alone was not sufficient to reduce total sitting time.
- Self-reported questionnaires were highly effective at creating awareness surrounding sedentary habits.

- Workplace culture plays a large role in how successful an intervention can be – with many participants reporting work pressure and deadlines as issues they needed to overcome.
- Businesses should integrate movement strategies into already existing systems if possible, but having customisable systems would go a long way to improve adherence.
- Future workplace intervention must address personal, behavioural and organisational barriers if they want to ensure long-term behaviour changes.

6.6 Conclusion

In conclusion, this study contributes to the growing body of evidence that workplace eHealth interventions can reduce sedentary behaviour and improve mental well-being. However, the results also emphasise the complexity of influencing cardiometabolic health and SB outside of the working world. More research is needed to explore long-term interventions and strategies that target both occupational and leisure-time behaviours. The findings from this study support the continued development of workplace health programmes that encourage movement, particularly during vocational hours, but also highlight the need for more vigorous and sustained efforts to improve overall health outcomes.

When examining the results as a whole, the intervention appeared to foster an improved sense of awareness regarding the importance of reducing sedentary behaviour. It also seemed to empower participants to take accountability for their health and mental well-being. Encouraging the participants to focus on the quality of their movement breaks may have contributed to broader behavioural and attitude shifts. The findings from the study also underscore the importance of addressing workplace culture and the physical layout of the office as important factors to consider when trying to implement effective changes. By integrating the subjective and objective findings there is some evidence that self-efficacy, shaped by mastery of experiences and external reinforcement, has played a role in supporting changes in certain behaviours. While the changes were not always reflected in the quantitative outcomes, by fostering confidence and reinforcing small successes, the intervention may have supported the participants' belief in their ability to prioritise their health.

The integration of quantitative and qualitative findings highlights that health interventions are not solely about achieving measurable outcomes, but also about understanding the individual experience behind the data collected. This study's findings show the effects of reducing SB on both physical and psychological well-being, but it also underscores the importance of considering personal perspectives in health-related research. Healthcare interventions should not be viewed only through statistical outcomes, they must also consider the behavioural changes, prioritise that change, and the lived realities. In the South African context, where workplace initiatives are often under-resourced, these findings highlight the importance of interventions that balance measurable outcomes with employee well-being. This perspective reinforces that while quantitative data is invaluable, the broader aim of health promotion is to improve the quality of life, making the lived experience a critical factor in the design and implementation of future interventions.

CHAPTER 7: References

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CHAPTER 8: APPENDICES:

8.1 Appendix A – Ethical Clearance

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG	HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research and Innovation)

TO: Ms KR Kallmann
School of Therapeutic Sciences
Centre of Exercise Science and Sports Medicine
Medical School
University

E-mail: krkallmann@gmail.com

CC: Supervisor: Professor P Gradidge and Ms N Neophytou
<Philippe.Gradidge@wits.ac.za>
and <HREC-Medical Research Office@wits.ac.za>

FROM: Mr Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2021/11/12

REF: R14/49

PROTOCOL NO: **M210823** (This is your ethics application reference number. Please quote it in all enquiries, oral or written, relating to this study.)

PROJECT TITLE: *Using mobile technology to reduce sedentary time in employees of a Johannesburg marketing company*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to Government funding of the University.

MSWorks2000/Iain0007/Clearscan.wps

8.2 Appendix B – Invitation Letter

12/07/2021

To Whom this may concern,

This letter is to confirm the that Kristi Kallmann is allowed to conduct her research for her studies at Vetro Media, this research will be conducted at our head office, with the address of 382 Jan Smuts Avenue, Craighall, Johannesburg.

For any queries regarding this instruction please contact the company Managing Director Christian Schmidt

Thank you.

Kind Regards,

Christian Schmidt

Managing Director

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8.3 Appendix C – Information Sheet

USING MOBILE TECHNOLOGY TO REDUCE SEDENTARY TIME IN EMPLOYEES OF A JOHANNESBURG MARKETING COMPANY

Good day,

My name is Kristi Kallmann, and I am a Masters student at the University of the Witwatersrand.

I am interested in determining how sitting for an extended time can influence your health. I would like to invite you to participate in my research study.

If this study is something you would be interested in, please read the information below carefully. If you are interested in being part of the study, please sign the consent form attached.

At the start of the study, I would visit your office building for all the data collection required. At this visit, you will be asked to complete a short questionnaire, this will help determine your overall general health and physical activity level. You will also be asked to fill in another questionnaire, this one will indicate how much time you spend sitting. The information collected from these questionnaires will help determine if you are eligible to participate in the research study. If you are eligible, I would then measure your height, weight, waist and hip circumference.

I would like to measure blood pressure; this will be done with an automatic blood pressure cuff. I would also like to measure your glucose and cholesterol levels; this will be done using a small finger-prick test.

During this visit, I would also like to determine the state of a few mental health issues, namely how stressed you are and your overall satisfaction with life, this will be the final questionnaire.

Once the pre-screening measurements are complete, you will be allocated into either the control or intervention group. This allocation will be based on the type of mobile phone you own; depending on the make of phone, you will be asked to download a certain app. Then for the next 12-weeks during your workday (e.g., 08h00 – 17h00), you will be required to use the app. Each participant will be provided with information about how the app needs to be set up. A brief, purposeful walk every hour around the office will be required during those hours. To keep track of your physical activity, a simple logbook will be provided, this will allow you to simply tick if you were able to get your walk-in during that hour. The participants in the intervention group will receive an email, once a week at random, that encourages breaking up prolonged bouts of sitting.

