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Associations Between Health-Related Quality of Life, Self-Reported and Accelerometer-Measured Physical Activity, and Socioeconomic Status among Schoolchildren in Gqeberha

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Abstract

Background: Health-related quality of life (HRQoL) and physical activity (PA) are critical factors for overall well-being, with PA positively impacting HRQoL. However, socioeconomic challenges in South Africa pose barriers to PA participation for underprivileged children, affecting their HRQoL. When studying relations between HRQoL, PA and socioeconomic status (SES), self-reports and accelerometers each present methodological implications by reflecting different facets of PA. Understanding these relationships using both measures of PA could improve guiding interventions and policies.

Methods: Cross-sectional data of 572 children (8 – 13 years) from underprivileged neighborhoods in Gqeberha, South Africa, was analyzed. ANCOVAs and spearman rank correlations were performed to examine relationships between PA and HRQoL. To explore relations for PA and HRQoL across SES, either Kruskal-Wallis-Tests or ANOVAs, and spearman rank correlations were performed.

Results: Self-reported PA predicted HRQoL ($p = 0.023$), while accelerometer-measured PA did not ($p = 0.325$). Stratified by sex, correlations between self-reported PA and HRQoL remained in girls only ($p = 0.015$). Self-reported PA differed between groups of SES ($p < 0.001$), while sex-specific group differences remained in boys ($p < 0.001$). WHO PA guidelines were met by 82% of boys and only 45.5% of girls. No associations were found between HRQoL and SES.

Conclusion: Findings demonstrate that self-reported PA is positively associated with HRQoL and provides valuable information when used in combination with accelerometer-measured PA. The fact that girls' PA levels are low and remain unchanged across SES highlights the need for more PA opportunities and enhancing social correlates for girls to engage in PA. Structural adjustments are needed to provide equitable access to PA across SES in South Africa.

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List of Abbreviations

SES	socioeconomic status
HRQoL	health-related quality of life
PA	physical activity
PAQ-C	Physical Activity Questionnaire for Older Children
SB	sedentary behavior
LPA	low physical activity
MPA	moderate physical activity
VPA	vigorous physical activity
MVPA	moderate to vigorous physical activity
HIC	high-income countries
LMIC	low and middle-income countries
WHO	World Health Organization
NCDs	non-communicable diseases
CVDs	cardiovascular diseases
PE	physical education

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1 Introduction

Inequalities in health are undoubtedly a legitimate global concern (Marmot & Bell, 2016). These inequalities are subject to various influences on health, such as: (i) socioeconomic, cultural, and environmental conditions; (ii) social and community networks; and (iii) individual lifestyle factors, such as, e.g., physical activity (PA) (Dahlgren & Whitehead, 1991). It is needless to say that disadvantages in early childhood may well persist into adulthood.

In the research fields of public health, medicine, and psychology, "health-related quality of life" (HRQoL) is frequently used to measure and monitor health. It is a concept that encompasses a subjective representation of a person's physical and psychosocial well-being (Solans et al., 2008). Indeed, it has been shown that HRQoL shows great stability over time, from childhood to adulthood (Meade & Dowswell, 2016). Furthermore, it has been demonstrated that PA has a favorable impact on children's and adolescents' HRQoL in both the physical and psychosocial domains through its physiological, behavioral, and social components (X. Y. Wu et al., 2017). Consequently, Meade & Dowswell (2016) argue that HRQoL enhancing lifestyle behaviors such as regular PA should already be a priority during childhood. This is especially crucial for children of low socioeconomic status (SES), who show lower levels of HRQoL (Rajmil et al., 2014) and experience more barriers to participation in sports (Peralta et al., 2019).

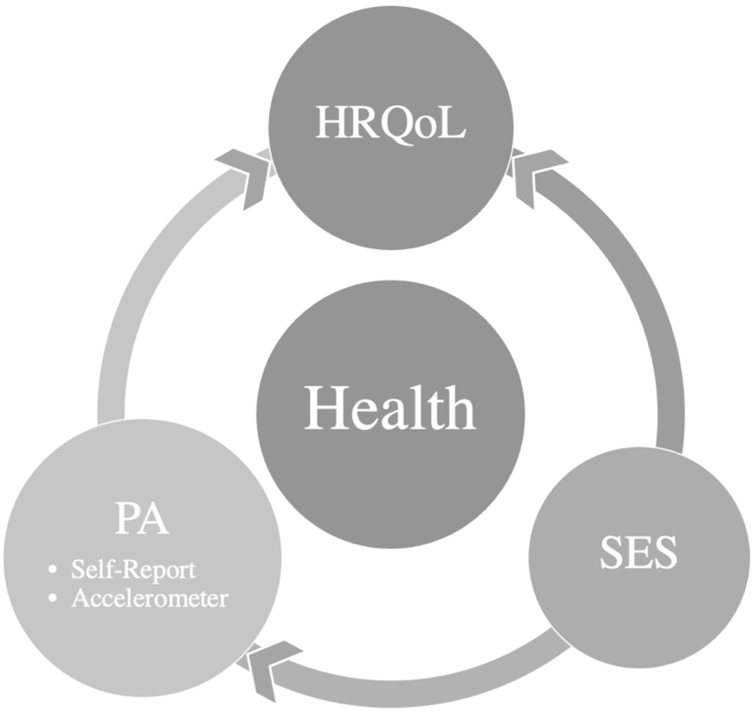

Figure 1. *Illustration of the Main Study Variables HRQoL, PA and SES*

In order to make recommendations for the general public or PA interventions and reach the most vulnerable populations accordingly, understanding the relations between HRQoL, PA, and SES (see Figure 1) is crucial (Chai et al., 2010). In the case of PA and its relations with

HRQoL, the choice of PA assessment method has been observed to be of great importance since varying methodological choices have been found to deliver differing results (Marker et al., 2018). It has been argued that the two most frequently used methods – self-reports and accelerometers –reflect different facets of the construct of PA (Marasso et al., 2021). Literature suggests that considering both measures simultaneously may provide important insights into the relationship between HRQoL and PA (Marasso et al., 2021; Wunsch et al., 2021).

When placing the aforementioned processes within the context of South Africa, several key components emerge. Currently, there is little research available on the PA and/or HRQoL of schoolchildren in South Africa, and while socioeconomic inequalities in health are prevalent, efforts to promote healthy lifestyles in children should be made (Draper et al., 2018). According to the "2018 Report Card for South Africa on Physical Activity for Children and Youth", South Africa is not making enough progress in promoting safe and accessible PA opportunities, and especially PA for children from low-income settings is often limited due to safety concerns (Draper et al., 2018). In fact, children from disadvantaged communities with low SES report lower levels of PA (McVeigh et al., 2004) and potentially lower levels of HRQoL than their peers with high SES. Overall, social inequalities in South Africa are a major issue, with those from low socioeconomic backgrounds showing greater numbers of ill-health while good health is in favor of high-income groups (Ataguba et al., 2016).

In reference to these findings, one way to address the problem of social inequity in mental, social, and physical health in children and adolescents has been brought forward by Elsborg et al. (2019), who suggest the implementation of PA interventions among those living in low socioeconomic settings. Indeed, these interventions may address these problems by applying a holistic approach of inducing a sustainable health behavior change in school settings and potentially increase HRQoL despite low SES, especially since children spend most of their waking time at school. Aldridge & McChesney (2018), for example, found strong evidence that school climate plays an important role in influencing adolescents' mental and psychosocial well-being.

Given the close interconnectedness and dependency with which environmental, cultural, and individual factors impact HRQoL and PA, findings from differing countries should be considered with caution when applied elsewhere. Sampasa-Kanyinga et al. (2017) criticize a "one-size-fits-all" approach, which is unlikely to consistently achieve the same outcomes when planning interventions to improve lifestyle behaviors. For instance, PA patterns have been observed to differ across SES between rural and urban settings and countries (McVeigh et al., 2004; Stalsberg & Pedersen, 2010).

The overarching project *KaziBantu,* this thesis is part of, is a school-based intervention with the goal of strengthening physical activity practices and providing a framework for physical literacy and a healthy active lifestyle for schoolchildren and teachers in disadvantaged neighborhoods in Gqeberha, South Africa. The aim of this master's thesis is to investigate the association between HRQoL, self-reported and accelerometer-measured PA across SES among schoolchildren from disadvantaged neighborhoods in Gqeberha.

2 Definitions and Theoretical Framework

The sections of this chapter describe the underlying constructs of the main study variables and situate them in the global and South African contexts. The study variables of HRQoL, PA, and SES are always influenced by the methods used to obtain data, thus it is important to understand what each variable entails in the underlying research. As a result, variables will be presented in a way that helps readers comprehend what they reflect in the underlying thesis.

2.1 Health-Related Quality of Life

Advances in medicine and public health in the last decade were able to increase life expectancy, especially in the "Western World" (Ravens-Sieberer & Kidscreen Group Europe, 2016). With longer life expectancy and modern lifestyle behaviors, other difficulties, such as chronic diseases, have increased in the general population, which led to a paradigm shift of not only focusing on "quantity" of life but also expanding how well-being is assessed within the notion of "quality" of life. The concept of "quality of life" has been increasingly researched and comprises nearly all areas of living with the goal of representing a person's satisfaction (or dissatisfaction) with their life. A subsequently developed concept is "health-related quality of life", which is used to assess a person's physical and psychosocial well-being (Ravens-Sieberer & Kidscreen Group Europe, 2016). It accounts for central aspects of health, which – as defined in the constitution of the WHO – is not only the absence of a disease but "a state of complete physical, mental, and social well-being", thus not only somatic factors are contributing to health (WHO, 1948). HRQoL is a multidimensional construct based on self-report with the aim of reflecting a subject's perception of their physical, psychological, and social functioning (Solans et al., 2008). Within the research fields of psychology, medicine, and public health, the progress in the conceptualization and measurement of HRQoL has led to many well accepted tools and questionnaires for assessing HRQoL in adults as well as children and adolescents. To note, however, most tools were developed in the United States and European countries (Solans et al., 2008). The way how a child judges his or her own health and well-being is determined by age, maturity, and cognitive development (Ravens-Sieberer & Kidscreen Group Europe, 2016). That is why differences in assessing HRQoL compared to adults must be accounted for and why questionnaires, such as the KIDSCREEN questionnaires for children and adolescents between the ages of 8 and 18, have been specifically developed.

2.1.1 Measuring Health-Related Quality of Life

The KIDSCREEN project aimed at collectively developing a generic assessment tool for HRQoL in children and adolescents while addressing challenges of language and cross-cultural differences in a number of European countries. The KIDSCREEN-10 index used for this thesis is a reduced questionnaire providing a global HRQoL score that describes whether a child feels happy, fit, and satisfied with regards to family life, peers, and school life or not. While the KIDSCREEN-10 index is easily applicable with only 10 questions, it does not provide the depth and distinctness with which the often-used KIDSCREEN-52 and -27 questionnaires describe the respective HRQoL dimensions. The KIDSCREEN-27 questionnaire is composed of five subscales or dimensions: physical well-being, psychological well-being, autonomy and parent relations, peers and social support, and school environment. The KIDSCREEN-52 questionnaire is even more precise, with 52 items covering 10 dimensions in three domains (physical, psychological, and social well-being). Hence, in subsequent chapters, results from studies on HRQoL will refer to the abovementioned dimensions and subscales when discussing their associations with influencing factors.

The KIDSCREEN group mentions several determinants of HRQoL that are discussed in literature, such as age and gender, health status, mental health, familial SES, parent-child relationship, and social support, which were analyzed in a study conducted in 13 European countries. The results showed that a higher SES was associated with a higher KIDSCREEN-10 index score. A strong negative association was found between the occurrence of psychosomatic health complaints as well as mental health problems and the KIDSCREEN-10 index score. Furthermore, poor social support and parent-child relations were associated with a lower KIDSCREEN-10 index score (Ravens-Sieberer & Kidscreen Group Europe, 2016). In general, PA is well known to have a positive influence on HRQoL (X. Y. Wu et al., 2017).

2.1.2 Health-Related Quality of Life in South Africa

There are few appropriate instruments for HRQoL assessment in low-resource settings; however, there have been a few studies investigating the reliability of assessment tools in such environments. Masquillier et al. (2012) found that the shorter KIDSCREEN-27 questionnaire, after being adjusted to language and culture-specific differences, is a good HRQoL measure in adolescents living with HIV in Eastern Africa. For the use of the KIDSCREEN questionnaires in a South African context, Taliep & Florence (2012) indicate that the KIDSCREEN-52 questionnaire is an internally reliable tool for assessing HRQoL in South African adolescents. Further, the KIDSCREEN-27 questionnaire has been successfully used in a population of South African children from the Gqeberha area, which is similar to that of my study population (Gall et al., 2020; Salvini et al., 2018).

To my knowledge, little research has been done on HRQoL in children and adolescents in South Africa. Nevertheless, recent papers on HRQoL were published by Gall et al. (2020) and Salvini et al. (2018). They both used similar data on children in Gqeberha as part of the *KaziBantu* Project. Their results enable us to compare HRQoL of these children to data collected with the KIDSCREEN tool in other countries as well as provide a better understanding of its relation to PA. Furthermore, a study conducted by Van Hout et al. (2013) found that adolescents engaging in PA had better quality of life than those who were less active. In general, however, not many studies are available on how inequalities in South Africa affect the HRQoL of children and adolescents. In light of prevalent inequalities in health in South Africa (Ataguba et al., 2016) and the double burden of both communicable and non-communicable diseases (NCDs), the research and monitoring of HRQoL in treatment or lifestyle behavior (such as PA or screen time) interventions would provide great insights (Müller et al., 2019).

2.2 Physical Activity

It is known that physical activity is a key factor in promoting and sustaining people's physical and psychosocial health and well-being (Ortega et al., 2008). Regular PA is a protective factor for numerous NCDs and can increase life expectancy (Lee et al., 2012). It has positive implications for sleep (Lang et al., 2016) and mental health (Schuch et al., 2016), can reduce stress, and can improve overall physical and mental well-being (Das & Horton, 2012). Das & Horton (2012) extend their view on PA, arguing that it may not only contribute to better physical health but also give a sense of purpose and value in life and create deeper social connections.

In order to be sufficiently physically active, the WHO recommends an "average of at least 60 minutes of moderate to vigorous physical activity per day for children and adolescents aged 5 – 17 years" (WHO, 2022b). The estimates for children globally are concerning, with only around 19% of children and adolescents between the ages of 11 and 17 meeting current PA guidelines (Guthold et al., 2020). This puts them at a higher risk for non-communicable diseases, which account for 71% of global deaths and 51% in South Africa (WHO, 2022a). The WHO (2022a) identifies technological advancement, the use of motorized transportation, and an increase in sedentary jobs as factors contributing to a shift in PA patterns and an increase in sedentary behaviors.

2.2.1 Measuring Physical Activity

Physical activity is defined by the WHO as "any bodily movement produced by skeletal muscles that requires energy expenditure" (WHO, 2022b). Since PA involves diverse movement patterns, assessment of PA becomes challenging; hence, no gold standard exists. There are different ways to measure PA, which can involve both self-report methods, such as behavioral observations, questionnaires, and PA diaries, as well as device-based methods, such as pedometers, heart rate monitors, accelerometers, and calorimetry (Skender et al., 2016). Each method has its strengths and weaknesses in assessing PA levels. Whereas self-reports, such as questionnaires, may give more insights into the type, context, and place of an activity, device-based methods, such as accelerometry, may provide more precise information on intensity and duration of an activity (Chinapaw et al., 2010). Intensity of PA is commonly categorized into sedentary behavior (SB), low (LPA), moderate (MPA), vigorous (VPA), or moderate to vigorous PA (MVPA), which in the case of accelerometer data is done by pre-defined cut-off points. In self-reports, PA intensities depend on the specific items of the questionnaire, but most often, self-reports have been found to reflect MVPA (Kim et al., 2013; Sabia et al., 2014).

The underlying study applies the most common techniques for PA assessment, which include PA questionnaires and accelerometers. The traits, strengths, and weaknesses of both approaches, as well as the specific tool employed here, will be discussed in the subsequent sections.

Self-Reported Physical Activity

Self-reports are the most frequently used method for evaluating PA levels. Due to its easy administration and low cost, it can allow the assessment of PA levels over large populations and long timeframes (Chinapaw et al., 2010). PA questionnaires usually consist of a number of questions covering different types of PA activities, with recall periods spanning mostly from one day to a week. However, self-reported measures can present some limitations. Prince et al. (2008) found that self-reporting PA in an adult population led to both an overestimate and an underestimate of PA levels when directly compared to a device-based PA measure. Questions answered by adolescents aged 14 – 20 years seem to be more reliable than those answered by younger children aged 8 – 14 years, since children tend to have difficulties understanding certain questions correctly or precisely recalling activities (Chinapaw et al., 2010; Janz et al., 2008). Recall biases in children can also occur because they show more variable and intermittent activity patterns than adults (Baquet et al., 2007).

