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# Perceived stress, school satisfaction and academic self-concept before and after a physical activity intervention among 4th – 6th grade primary schoolchildren in marginalized neighbourhoods of Port Elizabeth, South Africa

Masterarbeit

vorgelegt am Departement für Sport, Bewegung und Gesundheit

der Universität Basel

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University
of Basel

Basel, April 2020

## Acknowledgement

I wish to thank all people whose assistance was a milestone in the contribution of this project. First, I would like to acknowledge both principal investigators of the *KaziBantu* project Professor Doctor Uwe Pühse in Switzerland and Professor Cheryl Walter in South Africa for their persistent and long-term engagement, as well as the project coordinators, Doctor Ivan Müller in Switzerland and Danielle Smith in South Africa, for their enthusiastic and ongoing commitment to this project. Their great passion for and work contributed to the matter of subject of children's' and communities' health in South Africa are without comparison and is highly contagious to all other members involved in the *KaziBantu* project. It feels like "work" is not the appropriate term to express their intention and effort put into this affair of the heart.

Having been part of this project and having had the opportunity to get an insight of the various fields of the project has been a unique and very precious experience to me. My appreciation for this adventure and the time spent during data collection in South Africa is deep, and the memories made will last much longer than the memories of the difficulties encountered in the writing of this thesis.

I would like to thank Ivan Müller and Stefanie Gall for their guidance and great support involving everything in and around Port Elizabeth. The same goes for Siphesihle Nqweniso, Nandi Joubert, Larissa Adams, Danielle Smith, Zaahira Ismail and the rest of the South African *KaziBantu* team members. Their introduction to the fieldwork, our collaboration during data collection and their interest and kindness have made the experience all the better. I also thank all learners, teachers and principals from the *KaziBantu* schools in Port Elizabeth, South Africa for their patient and pleasant collaboration.

My appreciation is extended to Katlyn, Lauren, Beni and Marcel for their immensely helpful support and corrections during the finalisation of my thesis.

Finally, I would like to add special thanks to my family and dear friends who always supported and encouraged me in times of need.

The *KaziBantu* project was funded by the Novartis Foundation. Without their financial support, the realisation of the *KaziBantu* project and therefore this study would not have been possible. Detailed information about the *KaziBantu* project can be found on the *KaziBantu* website *www.kazibantu.org*.

# Abstract

## Background

Mental health problems and the trend towards a sedentary lifestyle are core health challenges of the 21$^{st}$ century. Psychological and physiological health burdens are a global public health concern. Identifying and denominating protective factors for either sections is essential for preventing and tackling these major health challenges. There is a large body of studies proving positive relationships between physical activity and mental health. This master thesis aims at providing evidence to measure the influence of physical activity on mental wellbeing concerning perceived stress, school satisfaction and academic self-concept. Additionally, this association is put into perspective by also taking the socio-demographic factors age, gender, ethnicity, home language and socioeconomic status into account.

## Methods

Within the framework of the longitudinal *KaziBantu* study, cross-sectional data was collected from 852 primary schoolchildren living in marginalized neighbourhoods in Port Elizabeth, South Africa. Learners from grade 4 to 6 were asked to fill out the same self-reported questionnaire twice, first in T1-baseline testing from January to March 2019 and again in T2-follow-up testing from June to October 2019. In between, four of the eight participating schools experienced a physical activity intervention program.

## Results

On average, schoolchildren independent of the school group (control or intervention) reported significant higher values in perceived stress (+0.22; $p = 0.038$) and negligible lower values in school satisfaction (–0.02; $p = 0.002$) and academic self-concept (–0.09; $p = 0.001$) in follow-up testing compared to the baseline testing. An overall decrease of the psychosocial wellbeing can be suggested. However, scores decreased less in learners of intervention schools compared to those of the control schools without intervention. Age, gender and socioeconomic status did not have an influence, whereas home language (mean difference: −0.07; 95% CI: −0.11 to −0.04; $p < 0.001$) and ethnicity (mean difference: −0.10; 95% CI: −0.14 to −0.07; $p < 0.001$) correlated negatively with school satisfaction.

## Conclusion

An overall decrease of the psychosocial wellbeing was detected after the intervention period. However, school children which experienced regular physical activity interventions reported fewer decreasing results than school children without intervention. This might be attributable to the beneficial effects of physical activity on mental health. Therefore, a more physically active schooling environment is recommended to improve far-reaching health aspects of young learners in disadvantaged primary schools in South Africa.