At the 6-week mark, the tests will be remeasured, and the intervention will continue as before. At the end of the 12 weeks, all tests will be measured for a final time. After if you were in the intervention group, you will be invited to take part in a group discussion in which you can provide feedback regarding the research study. A few questions about the study will also be asked.

You will receive a short report back that will have your results on conclusion and the findings of the research study will be made available to you, should you wish to read it.

Please note you may withdraw from the study or withdraw consent at any stage once the study has started, this will be without any prejudice or negative consequences to the participant. All results will be completely confidential. Results will only be made available to the researcher and yourself. The anonymity of all participants will be ensured throughout the study. All data will be analysed, and the results shared within the scientific community. Ethical approval from the University of the Witwatersrand will be obtained before the study will commence.

Thank you for considering to be a part of this study. Please make sure you are familiar with the above information before signing the informed consent. If you have any questions or concerns, feel free to contact me.

Contact details:
Kristi Kallmann (investigator)
076 141 6956
krkallmann@gmail.com

If you have any issues regarding the investigator, please feel free to contact:
Prof Philippe Gradidge: +27 11 717 3372 or Philippe.gradidge@wits.ac.za
Ms. Natalia Neophytou +27 11 717 3368 or Natalia.Neophytou@wits.ac.za

*This study will seek approval by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research. *
The telephone numbers for the Committee secretariat are 011 717 2700/1234, Ms. Zanele Ndlovu (Zanele.Ndlovu@wits.ac.za).

8.4 Appendix D – Informed Consent Form

I, ____ (full name(s) and surname) consent to be a participant in the research study titled: "Using mobile technology to reduce sedentary time in employees of a Johannesburg marketing company"

I fully understand the procedures and questionnaires and I understand and appreciate their purpose. I am aware of any risks involved in participating, and the extent of my involvement.

I understand that with the focus-group discussion my anonymity cannot be maintained, due to the group nature of the discussion.

I have read the Information Sheet provided and I understand all it entails.

I understand that my participation in the research study is completely voluntary, and I understand that I am free to withdraw from the study at any point in time without prejudice or negative consequences.

I understand that the research study will be sanctioned by the Committee for Research on Human Participants for the University of the Witwatersrand, Johannesburg.

Signature of participant: ______________________ Date: ____________________

Signature of researcher: ______________________ Date: ____________________

8.5 Appendix E – General Questionnaire

The aim of this questionnaire is to establish your sociodemographic information and your overall general health:

<u>Sociodemographic – please select best option:</u>

Name (For record keeping, will not be used elsewhere): ____________
Date of Birth: ________________

Age (in years):

18-20	21-29	30-39	40-49	50-59	60 or older

Gender:

Male:	Female:	Other:	If other, please specify:

Marital status:

Single	Living with a partner:	Married	Separated:	Divorced:	Widowed:	Other, please specify:

Highest level of education:

Matric certificate or equivalent	No degree	Bachelor's degree	Honour's degree	Master's degree	PhD degree

Do you have access to a smartphone and email?

Yes	No

<u>General health questions:</u>

In the last 2 years have you been admitted into hospital?

No	Yes	If yes, for which condition and for how long

Have you undergone any surgery in the last 2 years?

No	Yes	If yes, which procedure

Are you a current smoker?

Yes	No

Have you ever been diagnosed with a heart condition, or do you have high blood pressure?

Yes	No	If yes, please specify

Do you experience unexplained pain in your chest during rest, during your daily life or when you are being physically active?

Yes	No

Do you suffer from unexplained dizziness, or have you lost consciousness in the last 12 months?

Yes	No

Have you been diagnosed with any other chronic medical conditions (e.g., diabetes mellitus, asthma, etc.) and/or are you taking any chronic medication?

Yes	No	If yes, please specify

Are you pregnant or have you recently given birth?

Yes	No

Do you currently have any injuries (joint, soft tissue or bone related) that could be made worse by physical activity

Yes	No	If yes, please specify

Has a doctor ever advised that you should only participate in supervised physical activity?

Yes	No

Do you have any safety concerns with regards to physical activity or your general health?

Yes	No	If yes, please specify

On a scale of 1-10 (1=extremely poor to 10=excellent) how would you rate your overall health? ___________________________

In the last 6 months have you had any of the following:

	Yes	No	Unsure
Influenza			
Common cold			
Covid-19			
Asthma attack			
High cholesterol			

8.6 Appendix F – SIT-Q-7d Questionnaire

These questions are about the amount of time that you spent **sitting or lying down** in the **last 7 days**. This questionnaire is organised into five sections, each asking about sitting or lying down in different settings.

Please **first answer** the question below and read the instructions underneath, which will help you to complete this questionnaire.

Please tick one box only:

Compare your amount of sitting time over the **last 7 day** with a **typical week** for you. **In the last 7 days**, my amount of sitting was…				
Much less than normal	A little less than normal	About the same	A little more than normal	A lot more than normal

Instructions:

1. Please complete the following sections by thinking about the **last 7 days**.
2. Each period of sitting down **should only be entered once** on this questionnaire. For example, if you spent one hour sitting on the sofa reading a book while you were listening to music, count this time as one hour reading if this was your main focus. Do not also count this as one hour listening to music.
3. If there is a big difference between different weekdays or between different weekend days for some answers, then tick the box which is nearest to the **average** for those weekdays or weekend days **in the last 7 days**.
4. The focus of this questionnaire is **sitting and lying** while doing the activities specified below. If some of these activities also involved standing or walking around, please try to only include the time spent sitting and lying during these activities.
5. If you tick the wrong box, please put a large cross through it and then tick the correct box.