There is a wide range of questionnaires available to study PA levels of children, adolescents, and adults. A review by Chinapaw et al. (2010) on PA questionnaires for youth found the "Physical Activity Questionnaire for Older Children" (PAQ-C) to be one of the more promising PA questionnaires available in PA assessment. The PAQ-C is a self-administered 7-day recall questionnaire. It is constructed to measure general levels of PA for the use during the school year in 8-14 year old children (Kowalski et al., 2004). The questionnaire consists of nine items that can be answered on a 5-point scale. Item 1 provides a list of spare time activities that can each be marked between "no activity" (= 1) and "7 times or more" (= 5). Item 2 – 8 cover the children's PA levels during recess, lunch, right after school, evening, and weekends as well as their general perception of PA levels. Item 9 is a composite score of the frequency of PA, scored on the 5-point scale for each of the last 7 days. An additional item that is not part of the PA summary score is used to assess unusual PA during the previous week (e.g., due to sickness). The final PAQ-C summary score provides information on general PA levels between one and five, with a higher score indicating higher levels of PA. (Kowalski et al., 2004)

The PAQ-C questionnaire can be administered in a classroom setting and is designed to guide children towards accurately recalling their PA levels. For instance, item 1 of the PAQ-C provides children with a checklist of common activities that are used as memory cues and should help with children's recall ability. Three studies conducted by Crocker et al. (1997) observed acceptable measurement properties, internal consistency, and test-retest reliability of the PAQ-C. The third study found that two to three PAQ-C scores assessed throughout the year can be compiled into a reliable yearly composite score, which makes the PAQ-C questionnaire a reliable option for longitudinal studies. Several later studies could confirm the internal consistency of the PAQ-C (Benítez-Porres et al., 2016; Janz et al., 2008; Venetsanou et al., 2020) as well as test-retest reliability (Benítez-Porres et al., 2016; Venetsanou et al., 2020).

For the validation of PAQ-C, accelerometers have often been selected due to their increasing affordability and use in measuring PA in large studies. Since a gold standard for assessing PA does not exist and accelerometry in itself has its strengths and weaknesses, there are inconsistent results in validation studies of self-reports (Chinapaw et al., 2010; Sabia et al., 2014). A validation study by Kowalski et al. (1997) compared the PAQ-C questionnaire to other PA questionnaires for children as well as external PA assessments done by teachers. Their findings support the validity of the PAQ-C. Validation studies comparing PAQ-C with an accelerometer found moderate to high criterion validity (Voss et al., 2017), weak to moderate (Venetsanou et al., 2020), and low correlations (Benítez-Porres et al., 2016). Janz et al. (2008) looked at both PAQ-C and PAQ-A (for adolescents) and observed moderately high validity for PAQ-A but low validity for PAQ-C, which they attribute to the increased ability of adolescents to recall activities and understand questions correctly compared to children. Thomas & Upton (2014) therefore argue to reduce the comprehension difficulty of questions for the PAQ-C.

Although PAQ-C can provide information on behavioral aspects of PA and MVPA or VPA activities, it has its limitations in detecting the exact frequency, duration, and intensity of activities. The PAQ-C does not differentiate between intensities of PA but provides a global measure of PA. However, Kim et al. (2013) and Sabia et al. (2014) both found that the PAQ-C might be more associated with vigorous and moderate to vigorous PA than low to moderate PA. They attribute it to the better ability of children to recall vigorous activities, which are often more structured than low to moderate activities. This has been shown in the stronger association between higher PA intensities in accelerometer data and PAQ-C (Sabia et al., 2014). Marasso et al. (2021) show moderate convergent validity between PAQ-C and accelerometer MVPA in their systematic review, but they also point out that discrepancies in the measures could result from assessing different components of the construct of PA.

Accelerometer-Measured Physical Activity

As discussed above, accelerometers are being increasingly used in studies as an additional measure of PA, especially in free-living conditions (Rosenberger et al., 2013). Accelerometer devices are relatively small and can be worn on the arm or over the hip, which is the most common placement, and generally do better in estimating activity energy expenditure and identifying intensity thresholds. The ActiGraph wGT3X-BT, the accelerometer used in the underlying study, has been widely used in PA research since the mid-1990s (Sasaki et al., 2011). It has also been one of the most frequently used accelerometers in studies for monitoring and assessing PA (Wijndaele et al., 2015). It measures the acceleration produced by bodily movements and provides information on the duration and intensity of locomotion. The movements are eventually expressed as activity counts per minute (Skender et al., 2016), which can then be classified into sedentary behavior as well as low/light, moderate, and vigorous PA (Evenson et al., 2008). The “counts” are summed up over a selected time interval, which is called an “epoch”. The smaller the epoch, the higher the information’s resolution. The quality of the data assessed by an accelerometer depends on the type (i.e., uniaxial or triaxial), settings of recorded data (e.g., epoch length and number of days worn), and data analysis algorithms that include non-wear-time definition and cut-off points of PA intensities (Marasso et al., 2021). According to Ojiambo et al. (2011), epoch length and cut-off points have been observed to have a significant impact on the classification of SB and MVPA, as well as the subsequent compliance with MVPA recommendations. Indeed, Bornstein et al. (2011) argue that since there have been varying cut-off points used across studies, the absence of a consensus makes comparisons of accelerometer-based MVPA estimates challenging.

Accelerometry, since it is a device-based measure, can remove recall bias and difficulties in understanding meaning or language of questionnaires as well as limit social desirability to a certain extent (Evenson et al., 2008). Further, the use of accelerometers allows for dose-response relationships to be made, which can strongly contribute to formulating PA policy guidelines (Ness et al., 2007). While accelerometers enable precise measurements, certain activities (such as lifting weights, carrying loads, cycling, or swimming) are difficult to assess (Lee & Shiroma, 2014). For some populations, such as elder people, these limitations are less important (Lee & Shiroma, 2014), than, for example, children, whose movement patterns are more complex and often occur in short bouts (Bailey et al., 1995; Baquet et al., 2007), which is why epoch length is proposed to be set at 2 – 15 seconds for children and adolescents (Aibar et al., 2014; Baquet et al., 2007). In general, the usage of different epoch lengths, intensity cut-off-points, and data analysis algorithms may lead to errors, which makes comparison of studies often challenging (Banda et al., 2016).

2.2.2 Physical Activity in South Africa

According to the "2018 Report Card for South Africa on Physical Activity for Children and Youth", South Africa is not making enough progress in promoting safe and accessible PA opportunities since overall PA levels do not seem to improve (Draper et al., 2018). As observed by Draper et al. (2018), according to some studies, 48%-51.7% of children and adolescents meet PA guidelines, while other studies reported higher levels of compliance with guidelines. For instance, Biljon et al. (2018) found that 69% of children across provinces in South Africa met the recommendations, with boys reporting higher PA levels than girls. Similarly, Müller et al. (2020) reported that 69.2% met recommendations. In light of these trends and levels of PA in children and adolescents, additional research is required to monitor PA levels in children and adolescents across South Africa (Draper et al., 2018; Van Deventer, 2012).

There are several factors that may contribute to insufficient PA levels, such as physical education (PE) not having a stand-alone place in the school curriculum but being incorporated into the broader Life Skills and Life Orientation subjects. As a result, there is limited time devoted to the promotion of PA in schools and a lack of qualified PE teachers. This poses challenges in promoting PA in children and adolescents, especially in low quintile schools, which are even more restricted by a lack of resources and infrastructure (Roux, 2020). Socioeconomic disparities once again put some children in an unfavorable situation as safety for active play and transportation is a concern, particularly in disadvantaged communities (Draper et al., 2018; Müller et al., 2020). As part of the apartheid ideology and agenda, "black schools" and township areas were systematically underdeveloped in comparison to "white schools" and living areas. This gap has not been closed, and sports facilities and infrastructure are often still underdeveloped. Especially underprivileged areas and formerly disadvantaged areas by the apartheid regime face inequalities until today (C. Walter, 2011).

Overall, the importance of PE in schools and healthy lifestyle behaviors is growing due to an increase in SB and screen time as a result of affordable smartphones and internet service (Draper et al., 2018). Data on PA levels must be collected and analyzed in order to make sound suggestions for stakeholders and develop recommendations for initiatives and policies.

2.3 Socioeconomic Status

Socioeconomic status reflects the economic and social status a person is inhabiting. In the scope of this thesis, SES is used in relation to aspects of health. SES is known to be positively associated with overall health (Marmot & Bell, 2016) and can have an impact on many facets of a person's health. An example of this gradient may be that those with higher SES have easier access to resources that promote health and are more likely to be exposed to healthy behaviors (E. H. Baker, 2014). Indeed, health is influenced by many factors, as Hu et al. (2021) note how both personal and environmental aspects must be taken into consideration, which constantly shape our behaviors in life. SES is one aspect that is frequently used to account for environmental factors. Therefore, placing health-related factors in relation to SES can contribute to a better understanding of the prevalence of ill-health within a society and locate which groups of that society are most vulnerable and why (Hu et al., 2021). SES and its connections to health outcomes, meanwhile, are not universally observed in the same way and may vary based on a location's geography and its rural-urban distinctions. Allen et al. (2017) observed in a review on SES and lifestyle behaviors that LMIC are almost not represented, and research is needed to assess whether the patterns of SES in high-income countries are applicable to other regions or not.

2.3.1 Measuring Socioeconomic Status

SES is most often put together using a number of indicators for children's or families' SES, such as material assets, infrastructure, parental education, household income, or geographical location, such as neighborhood (Marmot & Bell, 2016). SES has been linked to children's well-being through a variety of processes, but access to resources – both material and social – was found to have the greatest influence on children's wellbeing (Bradley & Corwyn, 2002). Hence, the construct of SES and how it is assessed can strongly influence outcomes, and a more clearly defined concept of SES is needed to be able to compare results from different studies (Stalsberg & Pedersen, 2010). Stalsberg & Pedersen (2010) use the example of income being important in countries where personal wealth can determine life chances, such as in the US, or having less of an influence in countries where personal welfare is more determined by education and social networks, such as in the Nordic Countries. In the scope of this study, an asset indicator index has been collected that has been shown to agree with other measures of SES such as income, education, and the food inventory index and may be used to assess inequalities in low-resource and low socioeconomic settings in South Africa (Nkonki et al., 2011). The index is calculated using a 10-item questionnaire with questions addressing living standards such as household assets, infrastructure, and type of access to water and electricity.

2.3.2 Inequalities and Socioeconomic Status in South Africa

It is widely acknowledged that inequalities are a major issue in South Africa (Ataguba et al., 2016). Ataguba et al. (2016) reported that groups from lower SES showed greater numbers of major categories of ill-health and disability, and social inequalities for good health are in favor of high-income groups in South Africa.

Since Apartheid ended in 1994, South Africa's political system has failed to bridge the enormous divide that Apartheid had left behind in terms of health, education, and social services between mainly black and white citizens (Ataguba & Alaba, 2012). As argued by P. A. Baker (2010), the neoliberal ideology as pursued by the post-apartheid government has enabled a few hegemonial actors to remain influential and in power while being unable to meet equity demands as vocalized by the poor. Disadvantaged areas and black communities still suffer from inequalities in health but are confronted with numerous barriers beyond health. To mention a few, Klasen (1997) pointed to the lack of access to education, quality health care, basic infrastructure, and transport. Factors that contribute to a healthy life in all domains. Finally, Ataguba et al. (2016) further argue that policy interventions aiming at improving SES and eventually health and well-being should be implemented to address the SES disparities in health in South Africa.

3 Relations of HRQoL, PA and SES – Current State of Research

At the individual level, lifestyle behaviors such as PA can improve HRQoL as well as overall health. Understanding this relationship can provide insights for guidelines and policies. SES can be viewed as an overarching factor that enables or limits opportunities for health and well-being in children, adolescents, and the general population. Given the present inequalities in South Africa, socioeconomic factors need to be understood and addressed in order to achieve equity goals. The following sections of this chapter will explore relations between HRQoL, PA, and SES while drawing from research done both internationally and in South Africa to help readers comprehend the most recent findings in this area of study. The intention of the final section is to summarize these conclusions, incorporate them into the research framework, and lay out the thesis' objectives.

3.1 Associations Between Self-Reported and Accelerometer-Measured PA with HRQoL

Reviews have found strong evidence for a positive association between PA and HRQoL in children and adolescents, irrespective of age, sex, weight-status, or SES (X. Wu et al., 2021; Zhang et al., 2020). While some studies also reported dose-response relationships between PA and HRQoL and several longitudinal studies were able to demonstrate the predictive value of PA for HRQoL, there is need for more longitudinal research to assess the causality of effects. Furthermore, methodological practices have continuously been questioned as variations in PA measurement have led to equivocal results and difficulties in its comparability (Marker et al., 2018). Especially the frequent use of self-reported measures without device-based measures such as accelerometer-measured PA was criticized, and the additional use of accelerometers was suggested (Anokye et al., 2012; Poitras et al., 2016; X. Wu et al., 2021). Indeed, most of the reviewed studies used self-report methods to evaluate PA levels (Marker et al., 2018; X. Y. Wu et al., 2017; Zhang et al., 2020). However, very few studies have used both measures simultaneously, with divergent results. For instance, Wunsch et al. (2021) found higher associations between self-reported PA and HRQoL in children and adolescents. In contrast, Anokye et al. (2012) observed a stronger association between accelerometer-measured PA and HRQoL. To note, however, the study was conducted with an adult population. Subsequent questions as to why associations differ when using these two measures and what measures should be used when, is discussed in the following section.

In their systematic review, Marasso et al. (2021) investigated the convergent validity of the PAQ-C by correlating it with accelerometer-measured PA. They found only a moderate relationship between the two measures. Similarly, Wunsch et al. (2021) found a low correlation when comparing adolescents' self-reported and accelerometer-measured PA in a German population. Both argue that these differences may be explained by both measures reflecting different aspects of the construct of PA. A combination of both methods is suggested, with self-reports being used for the assessment of behavioral and habitual aspects of children's PA, such as weekly routine, while accelerometer-measured information might provide the exact duration, frequency, and intensity of PA. Wunsch et al. (2021) further investigated the predictive value of both PA measures for HRQoL. Although they found rather low correlations with HRQoL for both self-reported and accelerometer measured PA, higher correlations were observed for self-reported PA, showing that self-reported PA might be related more to HRQoL than accelerometer-measured PA. Children's behavioral aspects, as captured with self-reported PA and their connections to actual games, might have a stronger influence on HRQoL than overall activities throughout the day, as assessed with the accelerometer (Wunsch et al., 2021). In support of this argument, Teychenne et al. (2020) argue that the domain in which an activity takes place may influence its benefits for mental health, and ultimately, those mental health benefits may also be linked to the social aspects of engaging in a sport (Wunsch et al., 2021). In summary, accelerometer-measured PA reflects actual PA throughout a whole week, including informal activities (e.g., transport), whereas self-reported PA most often reflects PA behavior in terms of, e.g., organized sports. Both methods have their advantages and disadvantages in explaining PA behavior in relation to HRQoL and contribute to a more pronounced understanding of their interactions when used together.

There is little research on PA and HRQoL in South Africa. In fact, none of the studies included in the abovementioned reviews on PA and HRQoL were conducted in an African country. Adding to research in South Africa, the *KaziBantu* project presented two studies conducted in Gqeberha that reported positive associations between self-reported PA and HRQoL in children and adolescents (Gall et al., 2020; Salvini et al., 2018).

In conclusion, since PA can have a positive effect on children's HRQoL, the promotion of PA may be of great value, especially in populations where PA opportunities are scarce. Furthermore, it can help reduce differences in HRQoL between girls and boys. These differences have been observed to develop from childhood to adulthood through a stronger decrease in girls' HRQoL (Killedar et al., 2020; Michel et al., 2009). While girls in South Africa have been reported to engage less in PA (Kruger et al., 2006; McVeigh & Meiring, 2014a; Minnaar et al., 2016), this provides an opportunity to close the gender gap, observed mostly during puberty, in HRQoL by increasing their PA. As was already noted in the previous chapter, the school setting presents a chance to improve PA and HRQoL. Indeed, PA in school settings was reported to have positive effects on well-being and mental health, as well as reducing anxiety and increasing resilience in children and adolescents (Andermo et al., 2020). Meanwhile, the value of using multiple measures of PA has been consistently encouraged.

3.2 Associations Between Self-Reported and Accelerometer-Measured PA with SES

Results from numerous studies provide weight to the argument that SES and PA are related. The direction of the correlations between the two measures, however, is in dispute, which ought to be examined in the section below.

In a review from 2010, Stalsberg & Pedersen examine the relationship between SES and PA in adolescents. Their results revealed a positive association between SES and PA in 58% of the reviewed studies while the others showed no or even inverse associations. While many of the studies support the notion that higher SES results in more time spent physically active, there are several explanations presented for the equivocal results in the remaining 42% of reviewed studies. For one, a lack of consistent methods for obtaining data on SES and PA was found. Furthermore, they found a relationship between the operationalization of SES and the origin of a study, which implies that SES and its relations to other variables may differ by location and conceptualization. Ultimately, the weight that SES has in the link with PA behaviors can vary depending on the country, its underlying system, and its culture (Stalsberg & Pedersen, 2010). Hence, PA patterns may not be generalizable. Since most of the studies included in the review were conducted in European and Northern American countries, the following research findings will be laid out based on studies from sub-Saharan Africa and South Africa.

In a systematic review, Muthuri et al. (2014) provide such insights into SES and PA for sub-Saharan Africa. In addition, they differentiated between children who lived in rural areas and those who lived in urban areas. In contrast to Stalsberg & Pedersen's findings from HICs, results from Muthuri and colleagues revealed that children with low SES who lived in rural areas had higher levels of PA than those with higher SES living in urban areas. They argue that higher PA levels in children with low SES living in rural areas are associated with more informal and survival activities, household chores, and active transport (e.g., walking, running). Although their peers with a higher SES living in urban areas may have more opportunities for organized sports activities, they show higher levels of SB.