## Zusammenfassung

### Hintergrund

Psychische Gesundheitsprobleme und eine zunehmend bewegungsarme Lebensweise sind zentrale gesundheitliche Herausforderungen des 21. Jahrhundert. Psychische und physiologische Gesundheitsbelastungen sind ein globales Anliegen der öffentlichen Gesundheit. Vorbeugende Faktoren beider Bereiche zu identifizieren und benennen ist für die Prävention und Bewältigung von wesentlicher Bedeutung. Eine Vielzahl an Studien belegen die positiven Beziehungen zwischen körperlicher Aktivität und psychischer Gesundheit. Ziel dieser Masterarbeit ist es, den Einfluss von körperlicher Aktivität auf das psychische Wohlbefinden in Bezug auf Stresswahrnehmung, Schulzufriedenheit und akademisches Selbstverständnis zu messen. Zusätzlich wird dieser Zusammenhang mit den soziodemographischen Faktoren Alter, Geschlecht, Ethnizität, Heimatsprache und sozioökonomischer Status relativiert.

### Methoden

Im Rahmen der Längsschnittstudie *KaziBantu* wurden Querschnittsdaten von 852 Grundschulkindern aus benachteiligten Gegenden in Port Elizabeth, Südafrika, erhoben. Sie wurden gebeten, denselben Fragebogen zweimal auszufüllen, im Baseline Test (Februar bis März 2019) und im Folgetest (Juni bis Oktober 2019). Dazwischen erhielten vier der acht teilnehmenden Schulen ein Interventionsprogramm mit körperlicher Aktivität.

### Ergebnisse

Im Durchschnitt berichteten Schulkinder unabhängig von der Schulgruppe (Kontrolle oder Intervention) im Vergleich zum Basistest über signifikant höhere Werte bei der Stresswahrnehmung (+0,22; $p = 0,038$) und vernachlässigbar niedrigere Werte bei der Schulzufriedenheit (-0,02; $p = 0,002$) und dem akademischen Selbstkonzept (-0,09; $p = 0,001$). Insgesamt lässt sich eine Abnahme des psychosozialen Wohlbefindens vermuten. Allerdings sanken die Ergebnisse bei Lernenden von Interventionsschulen im Vergleich zur Kontrollschule ohne Intervention weniger stark. Alter, Geschlecht und sozioökonomischer Status hatten keinen Einfluss, während Muttersprache (-0,07; 95% KI: -0,11 bis -0,04; $p < 0,001$) und Ethnizität (-0,10; 95% KI: -0,14 bis -0,07; $p < 0,001$) negativ mit der Schulzufriedenheit korrelierten.

### Schlussfolgerungen

Insgesamt wurde eine Abnahme des psychosozialen Wohlbefindens nach der Interventionsperiode festgestellt. Allerdings berichteten Schulkinder, welche regelmäßige Bewegungsinterventionen erfahren hatten über weniger abnehmende Ergebnisse als Schulkinder ohne Intervention. Dies könnte auf die positiven Auswirkungen von körperlicher Aktivität auf die psychische Gesundheit zurückgeführt werden. Daher wird ein körperlich aktiveres schulisches Umfeld empfohlen, um weitreichende Aspekte der Gesundheit junger Lernender in benachteiligten Grundschulen in Südafrika zu verbessern.

# Opsomming

### Agtergrond

Probleme rakende geestesgesondheid en die neiging na 'n sittende lewenstyl is die belangrikste gesondheidsuitdagings van die 21ste eeu: sielkundige en fisiologiese gesondheidslaste is 'n wêreldwye probleem met betrekking tot hedendaagse openbare gesondheid. Die identifisering en benaming van beskermende faktore vir beide afdelings is noodsaaklik om hierdie belangrike gesondheidsuitdagings te voorkom en aan te pak. Daar is 'n groot aantal studies wat positiewe verwantskappe tussen fisiese aktiwiteit en geestesgesondheid bewys. Hierdie magistertesis het ten doel om bewyse te lewer om die invloed van fisieke aktiwiteit op geestelike welstand rakende waargenome spanning, skooltevredenheid en akademiese selfkonsep te meet. Verder word hierdie assosiasie in perspektief geplaas met die volgende sosio-demografiese faktore: ouderdom, geslag, etnisiteit, huistaal en sosio-ekonomiese status.

### Metodes

Binne die raamwerk van die longitudinale *KaziBantu*-studie is dwarssnit-gegewens versamel van 852 laerskoolkinders wat in gemarginaliseerde woonbuurte in Port Elizabeth, Suid-Afrika woon. Leerders van graad 4 tot 6 is gevra om dieselfde self-gerapporteerde vraelys twee keer in te vul, eers in T1-basistoetse van Februarie tot Maart 2019 en weer in T2-opvolgtoetse van Junie tot Oktober 2019. Tussen vier van die agt deelnemende skole het 'n intervensieprogram vir fisieke aktiwiteite meegemaak.