Please try to answer every question as accurately and honestly as possible. Your answers will be treated as strictly confidential.

SECTION 1 - SLEEPING AND NAPPING

Sleeping: Think about what time you went to sleep and got up in the last 7 days. If you had variable sleeping patterns (e.g. you did shift work), please record the average time you went to bed and got up on weekdays and on weekend days.

*** DO NOT INCLUDE:** reading or watching TV before falling asleep or after waking. This is part of section 5

	1. In the last 7 days,	
	At what time did you go to sleep?	At what time did you get up?
Weekday	_______ (pm □ / am □)	_______ (pm □ / am □)
Weekend day	_______ (pm □ / am □)	_______ (pm □ / am □)

Napping: A nap is a brief period of sleep, often during the day. A nap can be taken on a sofa as well as in a bed.

Please tick **one** box only per line

	2. In the last 7 days, on average, how long did you nap per day?					
	No daily napping	1-15 min	15-30 min	30-45 min	45 min – 1 hour	More than 1 hour a day
Weekday						
Weekend day						

SECTION 2 – MEALS

Please think about the amount of time spent sitting for breakfast, lunch, dinner, on average in **the last 7 days**

* **DO NOT INCLUDE:** time spent eating while watching tv. This is part of section 5.

* DO INCLUDE: time spent sitting for breakfast lunch and dinner (at home, work, …), also when you are reading, chatting to other people or listening to the radio. For example if you spent 30 minutes sitting for breakfast while reading the newspaper, or for lunch while working, then include this in this section

Please tick **one** box only per line.

	3. **In the last 7 days**, on average, how long did you sit for each of these meals per day?						
	None	1-10 min	10-20 min	20-30 min	30-45 min	45-1 hour	More than 1 hour a day
Weekday							
Breakfast							
Lunch							
Supper							
Weekend day							
Breakfast							
Lunch							
Supper							

SECTION 3 – TRANSPORTATION

This section refers to the time you spent sitting during transportation (travelling in a car, bus, train, on a motorbike, etc.) in the last 7 days. The questions are about travelling to and from your occupation, travelling as part of your occupation, and getting about apart from your occupation.

"Occupation" refers to three different types of activities: work, study and volunteering. "Work" refers to all tasks done to earn money. "Study" refers to educational activities. "Volunteering" refers to work that you do for no pay, such as helping in a sports club. Please think about **all three** of these categories for the following questions.

* **DO NOT** INCLUDE: Cycling on a deal bicycle

4. Have you been working, studying or volunteering (referred to as "occupation") in **the last 7 days?**	Yes ☐
	No ☐

*If you did not have an occupation in the last 7 days, please skip to the **"Getting about – apart from your occupation" section** below.
*If you did have an occupation, please answer the questions below. There is space for two different occupations ("Occupation 1" and "Occupation 2").

Travelling to and from your occupation:

5. **In the last 7 days**, how many days a week did you sit while travelling to and from your occupation? (in a car, bus, train, on a motorbike, etc.; do not include cycling on a pedal bicycle)	**Occupation 1: ____________ days**
	Occupation 2: ____________ days

Please tick **one** box only per line:

	6. **In the last 7 days,** on average, how long did you sit while travelling to and from your occupation on such a day? (in a car, bus, train, on a motorbike, etc.; do not include cycling on a pedal bicycle)

	None	1-15 min	15-30 min	30-45 min	45 min- 1 hour	1-1.5 hours	1.5-2 hours	2-2.5 hours	2.5-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	More than 7 hours
Occupation 1														
Occupation 2														

Traveling as part of your occupation:

Now think about the time you **sit** while travelling as part of your occupation, for example driving from one customer to another, driving a taxi, etc.

7. **In the last 7 days,** how many days a week did you sit while travelling as part of your occupation? (in a car, bus, on a motorbike, etc.; do not include cycle on a pedal bicycle)	**Occupation 1: __________ days** **Occupation 2: __________ days**

Please tick **one** box only per line:

	8. **In the last 7 days,** on average, how long did you sit while travelling as part of your occupation on such a day? (in a car, bus, train, on a motorbike, etc.; do not include cycle on a pedal bicycle?)													
	None	1-15 min	15-30 min	30-45 min	45 min- 1 hour	1-1.5 hours	1.5-2 hours	2-2.5 hours	2.5-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	More than 7 hours
Occupation 1														
Occupation 2														

Getting about – apart from your occupation

Now think about the time you sit while getting about apart from your occupation, for example when going to the supermarket, going to visit friends, etc. Please include time spent sitting to and from your destination.

Please tick **one** box only per line:

	9. **In the last 7 days,** on average, how long did you sit for getting about apart from your occupation per day? (in a car, bus, train, on motorbike, etc.; do not include cycling on a pedal bicycle)													
	None	1-15 min	15-30 min	30-45 min	45 min- 1 hour	1-1.5 hours	1.5-2 hours	2-2.5 hours	2.5-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	More than 7 hours
Weekday														
Weekend day														

SECTION 4 – WORK, STUDY AND VOLUNTEERING

This section is about the time you spent sitting during your occupation, which refers to work, study and volunteering. Please think about all three of these categories for the following questions.

10. Did you have an "occupation" **in the last 7 days**?	Yes ☐
	No ☐

* If you did not have an occupation in the last 7 days, please skip to **section 5**.
* If you did have an occupation, please complete this section. There is space for two different occupations ("Occupation 1" and "Occupation 2").