Indeed, findings from a South African study conducted in a poor rural community of children aged 11 – 15 years revealed that SES predicted SB and PA. Low SES was connected to less SB and more walking for transport, but less time spent in MVPA at school or sports clubs (Micklesfield et al., 2014). They illustrate how not only overall PA but also intensities and domains of PA matter for analysis since they observed specific PA patterns in different socioeconomic groups. Hence, even though groups with lower SES report less time spent in MVPA, they have high levels of low PA (LPA), which are mostly acquired through every day or informal activities.

With findings from urban areas McVeigh et al. (2004) reported that children with low SES from Johannesburg spend more time in SB. In their study with nine-year-old children, they observed that children with low SES had lower self-reported PA levels than those with high SES. However, they did not differentiate between PA intensities.

Furthermore, Uys et al. (2016) found in a South African study that neighborhood environment is associated with children's outside-of-school MVPA, suggesting that socioeconomically related living areas may affect children's PA behaviors. Moreover, Stone et al. (2014) demonstrated that independent mobility and the freedom to explore in children from different neighborhoods in Toronto, Canada, are connected to more leisure time PA. According to McVeigh et al. (2004), providing adequate PE in schools could act as a buffer, reducing socioeconomic differences in PA opportunities and, in addition, raising PA opportunities for girls who, irrespective of socioeconomic status, show lower levels than boys in South Africa (Draper et al., 2018; Micklesfield et al., 2014).

The current state of literature on SES and PA shows that relationships between SES and lifestyle may vary across countries as well as rural and urban spaces. Even more so, data on SES should be acquired when collecting data on PA behaviors in children and adolescents to understand the connections to SES for each case specifically. In addition, PA intensities need to be taken into account when researching PA patterns.

3.3 Associations Between HRQoL and SES

There have been convincing results found in several studies for associations between HRQoL and SES. In a European study using data from 11 countries, Rajmil et al. (2014) found that HRQoL and mental health were generally lower in children and adolescents with low SES. Although socioeconomic inequalities in HRQoL of children and adolescents were not always as consistently observed across Europe, to a lesser or greater extent, all of the nations under study experienced socioeconomic inequalities in health (Rajmil et al., 2014). No patterns were found for the inter-country variations, and differences were attributed to the varying states of economic development as well as health, social, and political policies that shape socioeconomic inequalities, as outlined by Navarro (2004). There have been numerous studies backing the prevalence of inequalities in HRQoL, while showing inconsistent subscale-specific outcomes of HRQoL. In Greece, for example, Papadaki & Carayanni (2022) found an association between HRQoL, physical activity, and SES in adolescents during the COVID-19 pandemic and reported that adolescents with higher SES had higher scores in HRQoL dimensions of physical health, parent relations, autonomy, social support, and peers. Similar results were found in an Australian study by Killedar et al. (2020), with children and adolescents between the ages of 4 and 17 with high SES showing consistently higher levels of overall HRQoL. Positive associations of SES with HRQoL were also observed in Iranian schoolchildren (Hovsepian et al., 2019), and results from Germany support these findings by observing better health and lifestyle behaviors in children with higher SES (Poulain et al., 2019). Results from São Paulo, Brazil, showed that children from high socioeconomic backgrounds had significantly higher levels in the emotional, social, and psychosocial subscales as well as overall HRQoL levels (Klatchoian et al., 2010). These differing results have also been observed by Rueden et al. (2006), who argue that various SES components do in fact have distinct effects on HRQoL. Although the degree of associations varies between countries, there seems to be consensus that better HRQoL is mainly distributed in favor of those with high SES.

As already discussed in subsequent chapters, inequality in health is a major issue in South Africa. However, not many studies have looked into the relationship between SES and HRQoL in South Africa specifically, since HRQoL has been a measure almost exclusively used and researched in HIC (Dumuid et al., 2017). Although Dumuid et al. (2017) found many similarities in lifestyle behavior patterns across the world, with LMIC increasingly adopting "westernized" lifestyles, associations should be researched in light of the specific setting. With the development of the *KaziBantu* project in Gqeberha, Gall et al. (2020) were able to provide some insights into the association between SES and HRQoL. They found that children with high SES showed higher HRQoL levels of the KIDSCREEN-27 subscales physical well-being, autonomy, and parent relations, as well as school environment; however, the KIDSCREEN-10 index did not show a significant association between SES and HRQoL. Hence, within disadvantaged communities, children's HRQoL might differ in some categories but not all, while overall HRQoL as assessed with the KIDSCREEN-10 index does not seem to show differences between high and low SES.

Understanding children's HRQoL across different socioeconomic positions might assist in making specific suggestions for interventions in order to combat health inequality. Ataguba et al. (2016), for example, have emphasized the need for policies aimed at implementing such interventions.

3.4 Research Gaps and Study Objectives

Developing adequate and effective health policies and guidelines requires an understanding of the target population. Therefore, studying children's HRQoL and PA across SES helps to both identify groups that are most vulnerable and develop effective interventions that lead to sustainable environmental and individual changes. Hopefully, this will result in establishing healthy lifestyle behaviors in children and adolescents, which is needed since increased screen time and cell phone use in South African children might lead towards more sedentary lifestyle behaviors (Draper et al., 2018). Thus, this thesis' objectives are to contribute to the body of knowledge on HRQoL and PA across SES in South Africa. Meanwhile, applying both self-reported and accelerometer-based PA measures in relation to HRQoL may provide more insights into those relationships. There is little evidence on the abovementioned processes in South Africa, while inequality is still seen as a major issue in health generally (Ataguba et al., 2016) and in-school PA for children and adolescents has yet to be fully integrated into the school curriculum (Van Deventer, 2012). Ultimately, several points emerge when reviewing the associations between HRQoL, PA, and SES.

First, current research demonstrates a positive association between PA and HRQoL (X. Y. Wu et al., 2017); however, these associations are influenced in part by the tools employed that measure PA, which is predominantly self-reported or accelerometer-measured PA (Marker et al., 2018). Few studies have looked at both self-reported and accelerometer-measured PA in relation to HRQoL. While Wunsch et al. (2021) have made contributions to research on both PA measures, their findings, along with most of the evidence available on that matter, come from HIC countries outside of Africa. As part of the *KaziBantu* study, Gall et al. (2020) and Salvini et al. (2018) conducted research on the relationship between self-reported PA and HRQoL; however, none used a combination of both self-reported and accelerometer-measured PA. Since there is no overall accepted gold standard for measuring PA, many authors suggest that using both PA measures will provide the most accurate insights (Anokye et al., 2012; Marker et al., 2018; X. Y. Wu et al., 2017). Consequently, the first objective of this thesis is to contribute to the body of knowledge on the use of both PA measures in relation to HRQoL while adding to research on PA and HRQoL done in South Africa.

Second, there are no generalizable, clear PA patterns across SES, which were reported to differ within and across countries (Muthuri et al., 2014; Stalsberg & Pedersen, 2010). While there is evidence on PA patterns across SES within South Africa, findings from these studies have shown differing results between rural and urban areas (McVeigh et al., 2004; Micklesfield et al., 2014); hence, case-specific research might give important insights into PA patterns of my study population. Furthermore, mostly self-reported PA measures have been used for that matter. The second objective is to use both self-reported and accelerometer-measured PA across SES to assess PA patterns of children living in underprivileged neighborhoods of Gqeberha.

Third, given that inequalities are an undesirable and widespread aspect of children's and adolescents' lives in South Africa, it is apparent that HRQoL considered in reference to SES might inform current trends. The current state of research shows a positive relationship between SES and HRQoL (Rajmil et al., 2014), while associations vary between countries in terms of HRQoL subscales. Since there is little study on the subject in South Africa, the third objective is to determine if variations in HRQoL across SES may be identified in the underlying study sample.

4 Research Questions and Hypotheses

The aim of this master's thesis is to investigate the association between HRQoL, self-reported and accelerometer-measured PA, and SES among schoolchildren from disadvantaged neighborhoods in Gqeberha. The following research questions and hypotheses have been formulated based on the current state of research and the previously stated objectives.

Research Questions

Q1 How does self-reported PA and accelerometer-measured PA differ in their association with HRQoL?

Q2 Are there differences in self-reported and accelerometer-measured PA values among children with different SES and how are they correlated?

Q3 Are there differences in HRQoL values among children with different SES and how are HRQoL and SES correlated?

Hypotheses

H1a Self-reported PA and accelerometer-measured PA are positively associated with HRQoL.

H1b Self-reported PA is better at explaining differences in HRQoL than accelerometer-measured PA.

H2a Self-reported PA and accelerometer-measured PA differ between different values of SES

H2b Self-reported PA and accelerometer-measured PA are positively correlated with SES

H3a HRQoL differs between different values of SES

H3b HRQoL is positively correlated with SES

5 Methods

The data for this thesis was collected as part of the *KaziBantu* Project. The *KaziBantu* project is a school-based intervention with the goal of strengthening physical activity practices and providing a framework for physical literacy and a healthy active lifestyle for schoolchildren and teachers in South Africa.

5.1 Study Population and Area

Cross-sectional data of children was examined in early 2019 and consists of around 900 children from 8 primary schools in disadvantaged, historically black, and colored areas of Gqeberha in South Africa. Four primary schools are located in the townships (Motherwell, Zwide, Kwazakhele, and New Brighton). The other four schools are situated in the "northern areas" (Schauderville, Bethelsdorp, Windvogel, and Booysens Park) of Gqeberha. Figure 2 displays locations of schools participating in the study. These communities are marked by poverty and high unemployment, while their schools face a number of institutional and structural barriers to in-school PE, including a shortage of qualified PE teachers, the marginalization of PE (as a stand-alone subject) from the school curriculum, large class sizes, a lack of infrastructure and equipment, and issues with safety and security within those areas (Rajput & Van Deventer, 2010).

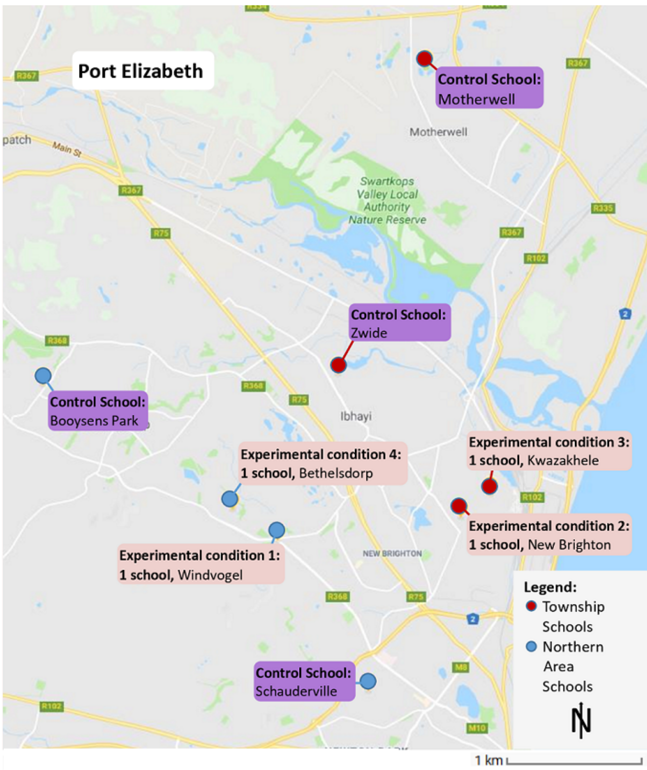

Figure 2: *Study Area (Gqeberha, formerly: Port Elizabeth, South Africa) displaying location of schools participating in the KaziBantu study. Source: Kartendaten, AfriGID (Pty) Ltd. (Müller et al., 2019)*

The children participating in this study were attending grades 4 to 6 and were between 8 and 16 years old. However, only children up until the age of 13 were selected for statistical analysis of this thesis due to an underrepresentation of children aged 14, 15, and 16.

5.2 Ethical Clearance

Ethical approval for the study has been received by the ethics committees of the Nelson Mandela University Ethics Committee, Eastern Cape Department of Education, and Eastern Cape Department of Health, as well as the Ethics Committee Northwest and Central Switzerland. All participants were informed about the study's procedures, duration, and possible risks and benefits involved. Since participation was voluntary, participants could withdraw from the study at any point without further obligations. Parents had to provide written consent, while children were asked if they would like to take part in the study.

5.3 Data Collection

5.3.1 KIDSCREEN-10 index

HRQoL was assessed with the KIDSSCREEN-10 index questionnaire, which was developed from the longer KIDSSCREEN-27 questionnaire and requires only a few minutes to answer. The questionnaire consists of ten questions that are answered on a 5-point scale ranging from "not at all" to "extremely". Negatively formulated questions were recoded to make sure that higher values reflect higher HRQoL and vice versa. Following KIDSCREEN manual procedures, all item scores of the respective scales were summed up to raw values. These were then further transformed into Rasch person parameter estimates using the SPSS syntax provided. These had to be transformed into z-values and eventually t-values with scale means at around 50 and SD = 10. A low score is interpreted as feeling unhappy, unfit, and dissatisfied with regards to family life, peers, and school life, whereas a high score represents the opposite (Ravens-Sieberer & Kidscreen Group Europe, 2016).

5.3.2 Physical Activity Questionnaire for Older Children

Self-reported PA behavior was assessed by the Physical Activity Questionnaire for Older Children (PAQ-C). The PAQ-C is a 7-day recall instrument to assess levels of physical activity in schoolchildren between 8 and 14 years of age. It is based on a 10-item questionnaire, with each item being scored on a 5-point scale. However, in this study, questions one and ten were excluded for reasons of practicality in the field. A summary physical activity score is provided by taking the mean of all items used. The summary score can be interpreted as follows: A score of 1 reflects low PA, whereas a score of 5 indicates high PA.

5.3.3 ActiGraph

Objectively measured PA was assessed by an ActiGraph accelerometer device (ActiGraph wGT3X-BT, Pensacola, Florida, USA). Children wore the accelerometer for 7 days. The data was considered valid if the accelerometer had been worn for a minimum of 10 hours on 4 weekdays and 1 weekend day. Sleep time as well as any wear time of more than 60 consecutive minutes of zero activity counts was excluded. Epoch length was set at 10 seconds. The activity counts were categorized as PA intensities according to Evenson et al. (2008). Cut-off points for PA intensities were set as follows: (i) sedentary behavior (SB): ≤ 100 activity counts per minute; (ii) light physical activity (LPA): >100 and <2296; (iii) moderate physical activity (MPA): ≥ 2296 and <4012; (IV) vigorous physical activity (VPA): ≥ 4012 activity counts per minute.

5.3.4 Socioeconomic Status

To assess the SES of the participants, an overall index of a 10-item questionnaire was calculated. The questions address living standards that include household assets (e.g., washing machine, refrigerator, car), infrastructure (e.g., shack in informal settlement, privately built house, etc.), and type of access to water and electricity. The answers were dichotomized into: (i) 0 = poor quality / not available; (ii) 1 = higher quality / available. All items were summed into a SES index with scores from one to nine. Higher scores reflect higher SES.

5.4 Statistical Analysis

Descriptive statistics for all study variables were reported for the total sample and stratified by sex. To identify differences between boys and girls, Pearson's chi-squared tests were used for categorical data, independent two-sample t-tests conducted for metric data, and Mann-Whitney-U-Tests used if values were not normally distributed. Visual examination of Q-Q-Plots was used to determine the normal distribution. Points had to be arranged closely to the diagonal with no notable deviating patterns. Main study variables were further analyzed across age groups by using Spearman rank correlations and Kruskal-Wallis-Tests. In addition, one-sample-t-tests were used to examine differences between means of HRQoL in the underlying study sample and European KIDSCREEN normdata. Furthermore, based on meeting PA guidelines, differences in children's HRQoL and SES were assessed using a Mann-Whitney-U-Test and Pearson's chi-squared test respectively.

To explore the relationship between self-reported PA, accelerometer-measured PA and HRQoL, spearman rank correlations were performed for the total sample and stratified by sex. To further study how self-reported and accelerometer-measured PA differed in their association with HRQoL, multiple linear regression models (ANCOVAs) were performed to evaluate the effect of self-reported and accelerometer-measured PA on HRQoL and to compare both PA variables in their ability to explain variances of HRQoL. ANCOVAs were controlled for SES, sex, and age, respectively. Univariate analyses of variance (ANOVAs) or Kruskal-Wallis-Tests were performed to examine differences in each HRQoL, self-reported PA, and accelerometer-measured PA based on levels of SES for the total sample and stratified by sex. Single items of self-reported PA were further examined using a Kruskal-Wallis-Test to account for differences between low and high SES. Additionally, spearman rank correlations were calculated to assess the relationship between HRQoL and SES, self-reported PA and SES, as well as accelerometer-measured PA and SES. Effect sizes were interpreted using Cohen's guidelines for (i) correlations: $|\rho| = 0.1$ small effect size, $|\rho| = 0.3$ medium effect size, $|\rho| = 0.5$ large effect size; and (ii) partial eta squared: (η_p^2) = 0.01 for small effect size, 0.06 for medium effect size, and > 0.14 for large effect size (Cohen, 1988).