Occupation

11a. Type of occupation 1: Work ☐ Study ☐ Volunteering ☐

12a. Name of occupation 1 (e.g. receptionist) ______________________________

13a. How many days did you do occupation 1 **in the last 7 days**? ______________________ days
14a. **In the last 7 days**, on average, how much time per day did you spend sitting while doing occupation 1?

DO NOT INCLUDE**:**

- time spent sitting for transportation (in a car, bus, train, on a motorbike, etc.) either for travelling to and from this occupation, or as part of this occupation. This was part of section 3.
- breakfast, lunch or dinner. This was part of section 2.

Please tick **one** box only

None	1-15 min	15-30 min	30- 1 hour	1-2 hours	2-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	7-8 hours	More than 8 hours

15a. **In the last 7 days**, on average, how many times per day did you interrupt your sitting time while doing occupation 1, for example by standing up, walking somewhere, or getting a coffee? ______________________ times

16. Did you have an "occupation" **in the last 7 days**?	Yes ☐
	No ☐

* If you did not have a second occupation in the last 7 days, please skip to **section 5**.
* If you did have a second occupation in the last 7 days, please answer the questions below.

11a. Type of occupation 2: Work ☐ Study ☐ Volunteering ☐

12a. Name of occupation 2 (e.g. receptionist) ____

13a. How many days did you do occupation 2 **in the last 7 days**? ____________________________ days

14a. **In the last 7 days**, on average, how much time per day did you spend sitting while doing occupation 2?

DO NOT INCLUDE**:**

- time spent sitting for transportation (in a car, bus, train, on a motorbike, etc.) either for travelling to and from this occupation, or as part of this occupation. This was part of section 3.
- breakfast, lunch or dinner. This was part of section 2.

Please tick **one** box only

None	1-15 min	15-30 min	30- 1 hour	1-2 hours	2-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	7-8 hours	More than 8 hours

15a. **In the last 7 days**, on average, how many times per day did you interrupt your sitting time while doing occupation 2, for example by standing up, walking somewhere, or getting a coffee? ___________________________ times

SECTION 5 – SCREEN TIME AND OTHER ACTIVITIES:

This last section refers to the time you spent sitting or lying down during other activities in the last 7 days. Remember, each period of sitting down should only **be entered once**. For example, if you spent one hour sitting on the sofa reading a book while you were listening to music, count this time as one hour of reading if this was your main focus. Do not also count this as one hour of listening to music.

Please tick **one** box only per line

	17. **In the last 7 days**, on average, how long did you spend sitting or lying in the following activities per day?											
		None	1-15 min	15-30 min	30 min – 1 hour	1-2 hours	2-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	More than 7 hours
Watching TV, DVDs, etc. * DO include meals while sitting and watching TV	**Weekday**											
	Weekend day											
Using a computer/mobile phone apart from work (internet, email, social media, etc.)	**Weekday**											
	Weekend day											
Playing computer games (PlayStation, Xbox, etc) *** DO NOT include non-sitting games**	**Weekday**											
	Weekend day											

Now think about the total time you spent **watching TV** in the last 7 days.
* If you did not watch TV in the last 7 days, please skip to the **“Other activities” section** below.
* If you did watch TV in the last 7 days, please answer the questions below.

18. **In the last 7 days**, on average, how many times per day did you interrupt your sitting time while watching TV for example, by standing up, walking somewhere, or getting a drink? ________________________________ times

Snacking while watching TV: This is about how often you had snacks or drinks while watching TV in the last 7 days in addition to your usual meals. Only think of snacks which are not part of your breakfast, lunch or dinner.

Please tick **one** box only per line:

	19. **In the last 7 days**, on average, how often did you have the following snacks while watching tv in addition to your breakfast, lunch or dinner?									
	None	1-2 times a week	3-4 times a week	5-6 times a week	Once a day	2 times a day	3 times a day	4 times a day	5 times a day	More than 5 times a day
Savoury snacks (e.g. crisps, nuts)										
Sweets, chocolate, cakes, biscuits										
Ice cream, chocolate mousse, etc										
Yoghurt										
Soda (e.g. coke)										
Fruit juice										
Fruit										
Milk, milkshake, hot chocolate										
Tea or coffee										
Alcoholic drinks:										

Other:____										

Other activates:
Please remember that each period of sitting down should **only be entered once**.

Please tick **one** box only per line.

	20. in the last 7 days on average, how long did you spend sitting or lying down in the following activities per day?											
		None	1-15 min	15-30 min	30 min- 1 hour	1-2 hours	2-3 hours	3-4 hours	4-5 hours	5-6 hours	6-7 hours	More than 7 hours
Sitting while reading (book, magazine, etc.)	Weekday											
	Weekend day											
Sitting while doing household tasks (cooking, ironing, etc.)	Weekday											
	Weekend day											
Sitting while caring for children, grandchildren, elderly, disabled relatives, etc.	Weekday											
	Weekend day											
Sitting for hobbies (playing piano, cards, crosswords, etc.)	Weekday											
	Weekend day											
Sitting for socializing (visiting friends, pub, cinema, sport event, etc)	Weekday											
	Weekend day											
Sitting while listening to music (radio, iPod, CD, etc)	Weekday											
	Weekend day											

Sitting for other activities (write below) ____________________	Weekday											
	Weekend day											

8.7 Appendix G – Satisfaction with Life Scale

Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on in the block preceding that statement. Please be open and honest in your response.

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

Statement:	**Score:**
In most ways my life is close to my ideal.	
The conditions of my life are excellent.	
I am satisfied with my life.	
So far, I have gotten the important things I want in life.	
If I could live my life over, I would change almost nothing.	

8.8 Appendix H – Data Collection Sheet

D/O/B: ________________ Phone type: _______________

Email address: ____

Height (cm):		Weight (kg):		BMI (kg.m^2)	BMI class:
Hip circumference:	1:	2:	3 (if >5mm):	WHR: WHR class:	
Waist circumference:	1:	2:	3 (if >5mm):		
Blood pressure (mmHg):	1:	2:	3 (if >5mmHg)	Mean BP: Cardiac meds: Y / N	
Heart rate (bpm):	1:	2:	3 (if >100bpm):	Mean HR:	
Glucose:				Glucose meds Y / N:	
Cholesterol:				Cholesterol meds Y / N:	

<u>Questionnaires:</u>

	Complete:	Incomplete:	Score (if applicable):
Sociodemographic:			
SIT-Q-7d:			
SWLS:			

8.9 Appendix I – Log Book

Logbook for the break-up of sedentary behaviour:				
Date:	**Time:**	**Activity completed: [√] [X]**	**Time:**	**Activity completed: [√] [X]**
	08h00		**13h00**	
	09h00		**14h00**	
	10h00		**15h00**	
	11h00		**16h00**	
	12h00		**17h00**	

8.10 Appendix J - Information Sheet (Focus Group)

<u>USING MOBILE TECHNOLOGY TO REDUCE SEDENTARY TIME IN EMPLOYEES OF A JOHANNESBURG MARKETING COMPANY</u>

Good day,

My name is Kristi Kallmann, and I am a Masters student at the University of the Witwatersrand.

I am interested in conducting a focus-group discussion with the participants of the intervention group to determine the feasibility of the e-health app on addressing sedentary behaviour in your office space.

If this focus-group is something you would be interested in, please read the information below carefully. If you are interested in being part of the focus group, please sign the consent form attached.

The focus group would take place 1 week post-intervention. I will send out an invitation to members of the intervention group of the study. During this focus-group discussion I will try and gather as much information regarding the intervention process you will undergo, namely; the e-health prompt app. The aim of the focus-group is to help future researchers better utilise the information from this study.

The nature of the focus-group will be informal and relaxed, the researcher will simply ask questions and you will provide honest feedback. There are no correct or incorrect answers.

The focus-group will make use of voice recordings which should last around 1-hour, this is just for the researcher to refer back to at a later stage. The recording of the session will only be available to the researcher, and not shared with anyone else.

Due to the nature of the focus-group, anonymity is not possible. However, if the researcher wishes to make use of something you said during the session, you will be assigned a code and this code will be used instead of your identifiable information (eg.name); this will ensure that your confidentiality is maintained throughout.

Please note you may withdraw from the study or withdraw consent at any stage once the study has started, this will be without any prejudice or negative consequences to the participant. All results will be completely confidential. Results will only be made available to the researcher and yourself at the end of the study. Ethical approval from the University of the Witwatersrand will be obtained before the study will commence.

Thank you for considering being a part of this study. Please make sure you are familiar with the above information before signing the informed consent. If you have any questions or concerns, feel free to contact me.

Contact details:
Kristi Kallmann (investigator)
076 141 6956
krkallmann@gmail.com

If you have any issues regarding the investigator, please feel free to contact:
Prof Philippe Gradidge: +27 11 717 3372 or Philippe.gradidge@wits.ac.za
Ms. Natalia Neophytou +27 11 717 3368 or Natalia.Neophytou@wits.ac.za

This study will seek approval by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research
The telephone numbers for the Committee secretariat are 011 717 2700/1234, Ms. Zanele Ndlovu (Zanele.Ndlovu@wits.ac.za).

8.11 Appendix K – Focus Group Discussions

Introduction:

- Researcher (moderator) will explain the purpose of the focus group
- Why these participants were selected to participate in focus group
- Explain that the results will be used in MSc dissertation
- Explain that focus group will be recorded, however, each participant will be allocated a number that will be used for results to keep confidentiality

Guidelines for session:

- No "correct" or "incorrect" answers to questions – aim of the group is to hear opinion of participants
- Session is recorded – so only one person to speak at a time
- Relaxed, informal session - with first name basis
- Role of researcher is to guide the session and ask questions

5 major topics will be covered in session (with sub-questions for each topic):

1. **Enjoyment of the intervention**
    a. Tell me about a positive experience you've had with regards to the intervention?
    b. Favourite aspect of the intervention?
    c. Which element do you think worked the best?
    d. Did you find the weekly health messages kept you motivated? Did you find them informative?
    e. Have you continued to use the app even though the intervention has ended?
2. **Obstacles they found which affects adherence**
    a. Tell me about any negative experience you've had with regards to the intervention?
    b. If you could eliminate one feature of the intervention, what would you pick and why?
    c. How did you find the time duration of the prompt (every hour) and the duration of the physical activity (3-min walk)?
    d. Did you find any obstacles within the workplace that stopped or hindered your adherence to the intervention?
3. **Perceived benefits of the intervention**
    a. Did your opinion on your health (physical or mental) change during the course of the study?
    b. Did you find you had any changes in your focus/productivity during the study?
    c. Did you feel more energised during the study?
    d. How was your quality of sleep?
    e. Would you say you were more conscious about how long you engage in prolonged sedentary behaviour?
4. **Recommendations**
    a. What area of the study do you think could have been improved?
    b. If you were in charge and could make 1 change to the intervention, what change would that be?

c. One feature of the study, that you believe could be developed further.
d. Any recommendations on how to make the workplace/environment better at decreasing the sedentary behaviour of its workers?