5.5 Data Cleansing Process

The initially examined population consisted of 981 children and was reduced to 572 children as described below and illustrated in figure 3. After excluding 14 children that did not give consent or left school, the study population counted 967 children between the ages of 8 and 16 years. Due to only 5 children between the ages of 14 and 16 and 1 child missing information on age, a total of 6 children were excluded from the data set. 73 children were then excluded because of missing data on their SES. For the ActiGraph data, children were excluded when missing information ($n = 46$) and not reaching the inclusion criteria of minimum wear time ($n = 70$). Another 11 children were excluded for missing PAQ-C data. To assess whether children reporting an illness in the PAQ-C questionnaire should be excluded or not, visual control of boxplots and a one-sample-t-test were conducted. It showed that there is a difference in PAQ-C scores between fit and unfit children, and therefore 179 children were excluded due to reporting an illness in PAQ-C measurements. Lastly, 10 children were excluded because of missing data on HRQoL and false information in ActiGraph data. The final complete data set consisted of 572 children, with 295 boys and 277 girls between the ages of 8 and 13 years.

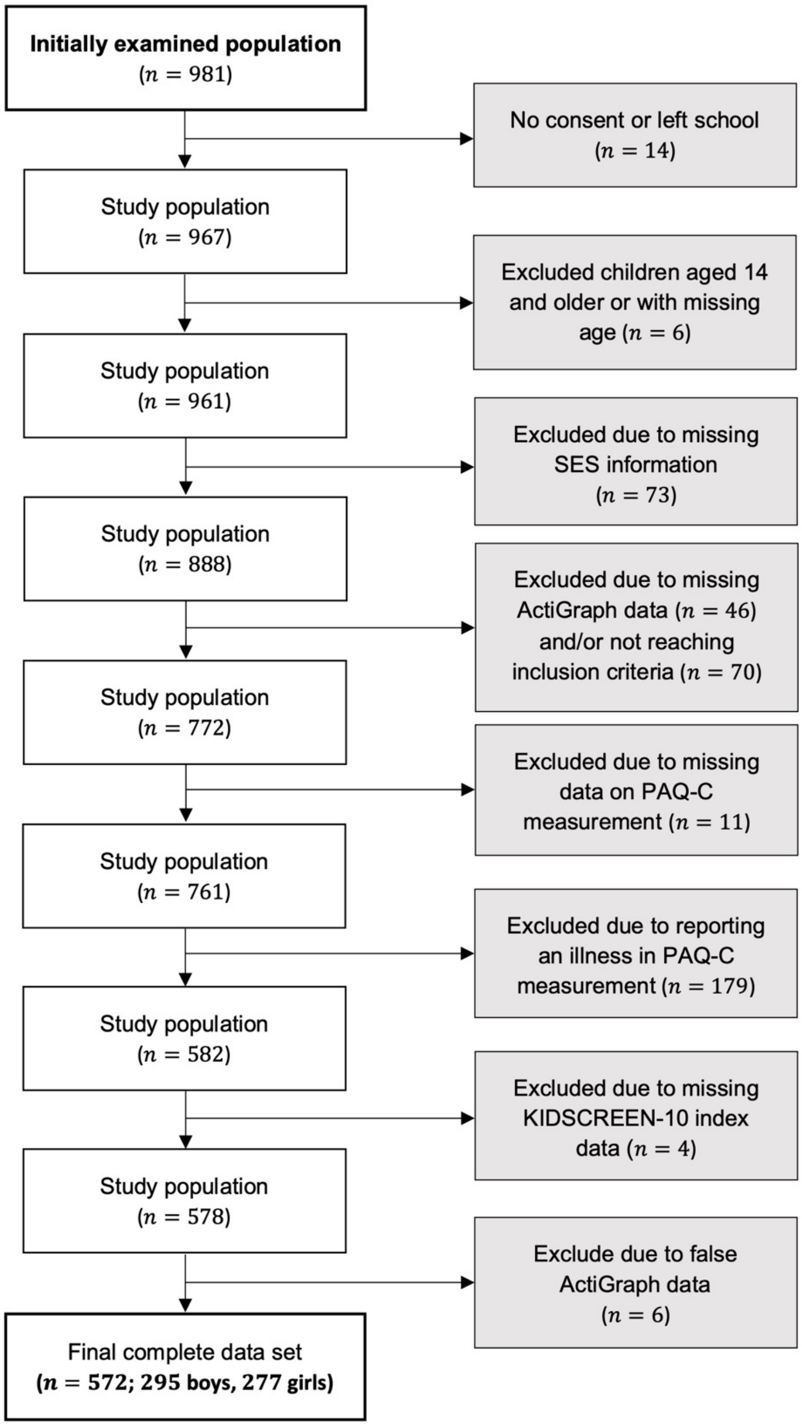

Figure 3. *Data Cleansing Process Flowchart*

6 Results

6.1 Descriptive Statistics

Table 1 provides an overview of descriptive statistics, which were additionally stratified by sex. The data set consisted of 572 children of whom 295 (51.6%) were boys and 277 (48.4%) were girls. Overall, children had a mean SES score of 6.0 ($IQR = 2$) and a HRQoL score of 51.4 ($IQR = 14.1$). Physical activity variables revealed a mean PAQ-C score of 2.92 ($SD = 0.77$). Children spend around 63.9% of their daily time in SB, 28.9% in LPA, 4.8% in MPA, and 2% in VPA. Significant differences between boys and girls were found for several measures. Boys were slightly more represented in higher age groups. Boys showed higher PAQ-C composite score values than girls and spent more time in MPA, VPA, and MVPA. Consequently, girls spent more time in SB. There was also a significant difference found for meeting PA guidelines, as 82.0% of the boys met the guidelines by spending a minimum of 60 minutes per day in MVPA, compared to only 45.5% of the girls. No significant differences between the sexes were found for SES, HRQoL, and LPA.

Table 1.

Sample Characteristics Stratified by Sex

	All ($\boldsymbol{n = 572}$)	Boys ($\boldsymbol{n = 295}$)	Girls ($\boldsymbol{n = 277}$)	$\boldsymbol{p}$-value
Age[a] (8/9/10/11/12/13)	17 / 108 / 171 / 159 / 94 / 23	5 / 52 / 80 / 85 / 61 / 12	12 / 56 / 91 / 74 / 33 / 11	**0.031***
SES Mean Score[a]	6.0 (5.0 – 7.0)	6.0 (5.0 – 7.0)	6.0 (5.0 – 7.0)	0.772
HRQoL[c]	51.4 (45.7 – 59.8)	51.4 (45.1 – 57.3)	51.4 (45.7 – 59.8)	0.302
PAQ-C Mean score[b]	2.92 ± 0.77	3.04 ± 0.77	2.79 ± 0.75	**<0.001****
Actigraph				
SB [%][b]	63.9 ± 5.8	62.6 ± 5.7	65.4 ± 5.5	**<0.001****
LPA [%][b]	28.9 ± 4.1	29.0 ± 4.1	28.7 ± 4.2	0.300
MPA [%][c]	4.8 (3.8 – 6.0)	5.5 (4.4 – 6.6)	4.1 (3.3 – 5.1)	**<0.001****
VPA [%][c]	2.0 (1.4 – 2.8)	2.5 (1.8 – 3.6)	1.5 (1.1 – 2.1)	**<0.001****
MVPA [min][c]	70.5 (52.4 – 89.1)	83.2 (65.1 – 102.9)	57.1 (45.5 – 73.2)	**<0.001****
Wear Time [min][c]	1032.4 (1001.6 – 1052)	1039.7 (1006.9 – 1059.1)	1027.1 (995.7 – 1047.1)	**<0.001****
Meets PA guidelines[a]	64.3 %	82.0 %	45.5 %	**<0.001****

Annotation. Data is expressed as mean ± SD, median (IQR), number; * $p < .05$; ** $p < .01$; Between-sex differences assessed by [a]Pearson's chi-squared test, [b]independent two-sample t-test, [c]non-parametric Mann-Whitney-U-Test; Socioeconomic Status (SES); Health-Related Quality of Life (HRQoL); Physical Activity Questionnaire for Older Children (PAQ-C); Physical Activity (PA); Sedentary Behavior (SB); Low PA (LPA); Moderate PA (MPA), Vigorous PA (VPA); Moderate to Vigorous PA (MVPA).

Additionally, one-sample-t-tests did not show evidence for differences in HRQoL means for boys and girls with regards to European KIDSCREEN normdata for children between 8 – 11 and 12 – 18 years of age. Furthermore, based on meeting PA guidelines of 60 minutes of MVPA per day or not, a Mann-Whitney-U-Test did not show evidence for differences in children's HRQoL ($U = 37977, z = 0.233, p = 0.816$). Similarly, Pearson's chi-square test did not show differences in meeting PA guidelines across children's SES ($\chi^2(6) = 7.368, p = 0.288$).

6.2 Results for Hypothesis 1

H1a Self-reported PA and accelerometer-measured PA are positively associated with HRQoL.

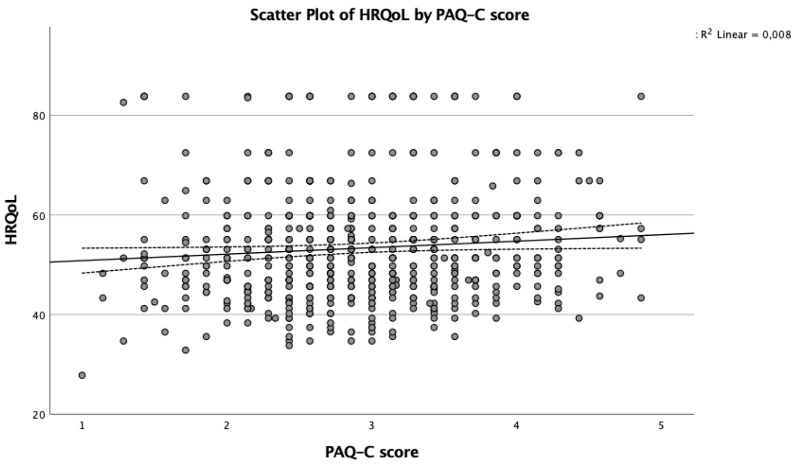

Figure 4. *Scatterplot with Trend Line (and 95%-CI) for the Relationship Between HRQoL and PAQ-C*

Associations between HRQoL and PAQ-C, SB, and MVPA are illustrated in Figures 4 and 5, while spearman rank correlations are displayed in Table 2. Significant associations were only found between HRQoL and PAQ-C ($p = 0.021$), although the effect size was negligible ($|\rho| = 0.096$). Sex-specific associations between HRQoL and PAQ-C were only found for girls ($p = 0.015$), where the effect size was small ($|\rho| = 0.146$). There was no evidence for an association between HRQoL and time spent in SB nor MVPA, respectively. However, not significantly, there was a stronger association observed between SB and HRQoL than between MVPA and HRQoL, and also a stronger association for boys than for girls when looking at SB and MVPA.

Table 2.

Spearman Rank Correlation with HRQoL

	PAQ-C		MVPA		SB	
	ϱ $(95\% - CI)$	p-value	ϱ $(95\% - CI)$	p-value	ϱ $(95\% - CI)$	p-value
All	**0.096** (0.012; 0.179)	**0.021***	0.018 (−0.067; 0.102)	0.670	−0.037 (−0.121; 0.047)	0.373
Boys	0.060 (−0.058; 0.176)	0.306	0.062 (−0.056; 0.178)	0.290	−0.018 (−0.196; 0.037)	0.168
Girls	**0.146** (0.025; 0.263)	**0.015***	0.019 (−0.102; 0.140)	0.750	0.004 (−0.117; 0.126)	0.947

Annotation. * p < .05; ** p < .01; Health-Related Quality of Life (HRQoL); Physical Activity Questionnaire for Older Children (PAQ-C); Moderate to Vigorous Physical Activity (MVPA); Sedentary Behavior (SB)

Additionally, the association between MVPA and PAQ-C was assessed using Spearman rank correlation coefficients. The analysis showed a strong association between both variables ($\rho = 0.151, 95\% - \text{CI}: 0.067; 0.232, p < 0.001$); however, only a small effect was observed ($|\rho| = 0.151$). PAQ-C and MVPA were used as predictors of HRQoL in the following ANCOVA models.

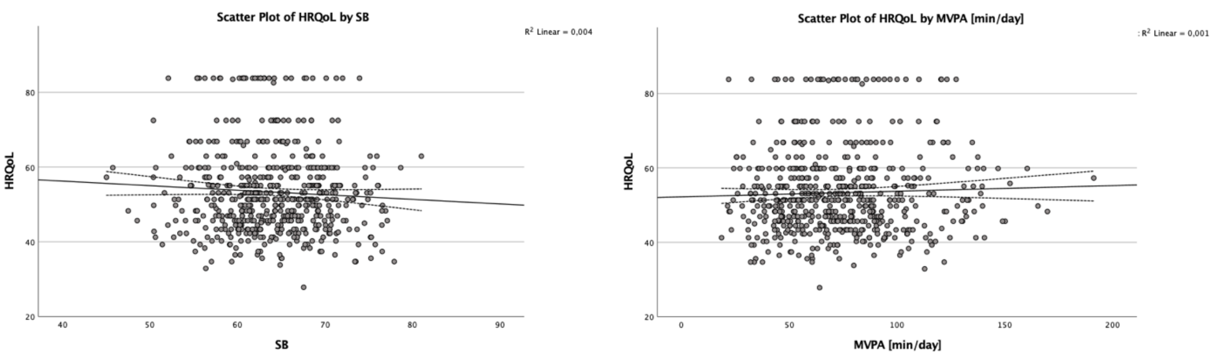

Figure 5. *Scatterplot with Trend Line (and 95%-CI) for the Relationship Between HRQoL and SB (left) or MVPA (right)*

H3b: Self-reported PA is better at explaining differences in HRQoL than accelerometer-measured PA.

Multiple linear regression models were calculated using MVPA and PAQ-C as predictors for HRQoL (Table 3). ANCOVAs were controlled for SES, age, and sex, as well as wear time for the accelerometer-measured minutes in MVPA. Results of the ANCOVA showed that PAQ-C scores significantly predicted HRQoL at the $p < 0.05$ level ($\beta = 1.42, 95\% - CI = 0.198; 2.640, p = 0.023$). However, only a negligible effect size of $\eta_p^2 = 0.009$ was reported.

Table 3.

ANCOVA Parameter Estimates for HRQoL and PAQ-C Controlled for Age, SES, and Sex

Dependent Variable: HRQoL

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	72.251	5.283	13.677	<0.001	61.875	82.628	0.248
PAQ-C	1.419	0.622	2.283	0.023	0.198	2.640	0.009
Age	- 1.944	0.402	- 4.835	<0.001	- 2.733	- 1.154	0.040
SES	- 0.437	0.412	- 1.060	0.290	- 1.247	0.373	0.002
[Sex=0]	- 0.174	0.949	- 0.184	0.854	- 2.038	1.689	0.000
[Sex=1]	0[a]	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

MVPA did not significantly predict HRQoL ($\beta = 0.019, 95\% - CI = -0.018; 0.056, p = 0.325$) (Table 4). Overall, ANCOVAs also showed that age had the biggest impact on HRQoL and explains $3.8 - 4\%$ of the variance of HRQoL, while effect sizes were small ($\eta_p^2 = 0.038 - 0.040$).

Table 4.

ANCOVA Parameter Estimates for HRQoL and MVPA Controlled for Age, SES, and Sex

Dependent Variable: HRQoL

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval		Partial Eta Squared
					Lower Bound	Upper Bound	
Intercept	75.290	9.403	8.007	<0.001	56.821	93.760	0.102
MVPA	0.019	0.019	0.985	0.325	- 0.018	0.056	0.002
Wear Time	- 0.001	0.008	- 0.178	0.859	- 0.018	0.015	0.000
SES	- 0.265	0.410	- 0.647	0.518	- 1.069	0.540	0.001
[Sex=0]	- 0.290	1.054	- 0.275	0.784	- 2.360	1.781	0.000
[Sex=1]	0[a]	.	.	.	.	.	.
Age	- 1.919	0.406	- 4.731	<0.001	- 2.715	- 1.122	0.038

a. This parameter is set to zero because it is redundant.

6.3 Results for Hypothesis 2

H2a *Self-reported PA and accelerometer-measured PA differ between different values of SES*

H2b *Self-reported PA and accelerometer-measured PA are positively correlated with SES*

Mean and Median for all analyzed PA variables stratified by SES are displayed in Table 5.

Table 5.

PAQ-C, MVPA, LPA and SB Across Groups of SES

		PAQ-C score	MVPA [min/day]	LPA [%/day]	SB [%/day]
		Mean ± *SD*	Median (IQR)	Mean ± *SD*	Mean ± *SD*
SES	2 – 5	2.78 ± 0.71	73.5 (55.9 – 90.4)	29.0 ± 3.9	63.5 ± 5.0
	6	2.86 ± 0.73	66.1 (51.0 – 87.6)	28.6 ± 4.2	64.4 ± 6.0
	7 – 8	3.06 ± 0.81	70.2 (51.6 – 89.4)	29.0 ± 4.3	63.9 ± 6.1

6.3.1 Self-reported PA (PAQ-C)

Spearman rank correlations showed a significant association between PAQ-C and SES ($\rho = 0.152, 95\% - \text{CI}: 0.069; 0.234, p < 0.001$). Since children were not equally distributed across levels of SES, data was divided into three equally distributed groups of SES: (i) SES levels from 2 – 5; (ii) SES level 6; and (iii) SES levels 7 – 8. A one-way-ANOVA showed strong evidence that PAQ-C scores differ between these three SES groups ($F(2, 569) = 7.479,\ p < 0.001$). Tukey post-hoc tests (Table 6) showed significant differences between SES groups (i) and (iii) ($p < 0.001$), as well as, at the $p = 0.05$ level, between group (ii) and (iii) ($p = 0.017$).