5. **Impact of NCDs on South African population**
    a. Were you aware of the risks associated with NCDs before the study?
    b. Any recommendations on how to improve NCDs awareness in South Africa?
    c. What other factors do you think can be addressed to decrease the prevalence of NCDs in South Africa? (e.g., Educations, Socio-economic class, awareness, etc)
    d. Do you think technology has been a factor with regards to the increase of NCDs over the past few decades?

<u>Closing questions:</u>

- Would you say this is an adequate summary of everything you wanted to say regarding the intervention?
- Do you think we missed anything, or do you have any closing remarks or comments?

<u>End of session:</u>

- Ask if there are any last remaining questions from participants
- Thank participants for time and agreeing to be part of study

8.12 Appendix L – Informed Consent (Focus Group)

I, ____ (full name(s) and surname) consent to be a participant in the focus-group discussion for the research titled: "Using mobile technology to reduce sedentary time in employees of a Johannesburg marketing company".

I fully understand the procedure and I understand and appreciate their purpose. I am aware of any risks involved in participating, and the extent of my involvement.

I understand that with the focus-group discussion my anonymity cannot be maintained, due to the group nature of the discussion.

I have read the Information Sheet provided and I understand all it entails.

I understand that my participation in the research study is completely voluntary, and I understand that I am free to withdraw from the study at any point in time without prejudice or negative consequences.

I understand that the research study will be sanctioned by the Committee for Research on Human Participants for the University of the Witwatersrand, Johannesburg.

Signature of participant: _______________________ Date: _____________________

Signature of researcher: _______________________ Date: _____________________

8.13 Appendix M – Informed Consent (recording of Focus Group)

I, ____ (full name(s) and surname) consent to the voice recording of the focus-group discussion for the research titled: "Using mobile technology to reduce sedentary time in employees of a Johannesburg marketing company".

I fully understand the procedure and I understand and appreciate the purpose of the voice recording. I am aware of any risks involved in participating, and the extent of my involvement.

I understand that with the focus-group discussion my anonymity cannot be maintained, due to the group nature of the discussion.

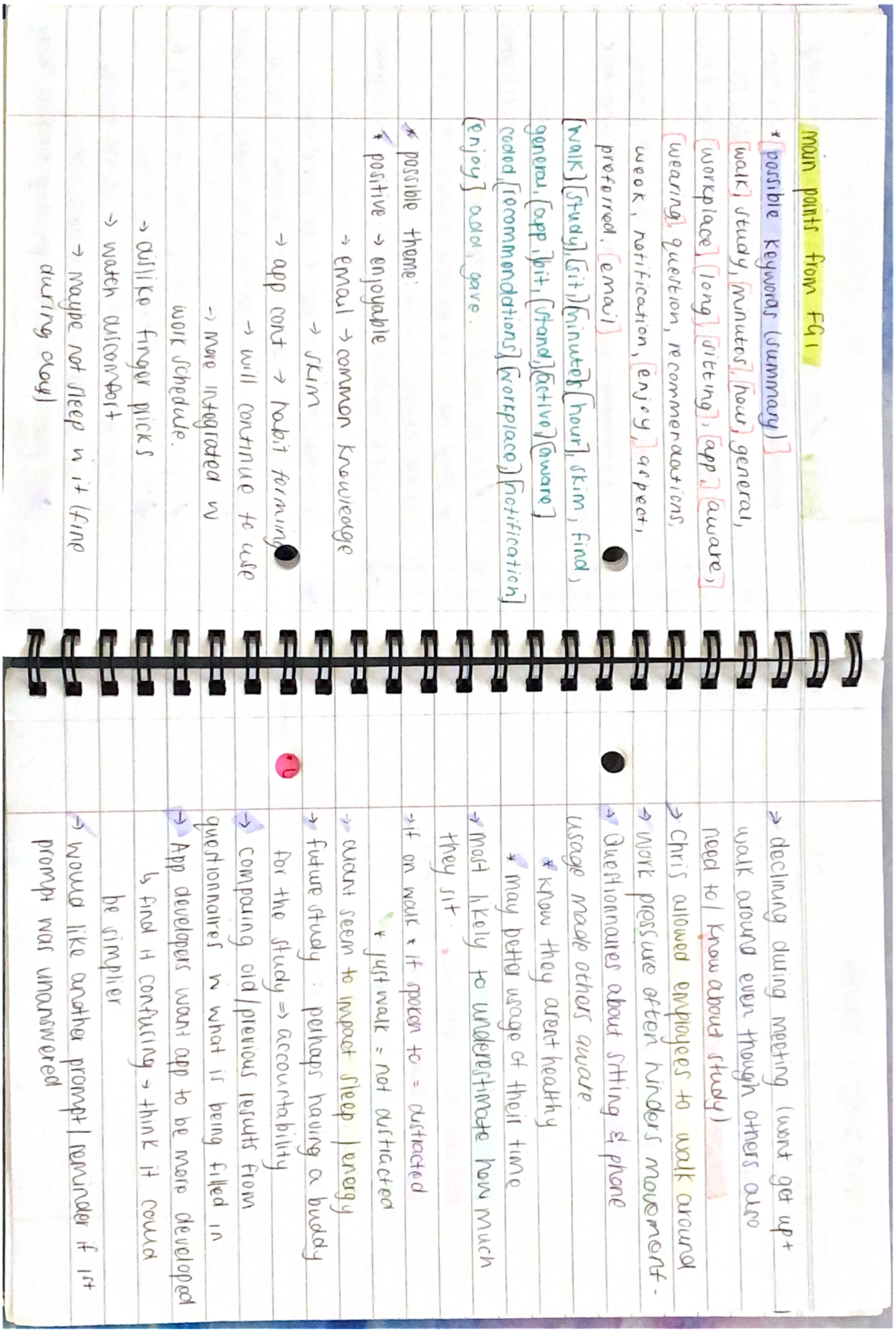
I have read the Information Sheet provided and I understand all it entails.

I understand that my participation in the research study is completely voluntary, and I understand that I am free to withdraw from the study at any point in time without prejudice or negative consequence.

I understand that the research study will be sanctioned by the Committee for Research on Human Participants for the University of the Witwatersrand, Johannesburg.

Signature of participant: ______________________ Date: ____________________

8.14 Appendix N – Sample Photo of Researchers Qualitative Notes

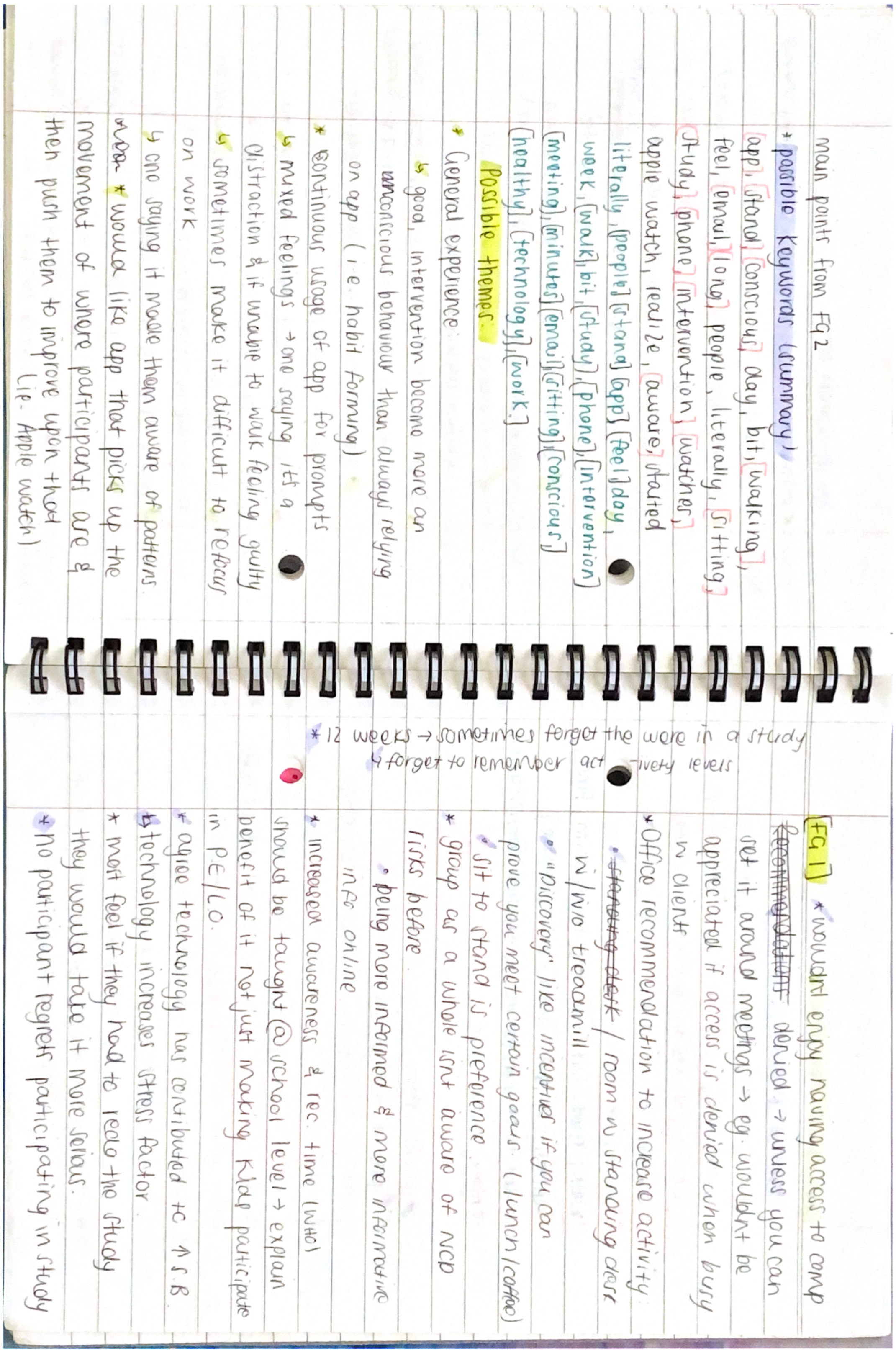


main points from FG1
* possible keywords (summary)
walk, study, minutes, hour, general,
workplace, long, sitting, app, aware,
wearing, question, recommendations,
week, notification, enjoy, aspect,
preferred, email
walk, study, sit, minutes, hour, skim, find,
general, app, bit, stand, active, aware
coded, recommendations, workplace, notification
enjoy, add, gave.