When stratified by sex, ANOVA showed strong evidence for PAQ-C differences between groups of SES for boys ($F(2, 292) = 10.506,\ p < 0.001$) but not for girls ($F(2, 274) = 0.517,\ p = 0.597$). Results for boys' ANOVA revealed a moderate effect ($\eta_p^2 = 0.067$), while a small effect was calculated for the total sample ($\eta_p^2 = 0.026$).

Table 6.

ANOVA Tukey Post-Hoc Comparisons for PAQ-C Across SES

Multiple Comparisons

Dependent Variable: PAQ-C score

	(I) SES Quartiles	(J) SES Quartiles	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Tukey HSD	2 – 5	6	- 0.07719	0.08201	0.614	- 0.2699	0.1155
		7 – 8	- 0.28405*	0.07801	**<0.001**	- 0.4674	- 0.1007
	6	2 – 5	0.07719	0.08201	0.614	- 0.1155	0.2699
		7 – 8	- 0.20686*	0.07547	**0.017**	- 0.3842	- 0.0295
	7 – 8	2 – 5	0.28405*	0.07801	**<0.001**	0.1007	0.4674
		6	0.20686*	0.07547	**0.017**	0.0295	0.3842

*. The mean difference is significant at the 0.05 level.

Additionally, single PAQ-C items were analyzed between the lowest and highest SES to get further insights into the domains of PA. Kruskal-Wallis pairwise comparisons revealed that children in the lowest SES group were less active in PE classes and school breaks as well as did less sports or games on weekends than children in the highest SES group (Table 7). Interestingly, when stratified by sex, there was strong evidence for a difference in PA levels during school breaks and on weekends in boys, but no differences in any item were found for girls. Boys with high SES were more active during school breaks, after school, and on weekends.

Table 7.

Post-Hoc-Test Evidence for Differences Between Low (2 – 5) and High (7 – 8) SES as Assessed with the Kruskal-Wallis-Test

	z-Value (*p*-Value[a])		
	All	Boys	Girls
Active PE	**- 2.595 ($p = 0.028$*)**	- 1.927 ($p = 0.162$)	- 1.728 ($p = 0.252$)
Active Break	**- 3.075 ($p = 0.006$**)**	**- 4.679 ($p = 0.000$**)**	0.371 ($p = 1.000$)
Active Lunch	- 1.916 ($p = 0.166$)	- 1.835 ($p = 0.199$)	- 0.909 ($p = 1.000$)
Active After School	- 1.497 ($p = 0.403$)	**- 2.469 ($p = 0.041$*)**	0.541 ($p = 1.000$)
Active Evening	- 1.530 ($p = 0.378$)	- 1.670 ($p = 0.285$)	- 0.371 ($p = 1.000$)
Active Weekend	**- 2.457 ($p = 0.042$*)**	**- 2.730 ($p = 0.019$*)**	- 0.603 ($p = 1.000$)

Annotation. * $p < .05$; ** $p < .01$
[a]Significance values adjusted by the Bonferroni correction for multiple tests.

6.3.2 Accelerometer-measured PA (ActiGraph)

Accelerometer data was analyzed for MVPA, SB, and LPA across SES. ANOVAs and Kruskal-Wallis-Tests did not show evidence for differences between levels of SES in MVPA ($\chi^2(2) = 3.435, p = 0.180$), SB ($F(2,\ 569) = 0.978,\ p = 0.377$), nor LPA ($F(2,\ 569) = 0.562,\ p = 0.570$). In addition, the Spearman Rank correlation did not show evidence for an association between either MVPA ($\rho = -0.051, 95\% - \text{CI:}\ -0.135; 0.034, p = 0.224$), SB ($\rho = 0.021, 95\% - \text{CI:}\ -0.064; 0.105, p = 0.618$), nor LPA ($\rho = -0.006, 95\% - \text{CI:}\ -0.091;\ 0.078, p = 0.883$). Children from SES group 2 – 5 spend 7.4 min more in MVPA than those from SES 6 and 3.3 min more than those from 7 – 8. Stratification by sex did not show evidence for differences in MVPA, SB, nor LPA across groups of SES.

6.4 Results for Hypothesis 3

H3a *HRQoL differs between different values of SES*

H3b *HRQoL is positively correlated with SES*

HRQoL and the distribution of children across levels of SES are displayed in Table 8. Since participants were not equally distributed across levels of SES, three groups were formed as described in the chapter above. A Kruskal-Wallis-Test between SES (i) 2 – 5, (ii) 6, and (iii) 7 – 8, did not reveal any significant differences between levels of HRQoL for SES groups ($\chi^2(2) = 0.538, p = 0.764$).

Table 8.

HRQoL Across SES

		HRQoL		
		n	Median (IQR)	Mean ± SD
	2 – 5	162	51.36 (45.7 – 59.9)	53.80 ± 12.1
SES	6	182	51.36 (45.7 – 59.9)	52.90 ± 11.3
	7 – 8	228	51.36 (45.7 – 59.9)	53.34 ± 10.9

Furthermore, the Spearman rank correlation did not show any evidence for an association between HRQoL and SES ($\rho = 0.001, 95\% - \text{CI}: -0.084; 0.085, p = 0.990$). Statistical analysis did not show any evidence for an association between HRQoL and SES in the underlying study population.

6.5 Age Differences

Spearman rank correlation coefficients (Table 9) showed strong evidence for a negative association between HRQoL and age. Sex-specific correlations revealed an even stronger negative association for girls than for boys. Further, there was strong evidence for a positive association between time spent in SB and age.

Table 9.

Spearman Rank Correlations Between HRQoL, PAQ-C, SB, MVPA and Age

	All ($n = 572$)		**Boys ($n = 295$)**		**Girls ($n = 277$)**	
	ϱ	p-value	ϱ	p-value	ϱ	p-value
HRQoL	**- 0.174**	**<0.001****	**- 0.129**	**0.027***	**- 0.215**	**<0.001****
PAQ-C	0.015	0.721	- 0.030	0.607	0.016	0.787
SB	**0.134**	**0.001****	**0.208**	**<0.001****	**0.132**	**0.029***
LPA	**- 0.189**	**<0.001****	**- 0.253**	**<0.001****	**- 0.145**	**0.016***
MVPA [min]	0.011	0.796	- 0.054	0.355	- 0.063	0.296

Annotation. * p < .05; ** p < .01; Health-Related Quality of Life (HRQoL); Physical Activity Questionnaire for Older Children (PAQ-C); Sedentary Behavior (SB); Low Physical Activity (LPA); Moderate to Vigorous Physical Activity (MVPA)

Strong evidence was also found for an inverse association between LPA and age. However, sex-specific differences show a stronger association between SB and LPA for boys than girls. Overall, effect sizes of correlations were small ($|\rho| = 0.13 - 0.25$). Spearman rank correlation did not show evidence for an association between either PAQ-C nor MVPA and age.

Differences across age groups for HRQoL, PAQ-C, SB, and MVPA were assessed with a Kruskal-Wallis-Test. To account for an uneven distribution of children across age they were assigned to one of the following three age groups: (i) aged 8 – 9; (ii) 10 – 11; (iii) 12 – 13.

A Kruskal-Wallis-Test showed strong evidence that HRQoL values differed across different age groups ($\chi^2(2) = 16.196, p = 0.001$). The pairwise comparisons of age are displayed in Table 10 and show children's decrease in HRQoL with increasing age. The following results of a Kruskal-Wallis-Test stratified by sex are in line with the correlation analysis and show that girls' HRQoL differs more across age groups ($\chi^2(2) = 10.956, p = 0.004$) than boys' ($\chi^2(2) = 5.665, p = 0.059$). Hence, HRQoL values of girls decrease more over time than HRQoL of boys. Partial eta squared values revealed small effect sizes ($\eta_p^2 = 0.013 - 0.033$) for HRQoL differences across age.

Table 10.

Kruskal-Wallis Post-Hoc Pairwise Comparisons of HRQoL Across Age (all Children)

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
12/13 – 10/11	49.165	17.753	2.769	0.006	0.017
12/13 – 8/9	85.041	21.224	4.007	<0.001	0.000
10/11 – 8/9	35.875	17.328	2.070	0.038	0.115

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is p = 0.05.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Furthermore, there was evidence for differences in SB across age groups ($\chi^2(2) = 5.937, p = 0.051$). Post-Hoc Pairwise comparisons (Table 11) revealed a significant difference only between groups aged 8 – 9 and 12 – 13 ($p = 0.047$). Sex-specific differences were stronger for boys ($\chi^2(2) = 9.280, p = 0.010$) than for girls ($\chi^2(2) = 3.802, p = 0.149$), which might be due to already higher SB values for girls between 8 and 9 years of age. There has been further evidence that LPA differs between age groups ($\chi^2(2) = 15.155, p < 0.001$). When stratified by sex, evidence remained for boys ($\chi^2(2) = 15.822, p < 0.001$) but not so for girls LPA ($\chi^2(2) = 5.815, p = 0.055$). Effect sizes for observed differences in SB and LPA were small to negligible ($\eta_p^2 = 0.007 - 0.047$). No evidence was found for PAQ-C differences across age groups ($\chi^2(2) = 0.562, p = 0.755$), nor for MVPA differences across age groups ($\chi^2(2) = 0.749, p = 0.688$).

Table 11.

Kruskal-Wallis Post-Hoc Pairwise Comparisons of Sedentary Behavior Across Age (all Children)

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
8/9 – 10/11	- 28.888	17.357	- 1.664	0.096	0.288
8-/9 – 12 /13	- 51.440	21.259	- 2.420	0.016	**0.047**
10/11 – 12/13	- 22.552	17.782	- 1.268	0.205	0.614

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is $p = 0.05$.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

7 Discussion

This study's objective was to shed additional light on the relationship between HRQoL, PA, and SES among underprivileged schoolchildren in Gqeberha. The subsequent chapters will walk readers through each variable's results and how they relate to the questions and hypotheses that were put forth. In the first hypothesis, self-reported and accelerometer-measured PA are discussed in relation to HRQoL. In the second and third hypotheses, the relationship of SES to PA and HRQoL will be discussed, respectively. If there were differences found in variables and relationships between boys and girls, they will be discussed accordingly. The last chapter will discuss overall age- and sex-related differences in HRQoL and PA.

When relating to my own findings, the term self-reported PA refers to the "Physical Activity Questionnaire for Older Children" (PAQ-C), while accelerometer-measured PA is labeled as sedentary behavior (SB), PA at low intensity (LPA), and moderate to vigorous intensity (MVPA).

7.1 Hypothesis 1: Association Between Self-Reported and Accelerometer-Measured PA and HRQoL

H1a *Self-reported PA and accelerometer-measured PA are positively associated with HRQoL.*

H1b *Self-reported PA is better at explaining differences in HRQoL than accelerometer-measured PA.*

Findings showed evidence for an association between HRQoL and self-reported PA. No association was found between HRQoL and accelerometer-measured MVPA nor SB. When stratified by sex, only girls' self-reported PA was associated with HRQoL. Using an ANCOVA to control for SES, age, and sex, self-reported PA still predicted HRQoL and, therefore corroborating hypothesis H1b. MVPA did not predict HRQoL, while age was the stronger predictor for HRQoL in both models. To note, however, in the cases where associations were found, the effect sizes were small.

Given that many studies have found associations between self-reported PA and accelerometer-measured MVPA to be inconsistent, differing associations of the PA measures with HRQoL are not surprising (Marasso et al., 2021). Despite a significant correlation between self-reported PA and accelerometer-measured MVPA of $\rho = 0.151$ was found in this study sample, Terwee et al. (2010) suggest a correlation coefficient of at least $r = 0.5$ for it to be acceptable for the validity of PA. Hence, the two measures might reflect different aspects of the construct of PA, as has been argued in other studies using both measures of PA (Marasso et al., 2021; Wunsch et al., 2021). They also argued that while accelerometer-measured PA assesses all types of movements (an accelerometer can measure) during a day, self-reported PA assesses specific PA behaviors and habits. Accelerometers might therefore not only measure activities connected to sports and games but also activities connected to house chores, informal activities, survival and work-related activities, and active transport. Having established the nature of both measures helps provide explanations for why self-reported PA was associated with HRQoL while accelerometer-measured PA was not, as will be discussed below.

Teychenne et al. (2020) argue that while frequency and intensity of PA are important for enhancing physical health, for mental health and psychosocial aspects of HRQoL, the domain in which physical activity takes place is even more important. Thus, PA done as a leisure time activity may enhance mental well-being more than work related PA. The behavioral component of self-reported PA as assessed with the PAQ-C in this study might rather reflect actual games that are connected to leisure time activity. Especially since PAQ-C questions specifically relate to PA as playing sports, games, or dancing. Therefore, the PAQ-C may have more commonalities with aspects of HRQoL, such as feeling fit and happy with regard to relations with peers, than accelerometer-measured PA might have with HRQoL. Furthermore, Lindwall et al. (2012) argue that psychological processes such as perception of mastery, control over body and health might play a more important role than physiological changes, when looking at mental well-being specifically, which is part of HRQoL.

Since self-reported PA seems to capture more of these behavioral leisure time activities, it might explain some of the differences in the association between self-reported and accelerometer-measured MVPA with HRQoL in the underlying study. In addition, self-reported PA still predicted HRQoL after controlling for SES, age, and sex. Therefore, self-reported PA might be a better tool to predict HRQoL than accelerometer-measured MVPA for children, especially in populations where the domain in which a PA takes places might be a contributing factor.

Overall, my findings would be in line with those of X. Y. Wu et al. (2017), who found in their review that the positive relationship between PA and HRQoL has been consistently observed irrespective of weight-status, sex, age, socioeconomic factors, and countries. A review by Marker et al. (2018) reported negligible to medium associations between PA and HRQoL. Most of the studies in both reviews used self-reported PA. Unfortunately, none of the studies were conducted in African or sub-Saharan countries. Moreover, my findings are in line with previous research conducted as part of the *KaziBantu* Project. Two studies conducted in the same area and with a similar study population found a positive association between self-reported PA and HRQoL across all five dimensions of KIDSCREEN-27 (Gall et al., 2020; Salvini et al., 2018).

Nevertheless, even though self-reported PA has repeatedly been associated with HRQoL, there are still equivocal results on the use of self-reported or accelerometer-measured PA. Wunsch et al. (2021), for example, found that self-reported PA was associated with more subscales of HRQoL than accelerometer-measured PA, while Anokye et al. (2012) found that accelerometer-measured PA was more closely associated with HRQoL than self-reported PA. At the same time, studies also reported no associations between both measures at all (Kvalø & Natlandsmyr, 2021) or PA being only related to the physical well-being subscale (Andersen et al., 2017). Indeed, the choice of PA measurement method is frequently discussed as a weakness in most studies, and a combination of both methods is repeatedly brought forward (Anokye et al., 2012; Marker et al., 2018; X. Y. Wu et al., 2017). In general, since HRQoL is a multidimensional concept, it is clear that PA is only one of many factors influencing HRQoL.

Wafa et al. (2016), for example, found that their observed association between accelerometer-measured PA and HRQoL was not significant after controlling for BMI and gender. Furthermore, while Kvalø & Natlandsmyr (2021) did not find an association between accelerometer-measured MVPA and HRQoL directly, their physical activity intervention was successful in improving children's HRQoL. Despite both studies using accelerometers, which might have resulted in a lack of associations with HRQoL, they show, how the association between PA and HRQoL can be mediated by other factors and why using a holistic approach might be the better path for PA or lifestyle behavior interventions.

Interestingly, when stratified by sex, only girls had significant associations between PAQ-C and HRQoL. The fact that 82% of the boys within the study met the recommended WHO guidelines of an average of 60 minutes spent in MVPA per day across the week, and just around 45.5% of the girls did, makes it possible that the impact of the PA disparities on girls' HRQoL is greater than it is on boys. Accordingly, if a person with low PA levels increases their activity, it might have a bigger impact on their physical and psychosocial well-being than for someone who already has higher levels of self-reported PA and accelerometer-measured MVPA. Ávila-García et al. (2021) have observed that for girls, an already smaller amount of PA can improve the perception of quality in life compared to boys since HRQoL was associated with LPA in girls and MVPA in boys. Especially since more time spent playing and engaging in sports activities was observed to be connected to more self-efficacy and self-esteem (Liu et al., 2015), hence improving girls' HRQoL.

Regardless of the measure of PA used, ANCOVAs revealed that the strongest predictor for HRQoL in both models was age. Age was found to be inversely associated with HRQoL. Girls' HRQoL decreased stronger than boys' HRQoL; however, mean HRQoL values did not differ between the sexes. These findings are in line with numerous studies reporting a decrease in HRQoL over time in children and adolescents, and especially girls (Killedar et al., 2020; Michel et al., 2009). More specifically, age-related changes in HRQoL were also reported in another study with underprivileged schoolchildren from Gqeberha aged 8 – 13 years (Gall et al., 2020). Compared to my findings, several studies have reported a stronger decrease in HRQoL around the transitioning period into adolescents. In fact, Palacio-Vieira et al. (2008) found that pubertal development has a negative effect on HRQoL, particularly in girls. They also point to other aspects such as life events, mental health, insecurities about the developing body, or problems with sexuality that contribute to lower levels of HRQoL. The stronger decrease in HRQoL between higher age groups observed in this thesis may therefore be partly attributed to starting pubertal development. The observation that no HRQoL differences were observed between the sexes in my findings may be attributed to the younger age of the study sample (Masini et al., 2021). Michel et al. (2009) found that boys and girls around age 8 have similar levels of HRQoL. The stronger decrease over time in girls eventually leads to different levels in boys and girls in adolescence. Therefore, sex differences in HRQoL might not occur until pubertal development starts.

Promotion of girls PA levels should be especially encouraged given the reported low levels of girls' PA and the more pronounced decline in HRQoL with age compared to boys, as observed in my findings. Finally, self-reported PA might be a better measure to predict HRQoL in children living in low-socioeconomic settings. Especially, since it captures information on PA behavior that might be more connected to organized and leisure time play, which in turn may contribute to a better HRQoL. Therefore, self-reported PA provides valuable information on the domain and type of activity compared to accelerometer-measured PA. The fact that effect sizes were low might be attributed to the nature of the KIDSCREEN-10 index, as this measure of HRQoL does not provide information on subscale differences, and therefore the specificity of PA's effect on HRQoL might have been missed. A more comprehensive measure of HRQoL, such as the KIDSCREEN-27 or -52 questionnaire, might give more specific insights.

Despite the lack of evidence for associations between accelerometer-measured PA and HRQoL, studies should use both measures in combination since accelerometer data also provides valuable insights into actual PA levels and different intensities. Sufficient everyday PA in any domain is important too, since SB has been shown to be connected to several risk factors such as cardiovascular and non-communicable diseases (Lee et al., 2012).

7.2 Hypothesis 2: Association Between Self-Reported and Accelerometer-Measured PA and SES

H2a Self-reported PA and accelerometer-measured PA differ between different values of SES

H2b Self-reported PA and accelerometer-measured PA are positively correlated with SES

The aim of the second hypothesis was to examine the relationship between both self-reported and accelerometer-measured PA and SES. Findings revealed strong evidence for a positive association between SES and self-reported PA. When stratified by sex, associations of SES with self-reported PA were only found for boys, but not for girls. There was no evidence found for an association between neither SB, LPA, MVPA, and SES. In summary, higher SES is associated with higher self-reported PA, but no strong evidence was found for differences with accelerometer-measured PA. While a moderate effect was found for associations in boys between SES and self-reported PA, only small effects were found for the total population.

It should be noted that a central limitation for the relationship between PA and SES and the reported small to moderate effect sizes is connected to the fact that the study population is from disadvantaged neighborhoods; hence, SES variations within this population might be small.

Single PAQ-C items were evaluated to get a clearer view of self-reported PA behaviors across SES. It was revealed that children with the lowest SES were less active during PE classes and school breaks and participated less in sports or games on weekends. For the latter item, "active-weekend", children were asked whether and how many times they did sports, danced, or played games in which they were physically very active. Hence, although children with low SES engaged less in specific high-intensity games, they might have been involved in house chores or other activities. That may have resulted in reported high levels of time spent in accelerometer-measured MVPA but was not reported as sport, dancing, or games in the PAQ-C. Muthuri et al. (2014), for example, argued that high PA in children from low SES might be more linked to informal or survival activities than organized games. Since children in the underlying thesis did not show differences in accelerometer-measured MVPA between levels of SES, the differences between the groups might lie in children's PA behavior (during PE, school breaks, and leisure time) rather than their specific duration and intensity of PA.

It has been argued that SES might be more associated with organized sports than general PA levels (Nielsen et al., 2012), which might be attributed to the fact that low-income groups tend to have less money to pay fees for organized sports (Elsborg et al., 2019). It is generally known that people with higher SES have more possibilities and fewer barriers – such as time, equipment, or knowledge – to invest in healthy lifestyle behaviors (Vukojević et al., 2017). Therefore, reducing these barriers through, e.g., subsidies might help increase MVPA levels connected to play and sports games in low SES populations (Elsborg et al., 2019). The school environment may be an important place for the promotion of PA behaviors since, as Draper et al. (2018) point out, especially children in South Africa living in low socioeconomic settings often lack facilities and infrastructure as well as leisure time. An observation that is shared by Micklesfield et al. (2014), who reported that children with low SES engage less in MVPA at school or in sports clubs, as already mentioned.

Although self-reported PA in this study does not differentiate between intensities of PA, it has been shown that self-reported PA, specifically PAQ-C values, might be more associated with MVPA than LPA (Kim et al., 2013; Sabia et al., 2014). Given this, our findings that low SES is linked to low self-reported PA would be consistent with associations for MVPA seen in numerous studies of HIC (Stalsberg & Pedersen, 2010), sub-Saharan African countries (Muthuri et al., 2014), as well as in underdeveloped rural communities in South Africa, as discovered by Micklesfield et al. (2014). Micklesfield et al. (2014) could also show that boys and girls from poor rural communities with lower SES were associated with lower MVPA in schools or clubs.

However, given the inconsistency in associations between SES and PA, arguments must be reconsidered for each population in HIC and LMIC as well as for rural and urban differences since they may have their own characteristics (Delisle Nyström et al., 2019; McVeigh et al., 2004; Micklesfield et al., 2014). A great diversity in socioeconomic-related PA patterns has been observed by, for example, Musić Milanović et al. (2021) across countries in the EU. Furthermore, Gerber et al. (2021) found in a study conducted in a similar population as in the underlying thesis in South Africa that children's accelerometer-measured MVPA was higher in low than high SES groups, which is contrary to what I found for self-reported PA and SES. Indeed, PA associations with SES have been shown to depend strongly on what part of PA was measured and how, thus, not only frequency but also intensity influences associations between PA and SES and vice versa (Drenowatz et al., 2010). In the case of the underlying thesis, had only PAQ-C data been used, sufficient accelerometer-measured PA levels of low SES groups would have been missed in the underlying study, which further adds to the argument that self-reported and device-based PA should be used simultaneously. At the same time, the choice of PA assessment method should be made based on the objective of study in general. Thus, when the goal is to provide insights on PA that are connected to playing sports, games, or dancing in the school and leisure time context, the PAQ-C might be an appropriate measure. On the other hand, an accelerometer might be used when overall activity, regardless of type or domain, is studied.

Finally, associations between self-reported PA and SES were found for boys but not for girls. More specifically, active weekend differences between SES were observed for boys but not for girls. A recent study by Walter (2011) found that girls' after-school activities were low due to compulsory domestic work, and their preferred leisure time activities involved mostly sedentary behaviors. It has been shown that socialization of girls from traditional communities in South Africa results in fewer opportunities for physical exercise by engaging them in house chores and other household and family-related responsibilities (C. M. Walter & Du Randt, 2011). Therefore, whereas boys' chances for PA may rise with greater SES, allowing them to participate in more games and sports, girls may not have the same opportunities, and their PA levels may remain unchanged despite better socioeconomic conditions. Thus, addressing the need to strengthen girls' PA opportunities and creating interventions as well as policy recommendations accordingly. Increasing in-school PA through PE might further act as a buffer, as already stated by McVeigh et al. (2004).

7.3 Hypothesis 3: Association Between HRQoL and SES

H3a HRQoL differs between different values of SES

H3b HRQoL is positively correlated with SES

Within a population of underprivileged children from low socioeconomic settings in South Africa, no differences in HRQoL across levels of SES were found. These findings were not anticipated since researchers have found a positive relationship between HRQoL and SES in many studies (Hovsepian et al., 2019; Killedar et al., 2020; Poulain et al., 2019). Particularly given that health inequalities in South African adults have been reported, showing that richer adults had fewer health issues than the poor (Ataguba et al., 2016). Since there is little research on HRQoL in South Africa, comparing the underlying findings to research from other locations with a similar geography and population is difficult. However, there has been one study that examined, among other variables, HRQoL and SES as part of the *KaziBantu* project. Gall et al. (2020) showed in a similar cohort that higher SES was positively associated with the KIDSCREEN-27 subscales physical well-being, autonomy and parent relations, and school environment. However, when they used the KIDSCREEN-10 index, similar to my analysis, no significant associations were found. My findings for the KIDSCREEN-10 index corroborate their results.

Numerous explanations have been offered that could account for the lack of relationships observed between the measured variables in this study. First off, although a positive association between HRQoL and SES was observed in a study by Ravens-Sieberer et al. (2007) in Europe, they found that these differences were less clear in children than in adolescents. The fact that no differences have been found in this study might be partly attributable to the younger age of the children. Second, SES might not always affect the same subscales. While Klatchoian et al. (2010) demonstrated that SES of children from urban areas of Sao Paolo, Brazil, was associated with their emotional and social subscales of HRQoL but not with their physical health or educational outcomes, Gall et al. (2020), in contrast, did find associations between SES and physical health and school-related subscales of HRQoL. Since the underlying thesis only used the KIDSCREEN-10 index version of the questionnaire, any potential subscale differences cannot be examined. Further, as relationships with SES have been found to vary between HIC and LMIC as well as rural and urban locations, comparisons of my findings with those from Europe or other places should be considered with caution. Another explanation for the missing association might be attributed to the study sample. The underlying study population is from low socioeconomic and underprivileged areas and cannot represent a diverse population from low and high socioeconomic settings. Hence, variations in HRQoL across SES might be small due to the narrow range of SES. However, it has been shown that variability in health measures within low SES settings does occur. Nkonki et al. (2011), for instance, noted that socioeconomic inequalities in child health were observed in underprivileged black communities, despite the fact that variability within low socioeconomic contexts may have been minor. In addition, there have been associations found between SES and self-reported PA in my thesis. Overall, further research in South Africa on HRQoL in children and adolescents from all socioeconomic backgrounds would therefore give more insights.

7.4 Physical Activity Patterns Across Age and Sex

To provide further data on PA, its patterns across age and sex are discussed in the following sections of this chapter.

No association was found between MVPA or self-reported PA and age (8 – 13 years). However, there was a positive association found between SB and age ($p = 0.001$) and an inverse association with LPA ($p < 0.001$) in both sexes. Therefore, older children spend more time in SB and less time in LPA. As MVPA did not change with age, the existing increase in SB comes at the expense of LPA levels. Ortega et al. (2013) argue that more academic responsibilities may contribute to more SB in adolescents. Draper et al. (2018) argue in their 2018 Report Card on PA that the affordability and increased use of smartphones and internet data in South Africa might be another reason for increasing SB in children and adolescents. McVeigh & Meiring (2014) observed a decline in self-reported MVPA and total PA among South African schoolchildren between 5 and 18 years of age, and Biljon et al. (2018) found a decline in schoolchildren's PA aged 11 – 14 years. A three-year longitudinal PA intervention study conducted in South Africa in 13 – 17-year-old adolescents showed a PA decline in the control group, while the intervention group could maintain their PA levels during the study period (Pienaar et al., 2012). This demonstrates both the need for and potential impact of PA interventions. Placing the findings in the South African context, shows a similar relationship in terms of overall PA levels, but not with MVPA.

Similar results from studies and reviews mostly conducted in the UK, US, and Australia were observed by reporting a decline in PA over time from childhood to adolescence (Brodersen et al., 2007; Cooper et al., 2015; Olds et al., 2009; Pearson et al., 2009). While Cooper et al. (2015) observed a decline in overall PA, it was mostly time spent in SB displacing time spent in LPA. A similar pattern as observed in my findings. In contrast to my findings, other studies and reviews observed a decline in higher intensity PA over time in children and adolescents. Farooq et al. (2020) report in their review and meta-analysis a decline in MVPA across all age groups, starting from around age 6 in girls and age 9 in boys. An increase in SB from childhood to adolescence has been observed in various studies, as discussed in a review by Kontostoli et al. (2021). Since the increase in SB in the underlying thesis comes at the expense of LPA, behavioral changes in SB might be an important additional focus of future interventions.

In the underlying study sample, 82% of boys and 45.5% of girls met PA guidelines. Meeting guidelines is defined according to the *WHO guidelines on physical activity and sedentary behavior,* which are formulated as follows: “Children and adolescents should do at least an average of 60 minutes per day (min/day) of moderate to vigorous-intensity, mostly aerobic, physical activity, across the week” (WHO, 2022b).

Regardless of sex, 64.3% of children met MVPA guidelines. Children spend around 70.5 min/day in MVPA, with boys mean at 83.2 min/day and girls’ around 57.1 min/day respectively. Müller et al. (2020) reported in a previous study in a similar population as mine, that 69.2% met recommendations measured by accelerometer. Biljon et al. (2018) reported that, similarly to our study sample, 69% of children in SA across provinces met recommendations, with boys showing higher self-reported PA levels than girls. The rather high number of children meeting PA recommendations in my study sample exceeds the numbers observed in other studies in South Africa, which reported that around 50% of children met a weekly average of at least 60 minutes MVPA per day (Roman-Viñas et al., 2016; Salvini et al., 2018).

Since findings from studies assessing PA across many countries worldwide found differing results, it may be debated if a comparison is possible. Even more so, since often different cut-off points are used, and slightly different formulations of PA guidelines exist. Thus, while Cooper et al. (2015) observed in mostly western countries, such as the US, UK, and Northern Europe, that only 9% of boys and 2% of girls met the PA recommendation, they referred to children spending at least 60 minutes in MVPA *every single day* and not – as used in the underlying study – to children’s *weekly average* of at least 60 minutes per day.

Overall, sex differences were strong for almost all PA measures and intensities. Boys spend more time in LPA, MPA, VPA, and MVPA than girls. Girls spend more time in SB accordingly. This clear gap between the sexes has already been observed in South Africa (Kruger et al., 2006; McVeigh & Meiring, 2014b; Minnaar et al., 2016). Similarly, reviews globally reported higher levels of MVPA in boys than in girls (Cooper et al., 2015; Pearson et al., 2009). Skaal & Toriola (2015) found in a study of South African children that boys had higher social correlates of participating in physical activity than girls. They argue that females are not socially encouraged to participate in vigorous PA. They also point to the varying importance of sport participation, which can differ in accordance with cultural norms. C. Walter (2011) found in her study in Gqeberha that girls participated less in PA during school hours, which might be connected to the point made above. Further, their leisure time activity opportunities, as argued by C. Walter (2011), were limited due to domestic and family duties that boys did not have to attend to the same extent. Even more so, highlighting the importance of in-school PA promotion in order to close the gap.

8 Strengths and Limitations

The relatively large sample size (n = 572) and equal distribution of sex across the study sample can be seen as an advantage. A main strength lies in the combined use of self-reported and accelerometer-measured PA in relation to HRQoL. As there has not been a lot of research on HRQoL in healthy children and adolescents in South Africa, the findings of this study might offer more insights.

However, the large study sample should not overshadow the fact that the children came from underprivileged neighborhoods in the Gqeberha region, which is characterized by a relatively low SES. As a result, even though the children in this study had high SES, they might still be considered to have lower SES compared to other populations in South Africa. Because of this, the findings from this study should be interpreted adequately when compared to populations in other countries or in South Africa. Since the results of this thesis are based on cross-sectional data, conclusions about the causes of effects cannot be drawn. As already mentioned by various studies looking at HRQoL, PA, and SES, the inconsistency in results across studies and countries is often argued to be related to methodological differences and limitations.

The KIDSCREEN-10 index used in the underlying study to assess children's HRQoL does not provide insights into subscales. This is a major limitation given the fact that numerous studies have consistently revealed that relationships with HRQoL vary among subscales.

PA assessment methods have their limitations as well. Accelerometer-measured PA is known to miss out on activities such as cycling or swimming since the accelerometer is not waterproof. Such activities might not be reflected in accelerometry measures and result in more or less accurate PA levels, depending on the PA behaviors. Furthermore, children's PA patterns are characterized by many short bouts of MVPA compared to elders or adults, and therefore, accelerometers might miss out on children's activities due to long epoch lengths. While the used epoch length of 10 seconds in this study could have been even shorter, it has been found to be a sufficient choice for measurements in children (Baquet et al., 2007).

Children's variable and intermittent activity patterns may also influence their ability to precisely report in questionnaires. Moreover, it might present recall biases in self-reported PA due to a lack of understanding questions, remembering activities, or a social desirability effect (Sirard & Pate, 2001). Furthermore, self-reported PA, as assessed with the PAQ-C, is constructed to reflect general PA levels. Thus, it technically does not differentiate between intensities, although it has been found to be more associated with MVPA than LPA (Sabia et al., 2014). Seasonal variations in PA patterns have been noted; as a result, PA levels measured in this study in February and March may differ from PA levels in other seasons (Kristensen et al., 2008). When looking at PA and HRQoL, common method variance between self-reported PA and HRQoL might have contributed to parts of the association since both are assessed with a questionnaire compared to accelerometer-measured PA.

SES was assessed using a material asset index. While it has been found to correlate well with other measures of SES such as income, education, and food inventory index and may be used to assess inequalities in South Africa (Nkonki et al., 2011), it might miss out on other socioeconomically relevant factors such as parental education or income. Nevertheless, since the underlying sample is somewhat homogenous and from a low SES setting, using a material asset index for each child’s household should make comparisons within the group reasonable.

9 Conclusion and Outlook

The thesis' objective was to add to the evidence on the relationship between HRQoL, PA, and SES in schoolchildren from the Gqeberha area. The first objective was to gain insights into the relationship between PA and HRQoL. The second and third objectives were to see whether HRQoL and PA differed across SES. This knowledge may be helpful in identifying HRQoL and PA patterns for use in informing intervention and policy decisions.