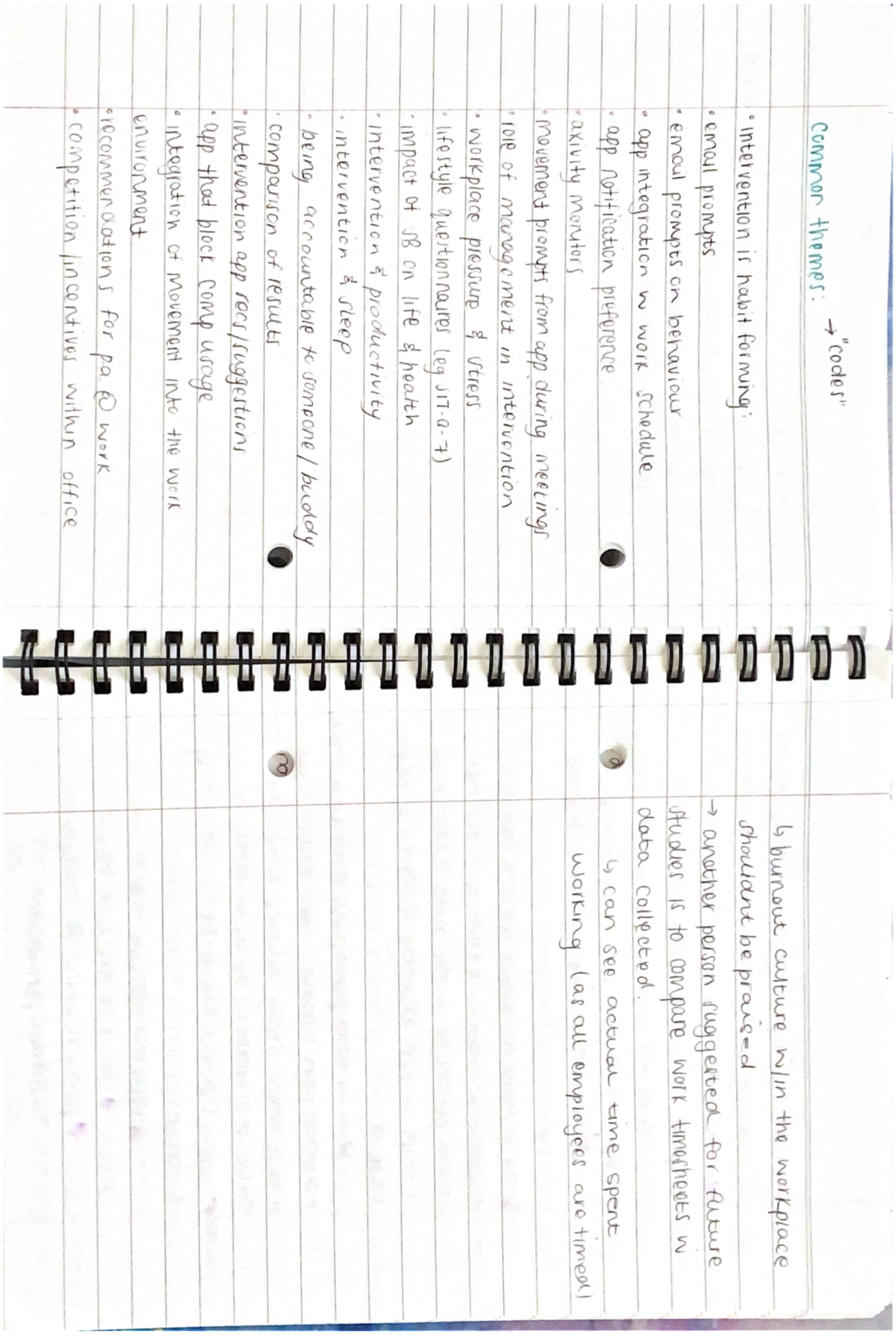
* possible theme:
* positive → enjoyable
→ email → common knowledge
→ skim
→ app cont → habit forming
→ will continue to use
→ more integrated w
work schedule.
→ dislike finger pricks
→ watch discomfort
→ maybe not sleep w it (fine
during day)

→ declining during meeting (wont get up + walk around even though others also need to / know about study)
→ Chris allowed employees to walk around
→ work pressure often hinders movement.
→ Questionnaires about sitting & phone usage made others aware
* know they aren't healthy
* may better usage of their time
→ most likely to underestimate how much they sit.
→ if on walk * if spoken to = distracted
* just walk = not distracted
→ didn't seem to impact sleep / energy
→ future study : perhaps having a buddy for the study ⇒ accountability
→ comparing old / previous results from questionnaires w what is being filled in
→ App developers want app to be more developed
↳ find it confusing → think it could be simpler
→ would like another prompt / reminder if 1st prompt was unanswered

8.15 Appendix O – Sample Photo of Researchers Notes for Thematic Analysis



8.16 Appendix P – Sample Photo of Researchers Notes for Emerging Themes



8.17 Appendix Q – Turnitin Summary Report

USING MOBILE TECHNOLOGY TO REDUCE SEDENTARY TIME IN EMPLOYEES OF A JOHANNESBURG MARKETING COMPANY

ORIGINALITY REPORT

10%	7%	8%	3%
SIMILARITY INDEX	INTERNET SOURCES	PUBLICATIONS	STUDENT PAPERS

PRIMARY SOURCES

1	wiredspace.wits.ac.za Internet Source	1%
2	"Sedentary Behaviour Epidemiology", Springer Science and Business Media LLC, 2018 Publication	<1%
3	Dunning, Jason Robert. "The Effect of Interrupting Sedentary Behaviour on the Cardiometabolic Health of Adults with Sedentary Occupations", University of the Witwatersrand, Johannesburg (South Africa), 2025 Publication	<1%
4	eprints.leedsbeckett.ac.uk Internet Source	<1%
5	Submitted to University of Witwatersrand Student Paper	<1%
6	hdl.handle.net Internet Source	<1%