The results of the underlying study showed that self-reported PA predicted HRQoL, while accelerometer-measured PA did not. It has been argued in the literature that both PA measures reflect different aspects of the construct of PA (Marasso et al., 2021; Wunsch et al., 2021). The behavioral component of self-reported PA might be more related to leisure time activity and therefore be a better predictor for aspects of HRQoL such as feeling fit or being happy with regard to relations with peers. It might therefore provide valuable insights that accelerometers do not. Despite the fact that no associations for accelerometer-measured MVPA have been found between either HRQoL and SES in this population, using accelerometers to measure and monitor PA levels is important since PA in any domain, whether connected to organized sports or not, contributes to a more active lifestyle. Overall, while the positive effect of PA on HRQoL has been well established (X. Wu et al., 2021), focusing solely on PA to promote HRQoL may lead to missing other factors influencing this relationship, as age and gender were found to be mediating factors in this relationship. In conclusion, self-reported PA might be a good predictor for HRQoL in underprivileged schoolchildren in South Africa. The causality of effects on these patterns, however, cannot be determined.

When looking at SES, socioeconomic differences were found for self-reported PA but not for accelerometer-measured MVPA. Again, the methodological nature of both PA measures might explain those findings. While self-reported PA (PAQ-C) specifically asks for children's engagement in games or dancing (organized sports and games), the accelerometer assesses MVPA independent of the activity and domain. Hence, children from lower SES might spend more time with house chores or some sort of informal and survival activities; these would be reflected in accelerometer MVPA but not PAQ-C, while children from higher SES with more opportunities for organized sports might have similar MVPA levels measured with the accelerometer, but also higher MVPA as assessed with the PAQ-C. In conclusion, it depends on the aim of a study whether self-reported or accelerometer-measured PA should be used across SES since they provide varying insights on the construct of PA.

Looking at socioeconomic differences, statistical analysis did not reveal any differences in HRQoL across different SES. The somewhat homogenous population in terms of SES might be the main limiting factor for the absence of an association between the two measures; hence, HRQoL differences cannot be neglected when comparing to a socioeconomically more diverse population from South Africa. Further, using the KIDSCREEN-10 index might have led to missing possible subscale differences that would have been observed with a more comprehensive HRQoL measure such as the KIDSCREEN-27 questionnaire.

What can we draw from these findings for future intervention and policy decisions in South Africa?

Despite the fact that there was no relationship between SES and HRQoL in this study, self-reported PA was associated with both SES and HRQoL. The links between self-reported PA (or children's PA behaviors), SES, and HRQoL suggest that a suitable approach to increase children's HRQoL through PA interventions is to deliver those doses of PA in the form of games and sports-related activities that take place in environments where children can move around safely. In support of this argument, I'd like to return to the remarks made by Draper et al. (2018), who state that children in South Africa from low-income settings lack safe and accessible PA opportunities while safety concerns limit their ability to freely engage in play. Even though PA interventions can increase levels of MVPA, Arnaiz et al. (2023) observed a drop in MVPA levels following the completion of the *KaziBantu* PA intervention, which emphasizes the need for structural adjustments to be made in order to achieve long-lasting effects.

While boys' levels of self-reported PA increase with higher SES, girls' self-reported PA levels remain unchanged. Therefore, girls should be given particular attention since their HRQoL has decreased more over time than boys' HRQoL. PA in the form of games and organized sports should be promoted. Further gender disparities in PA and HRQoL, as well as age-related increases in sedentary behavior, highlight the need for a more holistic approach. One example of this is increasing social correlates for girls to play sports or increasing in-school PA. Interventions should also include measures aimed at lowering SB, including, among others, screen time. In addition, the use of a more comprehensive measure of HRQoL, such as the KIDSCREEN-27 or KIDSCREEN-52 questionnaires, would provide valuable insights when used in relation to self-reported and accelerometer-measured PA.

In summary, a holistic approach entails changes on all levels, including: (i) socioeconomic, cultural, and environmental conditions; (ii) social and community aspects; and (iii) individual lifestyle factors. Yes, PA may temporarily improve HRQoL in low socioeconomic settings, but if not all influencing levels are taken into consideration, the root of the problem will not be solved.

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Appendix

Appendix 1: Physical Activity Questionnaire for Older Children (PAQ-C)

Physical Activity Questionnaire (Elementary School)

Name:_________________________ Age:___________

Sex: M_______ F_______ Grade:__________

Teacher:_______________________

We are trying to find out about your level of physical activity from ***the last 7 days*** (in the last week). This includes sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

---

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	❍	❍	❍	❍	❍
Rowing/canoeing	❍	❍	❍	❍	❍
In-line skating	❍	❍	❍	❍	❍
Tag	❍	❍	❍	❍	❍
Walking for exercise	❍	❍	❍	❍	❍
Bicycling	❍	❍	❍	❍	❍
Jogging or running	❍	❍	❍	❍	❍
Aerobics	❍	❍	❍	❍	❍
Swimming	❍	❍	❍	❍	❍
Baseball, softball	❍	❍	❍	❍	❍
Dance	❍	❍	❍	❍	❍
Football	❍	❍	❍	❍	❍
Badminton	❍	❍	❍	❍	❍
Skateboarding	❍	❍	❍	❍	❍
Soccer	❍	❍	❍	❍	❍
Street hockey	❍	❍	❍	❍	❍
Volleyball	❍	❍	❍	❍	❍
Floor hockey	❍	❍	❍	❍	❍
Basketball	❍	❍	❍	❍	❍
Ice skating	❍	❍	❍	❍	❍
Cross-country skiing	❍	❍	❍	❍	❍
Ice hockey/ringette	❍	❍	❍	❍	❍
Other:					
_________________________	❍	❍	❍	❍	❍
_________________________	❍	❍	❍	❍	❍

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

- I don't do PE ....…...❍
- Hardly ever ....❍
- Sometimes ....❍
- Quite often ....❍
- Always ....❍

3. In the last 7 days, what did you do most of the time *at recess*? (Check one only.)

- Sat down (talking, reading, doing schoolwork)……❍
- Stood around or walked around ....❍
- Ran or played a little bit ....❍
- Ran around and played quite a bit ....❍
- Ran and played hard most of the time ....❍

4. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

- Sat down (talking, reading, doing schoolwork)…....❍
- Stood around or walked around ....❍
- Ran or played a little bit ....❍
- Ran around and played quite a bit ....❍
- Ran and played hard most of the time ....❍

5. In the last 7 days, on how many days *right after school*, did you do sports, dance, or play games in which you were very active? (Check one only.)

- None ....….❍
- 1 time last week ....❍
- 2 or 3 times last week ....❍
- 4 times last week ....❍
- 5 times last week ....❍

6. In the last 7 days, on how many *evenings* did you do sports, dance, or play games in which you were very active? (Check one only.)

- None ....❍
- 1 time last week ....❍
- 2 or 3 times last week ....❍
- 4 or 5 last week ....❍
- 6 or 7 times last week ....❍

7. *On the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

None .... ❍
1 time .... ❍
2 — 3 times .... ❍
4 — 5 times .... ❍
6 or more times .... ❍

8. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

A. All or most of my free time was spent doing things that involve little physical effort .... ❍

B. I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics) .... ❍

C. I often (3 — 4 times last week) did physical things in my free time .... ❍

D. I quite often (5 — 6 times last week) did physical things in my free time .... ❍

E. I very often (7 or more times last week) did physical things in my free time .... ❍

9. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday	❍	❍	❍	❍	❍
Tuesday	❍	❍	❍	❍	❍
Wednesday	❍	❍	❍	❍	❍
Thursday	❍	❍	❍	❍	❍
Friday	❍	❍	❍	❍	❍
Saturday	❍	❍	❍	❍	❍
Sunday	❍	❍	❍	❍	❍

10. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

Yes .... ❍
No .... ❍

If Yes, what prevented you? ________________________________

Appendix 2: Statistical Result Tables for Chapter 6.1

Age * Sex

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	12,329[a]	5	,031
Likelihood Ratio	12,533	5	,028
Linear-by-Linear Association	8,003	1	,005
N of Valid Cases	572		

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 8,23.

SES * Sex

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	3,289[a]	6	,772
Likelihood Ratio	3,304	6	,770
Linear-by-Linear Association	,165	1	,685
N of Valid Cases	572		

a. 4 cells (28,6%) have expected count less than 5. The minimum expected count is 1,45.

HRQoL * Sex

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	42893,000
Wilcoxon W	81396,000
Test Statistic	42893,000
Standard Error	1972,018
Standardized Test Statistic	1,032
Asymptotic Sig.(2-sided test)	,302

PAQ-C * Sex

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	33323,000
Wilcoxon W	71826,000
Test Statistic	33323,000
Standard Error	1972,333
Standardized Test Statistic	-3,820
Asymptotic Sig.(2-sided test)	<,001

MPA across Sex

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	21105,000
Wilcoxon W	59608,000
Test Statistic	21105,000
Standard Error	1975,321
Standardized Test Statistic	-10,000
Asymptotic Sig.(2-sided test)	,000

VPA across Sex

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	19887,000
Wilcoxon W	58390,000
Test Statistic	19887,000
Standard Error	1975,321
Standardized Test Statistic	-10,616
Asymptotic Sig.(2-sided test)	,000

MVPA across Sex

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	19280,500
Wilcoxon W	57783,500
Test Statistic	19280,500
Standard Error	1975,320
Standardized Test Statistic	-10,923
Asymptotic Sig.(2-sided test)	,000

Wear Time across Sex

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	33819,000
Wilcoxon W	72322,000
Test Statistic	33819,000
Standard Error	1975,290
Standardized Test Statistic	-3,563
Asymptotic Sig.(2-sided test)	<,001

SB, LPA * Sex

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means							
						Significance				95% Confidence Interval of the Difference	
		F	Sig.	t	df	One-Sided p	Two-Sided p	Mean Difference	Std. Error Difference	Lower	Upper
SB	Equal variances assumed	,271	,603	−5,916	570	<,001	<,001	−2,7849	,4707	−3,7094	−1,8604
	Equal variances not assumed			−5,924	569,747	<,001	<,001	−2,7849	,4701	−3,7082	−1,8616
LPA	Equal variances assumed	,133	,715	1,039	570	,150	,299	,3603	,3466	−,3206	1,0411
	Equal variances not assumed			1,038	563,981	,150	,300	,3603	,3471	−,3215	1,0420

Meeting PA Guidelines * Sex

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	83,160[a]	1	<,001		
Continuity Correction[b]	81,574	1	<,001		
Likelihood Ratio	85,710	1	<,001		
Fisher's Exact Test				<,001	<,001
Linear-by-Linear Association	83,014	1	<,001		
N of Valid Cases	572				

a. 0 cells (0,0%) have expected count less than 5. The minimum expected count is 98,79.

b. Computed only for a 2x2 table

SES * Meeting PA Guidelines

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	7,368[a]	6	,288
Likelihood Ratio	7,251	6	,298
Linear-by-Linear Association	,304	1	,581
N of Valid Cases	572		

a. 4 cells (28,6%) have expected count less than 5. The minimum expected count is 1,07.

HRQoL * Meeting PA Guidelines

Independent-Samples Mann-Whitney U Test Summary

Total N	572
Mann-Whitney U	37977,000
Wilcoxon W	105873,000
Test Statistic	37977,000
Standard Error	1890,162
Standardized Test Statistic	,233
Asymptotic Sig.(2-sided test)	,816

Comparison of KIDSCREEN-10 index with European normdata

Boys aged 8 – 11 years:

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HRQoL	222	54,0710	12,30719	,82600

One-Sample Test

	Test Value = 54						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
HRQoL	,086	221	,466	,932	,07101	-1,5568	1,6989

Girls aged 8 – 11 years:

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HRQoL	233	54,3875	11,05559	,72428

One-Sample Test

	Test Value = 53.82						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
HRQoL	,784	232	,217	,434	,56752	-,8595	1,9945

Boys aged 12 – 13 compared to normdata (12 – 18y)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HRQoL	73	50,3930	10,03787	1,17484

One-Sample Test

	Test Value = 49.97						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
HRQoL	,360	72	,360	,720	,42298	-1,9190	2,7650

Girls aged 12 – 13 compared to normdata (12-18y)

One-Sample Statistics

	N	Mean	Std. Deviation	Std. Error Mean
HRQoL	44	48,8783	7,76705	1,17093

One-Sample Test

	Test Value = 47.21						
			Significance			95% Confidence Interval of the Difference	
	t	df	One-Sided p	Two-Sided p	Mean Difference	Lower	Upper
HRQoL	1,425	43	,081	,161	1,66829	-,6931	4,0297

Appendix 3: Statistical Result Tables for Chapter 6.2

Results of the multiple linear regression model for PAQ-C and HRQoL (N = 572)

Tests of Between-Subjects Effects

Dependent Variable: HRQoL

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3550,252[a]	4	887,563	7,188	<,001	,048
Intercept	22685,857	1	22685,857	183,721	<,001	,245
PAQ-C	643,465	1	643,465	5,211	,023	,009
SES	138,696	1	138,696	1,123	,290	,002
Age	2886,454	1	2886,454	23,376	<,001	,040
Sex	4,171	1	4,171	,034	,854	,000
Error	70013,213	567	123,480			
Total	1700449,407	572				
Corrected Total	73563,465	571				

a. R Squared = ,048 (Adjusted R Squared = ,042)

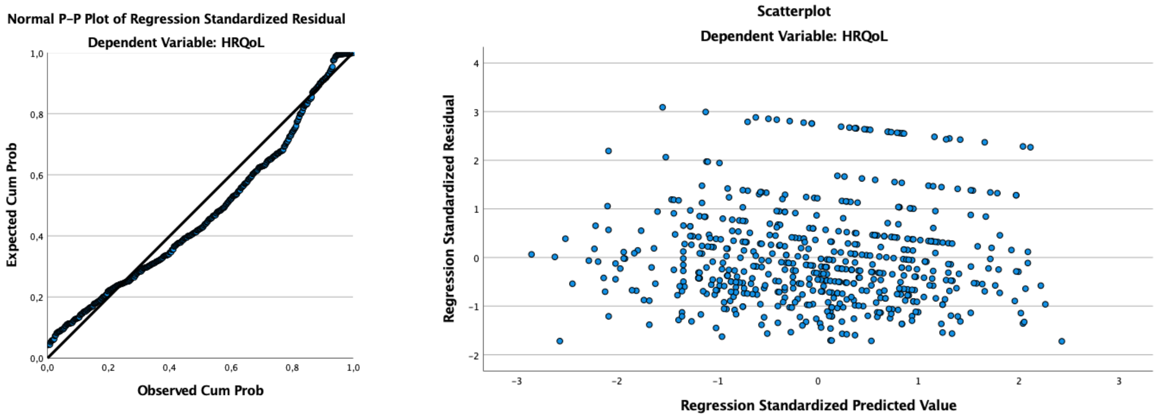
Parameter Estimates

Dependent Variable: HRQoL

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	Partial Eta Squared
Intercept	72,251	5,283	13,677	<,001	61,875	82,628	,248
PAQ-C	1,419	,622	2,283	,023	,198	2,640	,009
SES	-,437	,412	-1,060	,290	-1,247	,373	,002
Age	-1,944	,402	-4,835	<,001	-2,733	-1,154	,040
[Sex=0]	-,174	,949	-,184	,854	-2,038	1,689	,000
[Sex=1]	0[a]	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

Tukey-Anscombe-Plot



Results of the multiple linear regression model for MVPA and HRQoL (N = 572)

Tests of Between-Subjects Effects

Dependent Variable: HRQoL

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	3027,672[a]	5	605,534	4,859	<,001	,041
Intercept	7902,178	1	7902,178	63,409	<,001	,101
MVPA	120,883	1	120,883	,970	,325	,002
Wear Time	3,945	1	3,945	,032	,859	,000
SES	52,144	1	52,144	,418	,518	,001
Age	2789,910	1	2789,910	22,387	<,001	,038
Sex	9,404	1	9,404	,075	,784	,000
Error	70535,794	566	124,622			
Total	1700449,407	572				
Corrected Total	73563,465	571				

a. R Squared = ,041 (Adjusted R Squared = ,033)

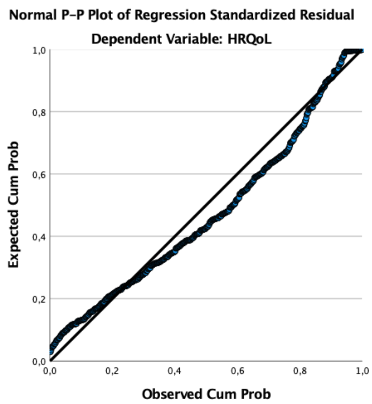
Parameter Estimates

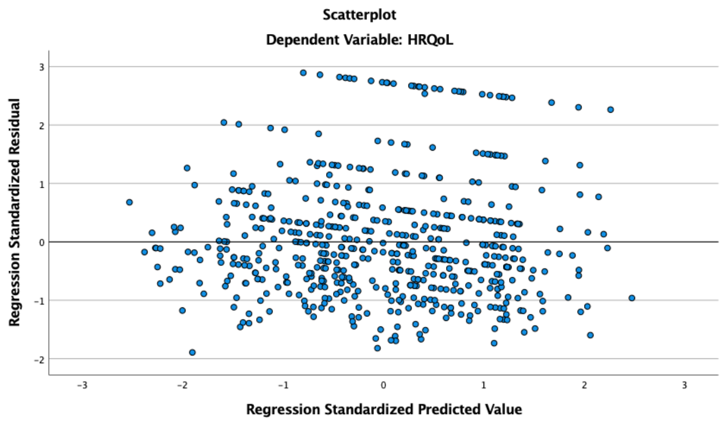
Dependent Variable: HRQoL

Parameter	B	Std. Error	t	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound	Partial Eta Squared
Intercept	75,290	9,403	8,007	<,001	56,821	93,760	,102
MVPA	,019	,019	,985	,325	-,018	,056	,002
Wear Time	-,001	,008	-,178	,859	-,018	,015	,000
SES	-,265	,410	-,647	,518	-1,069	,540	,001
Age	-1,919	,406	-4,731	<,001	-2,715	-1,122	,038
[Sex=0]	-,290	1,054	-,275	,784	-2,360	1,781	,000
[Sex=1]	0[a]	.	.	.	.	.	.

a. This parameter is set to zero because it is redundant.

Tukey-Anscombe-Plot





Appendix 4: Statistical Result Tables for Chapter 6.3.1

One-Way-ANOVA of PAQ-C differences between groups of SES

ANOVA

PAQ-C score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8,622	2	4,311	7,479	<,001
Within Groups	327,970	569	,576		
Total	336,592	571			

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval	
			Lower	Upper
PAQ-C score	Eta-squared	,026	,005	,054
	Epsilon-squared	,022	,002	,051
	Omega-squared Fixed-effect	,022	,002	,051
	Omega-squared Random-effect	,011	,001	,026

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

Multiple Comparisons

Dependent Variable: PAQ-C score

Tukey HSD

(I) SES Quartiles	(J) SES Quartiles	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
1,00	2,00	-,07719	,08201	,614	-,2699	,1155
	3,00	-,28405*	,07801	<,001	-,4674	-,1007
2,00	1,00	,07719	,08201	,614	-,1155	,2699
	3,00	-,20686*	,07547	,017	-,3842	-,0295
3,00	1,00	,28405*	,07801	<,001	,1007	,4674
	2,00	,20686*	,07547	,017	,0295	,3842

*. The mean difference is significant at the 0.05 level.

Stratified by Sex

Boys (N = 295) One-Way-ANOVA of PAQ-C differences between groups of SES

ANOVA

PAQ-C score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	11,650	2	5,825	10,506	<,001
Within Groups	161,903	292	,554		
Total	173,553	294			

ANOVA Effect Sizes[a]

		Point Estimate	95% Confidence Interval	
			Lower	Upper
PAQ-C score	Eta-squared	,067	,020	,125
	Epsilon-squared	,061	,013	,119
	Omega-squared Fixed-effect	,061	,013	,118
	Omega-squared Random-effect	,031	,007	,063

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

Girls (N = 277) One-Way-ANOVA of PAQ-C differences between groups of SES

ANOVA

PAQ-C score

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	,581	2	,291	,517	,597
Within Groups	153,977	274	,562		
Total	154,558	276			

ANOVA Effect Sizes[a,b]

		Point Estimate	95% Confidence Interval	
			Lower	Upper
PAQ-C score	Eta-squared	,004	,000	,025
	Epsilon-squared	-,004	-,007	,018
	Omega-squared Fixed-effect	-,003	-,007	,018
	Omega-squared Random-effect	-,002	-,004	,009

a. Eta-squared and Epsilon-squared are estimated based on the fixed-effect model.

Post-Hoc-Test results of single PAQ-C item analysis between low and high SES as assessed with a Kruskal-Wallis-Test for the Total Sample

Active PE (N = 571)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-19,243	16,840	-1,143	,253	,760
2 - 5-7 - 8	-41,521	16,000	-2,595	,009	,028
6-7 - 8	-22,279	15,501	-1,437	,151	,452

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Active Break (N = 567)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-18,734	17,149	-1,092	,275	,824
2 - 5-7 - 8	-50,211	16,328	-3,075	,002	,006
6-7 - 8	-31,476	15,764	-1,997	,046	,138

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Active Lunch (N = 569)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-,793	17,365	-,046	,964	1,000
2 - 5-7 - 8	-31,650	16,516	-1,916	,055	,166
6-7 - 8	-30,857	15,973	-1,932	,053	,160

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Active After School (N = 568)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-,580	17,282	-,034	,973	1,000
2 - 5-7 - 8	-24,706	16,501	-1,497	,134	,403
6-7 - 8	-24,126	15,966	-1,511	,131	,392

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Active Evening (N = 570)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-1,346	17,442	-,077	,938	1,000
2 - 5-7 - 8	-25,378	16,586	-1,530	,126	,378
6-7 - 8	-24,031	16,070	-1,495	,135	,404

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Active Weekend (N = 572)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-29,287	17,381	-1,685	,092	,276
2 - 5-7 - 8	-40,619	16,535	-2,457	,014	,042
6-7 - 8	-11,332	15,995	-,708	,479	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Single PAQ-C item analysis stratified by sex

Boys' Active PE (N = 294)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-7,016	12,182	-,576	,565	1,000
2 - 5-7 - 8	-22,434	11,640	-1,927	,054	,162
6-7 - 8	-15,418	11,162	-1,381	,167	,502

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Boys' Active Break (N = 294)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-24,125	12,229	-1,973	,049	,146
2 - 5-7 - 8	-54,894	11,733	-4,679	<,001	,000
6-7 - 8	-30,769	11,221	-2,742	,006	,018

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Boys' Active Lunch (N = 293)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
6-2 - 5	2,183	12,440	,176	,861	1,000
6-7 - 8	-24,006	11,360	-2,113	,035	,104
2 - 5-7 - 8	-21,822	11,889	-1,835	,066	,199

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Boys' Active After School (N = 293)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-8,972	12,396	-,724	,469	1,000
2 - 5-7 - 8	-29,423	11,915	-2,469	,014	,041
6-7 - 8	-20,450	11,397	-1,794	,073	,218

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Boys' Active Evening (N = 294)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-7,309	12,514	-,584	,559	1,000
2 - 5-7 - 8	-20,053	12,007	-1,670	,095	,285
6-7 - 8	-12,744	11,482	-1,110	,267	,801

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Boys' Active Weekend (N = 295)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-23,239	12,504	-1,859	,063	,189
2 - 5-7 - 8	-32,697	11,976	-2,730	,006	,019
6-7 - 8	-9,458	11,451	-,826	,409	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Girls' Active PE (N = 277)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-11,697	11,634	-1,005	,315	,944
2 - 5-7 - 8	-18,981	10,984	-1,728	,084	,252
6-7 - 8	-7,284	10,759	-,677	,498	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Girls' Active Break (N = 273)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
6-7 - 8	-1,977	11,019	-,179	,858	1,000
6-2 - 5	6,168	11,964	,516	,606	1,000
7 - 8-2 - 5	4,191	11,295	,371	,711	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Girls' Active Lunch (N = 276)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-3,422	12,094	-,283	,777	1,000
2 - 5-7 - 8	-10,403	11,440	-,909	,363	1,000
6-7 - 8	-6,982	11,207	-,623	,533	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Girls' Active After School (N = 275)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
6-7 - 8	-2,932	11,164	-,263	,793	1,000
6-2 - 5	9,096	12,023	,756	,449	1,000
7 - 8-2 - 5	6,164	11,396	,541	,589	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Girls' Active Evening (N = 276)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
6-2 - 5	7,956	12,153	,655	,513	1,000
6-7 - 8	-12,198	11,245	-1,085	,278	,834
2 - 5-7 - 8	-4,243	11,442	-,371	,711	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Girls' Active Weekend (N = 277)

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
2 - 5-6	-5,360	12,040	-,445	,656	1,000
2 - 5-7 - 8	-6,858	11,368	-,603	,546	1,000
6-7 - 8	-1,498	11,135	-,135	,893	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.

Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Appendix 5: Statistical Result Tables for Chapter 6.3.2

One-Way-ANOVA and Kruskal-Wallis-Tests of MVPA, SB and LPA differences between SES

MVPA across SES (N = 572)

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	3,435[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,180

a. The test statistic is adjusted for ties.

SB across SES (N = 572)

ANOVA

SB

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	65,621	2	32,811	,978	,377
Within Groups	19083,945	569	33,539		
Total	19149,566	571			

LPA across SES (N = 572)

ANOVA

LPA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	19,341	2	9,670	,562	,570
Within Groups	9783,139	569	17,194		
Total	9802,480	571			

Boys' MVPA across SES (N = 295)

Independent-Samples Kruskal-Wallis Test Summary

Total N	295
Test Statistic	3,278[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,194

a. The test statistic is adjusted for ties.

Boys' SB across SES (N = 295)

ANOVA

SB

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	2,505	2	1,253	,038	,963
Within Groups	9681,026	292	33,154		
Total	9683,531	294			

Boys' LPA across SES (N = 295)

ANOVA

LPA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	15,455	2	7,727	,467	,627
Within Groups	4833,817	292	16,554		
Total	4849,272	294			

Girls' MVPA across SES (N = 277)

Independent-Samples Kruskal-Wallis Test Summary

Total N	277
Test Statistic	2,311[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,315

a. The test statistic is adjusted for ties.

Girls' SB across SES (N = 277)

ANOVA

SB

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	142,369	2	71,184	2,374	,095
Within Groups	8215,712	274	29,984		
Total	8358,081	276			

Girls' LPA across SES (N = 277)

ANOVA

LPA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	80,281	2	40,140	2,266	,106
Within Groups	4854,386	274	17,717		
Total	4934,667	276			

Appendix 6: Statistical Result Tables for Chapter 6.4

Kruskal-Wallis-Test Results for HRQoL across SES

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	,538[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,764

a. The test statistic is adjusted for ties.

Pairwise Comparisons of SES Quartiles

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
6-7 - 8	-9,440	16,400	-,576	,565	1,000
6-2 - 5	12,216	17,821	,685	,493	1,000
7 - 8-2 - 5	2,777	16,954	,164	,870	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

Stratified by sex

Boys

Independent-Samples Kruskal-Wallis Test Summary

Total N	295
Test Statistic	1,347[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,510

a. The test statistic is adjusted for ties.

Girls

Independent-Samples Kruskal-Wallis Test Summary

Total N	277
Test Statistic	,370[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,831

a. The test statistic is adjusted for ties.

Appendix 7: Statistical Result Tables for Chapter 6.5

HRQoL across Age

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	16,196[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	<,001

a. The test statistic is adjusted for ties.

Pairwise Comparisons of Age_3

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
12-13-10-11	49,165	17,753	2,769	,006	,017
12-13-8-9	85,041	21,224	4,007	<,001	,000
10-11-8-9	35,875	17,328	2,070	,038	,115

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

SB across Age

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	5,937[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,051

a. The test statistic is adjusted for ties.

Pairwise Comparisons of Age_3

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
8-9-10-11	-28,888	17,357	-1,664	,096	,288
8-9-12-13	-51,440	21,259	-2,420	,016	,047
10-11-12-13	-22,552	17,782	-1,268	,205	,614

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

LPA across Age

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	15,155[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	<,001

a. The test statistic is adjusted for ties.

Pairwise Comparisons of Age_3

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
12-13-10-11	38,127	17,782	2,144	,032	,096
12-13-8-9	82,481	21,259	3,880	<,001	,000
10-11-8-9	44,354	17,357	2,555	,011	,032

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

PAQ-C across Age

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	,562[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,755

a. The test statistic is adjusted for ties.

Pairwise Comparisons of Age_3

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
8-9-10-11	-1,304	17,331	-,075	,940	1,000
8-9-12-13	-13,706	21,227	-,646	,518	1,000
10-11-12-13	-12,401	17,755	-,698	,485	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

MVPA across Age

Independent-Samples Kruskal-Wallis Test Summary

Total N	572
Test Statistic	,749[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,688

a. The test statistic is adjusted for ties.

Pairwise Comparisons of Age_3

Sample 1-Sample 2	Test Statistic	Std. Error	Std. Test Statistic	Sig.	Adj. Sig.[a]
8-9-10-11	-6,916	17,357	-,398	,690	1,000
8-9-12-13	-18,178	21,259	-,855	,393	1,000
10-11-12-13	-11,263	17,782	-,633	,527	1,000

Each row tests the null hypothesis that the Sample 1 and Sample 2 distributions are the same.
Asymptotic significances (2-sided tests) are displayed. The significance level is ,050.

a. Significance values have been adjusted by the Bonferroni correction for multiple tests.

HRQoL across Age, Stratified by Sex

Boys

Independent-Samples Kruskal-Wallis Test Summary

Total N	295
Test Statistic	5,665[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,059

a. The test statistic is adjusted for ties.

Girls

Independent-Samples Kruskal-Wallis Test Summary

Total N	277
Test Statistic	10,956[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,004

a. The test statistic is adjusted for ties.

SB across Age, Stratified by Sex

Boys

Independent-Samples Kruskal-Wallis Test Summary

Total N	295
Test Statistic	9,280[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,010

a. The test statistic is adjusted for ties.

Girls

Independent-Samples Kruskal-Wallis Test Summary

Total N	277
Test Statistic	3,802[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,149

a. The test statistic is adjusted for ties.

LPA across Age, Stratified by Sex

Boys

Independent-Samples Kruskal-Wallis Test Summary

Total N	295
Test Statistic	15,822[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	<,001

a. The test statistic is adjusted for ties.

Girls

Independent-Samples Kruskal-Wallis Test Summary

Total N	277
Test Statistic	5,815[a]
Degree Of Freedom	2
Asymptotic Sig.(2-sided test)	,055

a. The test statistic is adjusted for ties.

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Departement für Sport, Bewegung und Gesundheit

Associations Between Health-related Quality of Life, Self-Reported and Accelerometer-Measured Physical Activity, and Socioeconomic Status among Schoolchildren in Gqeberha

Leonard Wehinger

Supervisor: Patricia Arnaiz Jimenez

1 | Background

Health inequalities and their determinants, including socioeconomic and behavioral factors, have emerged as a significant global concern (Marmot & Bell, 2016). Health-Related Quality of Life (HRQoL) is a crucial concept for measuring and monitoring health, showing stability from childhood to adulthood (Meade & Dowswell, 2016). The positive impact of PA on children's HRQoL underscores the importance of promoting active lifestyles (X. Y. Wu et al., 2017). However, socioeconomic challenges in South Africa pose barriers to PA participation for underprivileged children (Draper et al., 2018), affecting their HRQoL. When studying relations between HRQoL, PA, and socioeconomic status (SES), self-reports and accelerometers each present methodological implications as they capture different aspects of PA (Wunsch et al., 2021). Understanding the interplay between those measures is crucial for addressing health disparities, informing interventions aimed at improving HRQoL, and promoting equitable access to physical activity across SES.

2 | Methods

Cross-sectional data of 572 children (8 – 13 years) from underprivileged neighborhoods in Gqeberha, South Africa, was analyzed. Data was collected as part of the KaziBantu Project. HRQoL was assessed using the KIDSCREEN-10 questionnaire. Self-reported PA was measured using the Physical Activity Questionnaire for Older Children (PAQ-C), while the ActiGraph wGT3X-BT was used to measure accelerometer-measured PA. SES was assessed using a 10-item questionnaire. ANCOVAs and Spearman rank correlations were performed to examine relationships between PA and HRQoL. To explore relations between PA and HRQoL across SES, either Kruskal-Wallis-Tests or ANOVAs, and Spearman rank correlations were performed.

3 | Results

Self-reported PA was positively correlated with HRQoL ($\rho = 0.096, 95\%-\mathrm{CI}: 0.012; 0.179, p = 0.021$) (Figure 1), while accelerometer-measured MVPA was not ($p = 0.670$). When controlling for SES, age, and sex, ANCOVAs revealed that self-reported PA still predicted HRQoL ($p = 0.023$). Stratified by sex, correlations between self-reported PA and HRQoL remained in girls only ($p = 0.015$).

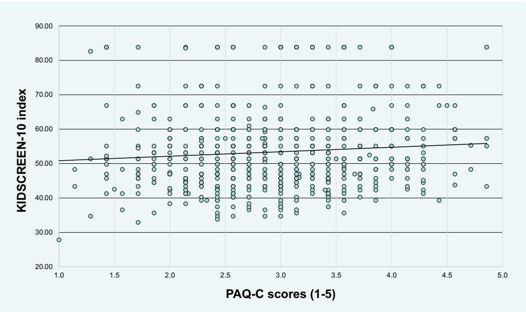

Figure 1. Scatterplot with trend line for the association between self-reported PA (PAQ-C) and HRQoL (KIDSCREEN-10 index)

Self-reported PA differed between groups of SES ($p < 0.001$), while sex-specific group differences remained in boys ($p < 0.001$) but not in girls (Figure 2). No evidence was found for an association between HRQoL and SES. WHO PA guidelines were met by 82% of boys and only 45.5% of girls. Age was negatively correlated with HRQoL in boys ($p = 0.027$) and girls ($p < 0.001$).

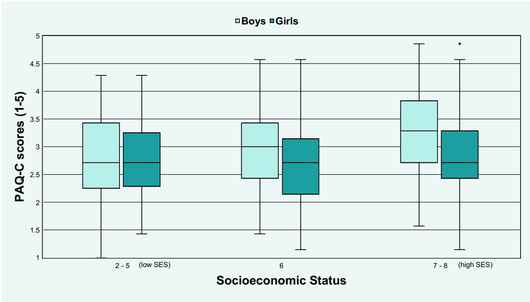

Figure 2. Box-Plots showing self-reported PA (PAQ-C) across socioeconomic status and stratified by sex

4 | Conclusions

- Findings demonstrate that self-reported PA is positively associated with HRQoL and provides valuable information on behaviors and domains of PA
- Associations between self-reported PA with HRQoL and SES imply that PA should be implemented in from of games and take place in an environment where children can play safely, especially for those of low SES
- The fact that girls' PA levels are low and remain unchanged across SES highlights the need for more PA opportunities and enhanced social correlates for girls to engage in PA
- Structural adjustments are needed to provide equitable access to PA across SES in South Africa

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