### Resultate

Gemiddeld het skoolkinders onafhanklik van die skoolgroep (kontrole of intervensie) beduidende hoër waardes in waargenome spanning (+0,22; $p = 0,038$), ignoreerbare lae waardes in skooltevredenheid (–0,02; $p = 0,002$) en akademiese selfkonsep (–0,09; $p = 0.001$) in opvolgtoetsing in vergelyking met die basislyntoetsing. Daarom kan 'n algehele afname in die psigososiale welstand voorgestel word. Die tellings het egter minder afgeneem by leerders van intervensieskole in vergelyking met beheerskool sonder ingryping. Ouderdom, geslag en sosio-ekonomiese status het geen invloed gehad nie, terwyl huistaal (verskil in gemiddelde verandering: −0,07; 95% CI: −0,11 tot −0,04; $p < 0.001$) en etnisiteit (verskil in gemiddelde verandering: −0.10; 95 % CI: −0.14 tot −0.07; $p < 0.001$) het negatief gekorreleer met skooltevredenheid.

### Gevolgtrekking

'n Algehele afname in die psigososiale welstand is na die ingrypingsperiode periode waargeneem: skoolkinders wat aan gereelde fisiese aktiwiteite deelgeneem het, het egter minder dalende resultate as skoolkinders gerapporteer sonder ingryping. Dit kan terugkeer na die voordelige gevolge van fisieke aktiwiteit op geestesgesondheid. Daarom word 'n meer aktiewe skoolomgewing aanbeveel om die verreikende aspekte van gesondheid van jong leerders in minderbevoorregte laerskole in Suid-Afrika te verbeter.

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# List of abbreviations

| | |
|---|---|
| ASC | Academic Self-Concept |
| ASCS | Academic Self-Concept Scale |
| DBE | Department of Basic Education |
| DoE | Department of Education |
| DoH | Department of Health |
| GDP | Gross Domestic Product |
| GLS | global life satisfaction |
| HBSC | Health Behaviour in School-aged Children |
| HRQoL | Health-Related Quality of Life |
| MSLSS | Multidimensional Students' Life Satisfaction Scale |
| MVPA | Moderate-to-Vigorous Physical Activity |
| NDP | National Development Plan |
| NSC | National Senior Certificate |
| PA | Physical Activity |
| PAQ | Physical Activity Questionnaire |
| PAQ-C | Physical Activity Questionnaire for Children |
| PS | Perceived Stress |
| PSS | Perceived Stress Scale |
| PSS-C | Perceived Stress Scale for Children |
| QSL | Quality of School Life Scale |
| SES | Socioeconomic Status |
| SS | School Satisfaction |
| SSA | Sub-Saharan Africa |

# 1 Introduction

*«I have always believed that exercise is not only a key to physical health but to peace of mind. [...]. In my letters to my children, I regularly urged them to exercise [...]. To take their minds off whatever might be bothering them.»* – Mandela, 1994.

This quote by Nelson Mandela is taken from the movie *«Long Walk to Freedom»* (Mandela, 1994). The former president of South Africa is right in making the connection between physical exercise and the mind. Today, there is a substantial body of evidence which supports a positive relationship between physical activity (PA), mental health and illness (Biddle, Fox & Boucher, 2000; Biddle & Mutrie, 2001; Callaghan, 2004; Daley, 2002; Fontaine, 2000; Saxena, van Ommeren, Tang & Armstrong, 2005). These studies draw conclusions about the benefits of PA on mental health, recommending exercise as an additional way of keeping the mind fit, or even treating mental illness. Despite the large amount of definite evidence, researchers also agree that the mechanisms responsible for this relationship are rather complex and are caused by a combination of different factors in the fields of biology, chemistry, psychology as well as various social factors (Biddle & Mutrie, 2001; Fontaine, 2000).

Crone, Smith and Gough (2005) are supportive of these findings and stresses the complex and interrelated nature of these relationships. One example is the large number of factors that affect the framework "self-acceptance" as part of mental health. Besides exercise, an individual's social network, support, environment, culture and many other context-related factors are responsible for how PA and mental health correlate. Through qualitative and descriptive methodologies people's experiences can be explored and interpreted in greater depth.

With the current project *KaziBantu* a greater and more profound depth of knowledge on physical and mental health issues among children in South Africa can be reached by conducting various tests, collecting evidence-based data and providing a long-term overview of the evaluations. The project is aimed at analysing the current state of primary aged schoolchildren's health in township-schools in and around Port Elizabeth, South Africa. The *KaziBantu* project, a partnership between the University of Basel in Switzerland and the Nelson Mandela University of Port Elizabeth in South Africa, aims to increase positive impacts on schoolchildren's and teachers' health for sustainable healthy communities, much like the project's slogan *«Healthy Schools for Healthy Communities»* suggests. The main goal of the project is to support the health of children and for them to grow into a healthy nation, independent of their socioeconomic status (SES).

The aim of this study is to assess the association between self-reported mental health and the physical condition of the selected study population in a cross-sectional survey. It holistically approaches the psychosocial wellbeing of the individual schoolchild in grades 4 to 6 and focuses on the parameters perceived stress (PS), school satisfaction (SS) and the academic self-concept (ASC). Furthermore, the study evaluates whether these three parameters interact with other factors such as age, gender, home language, ethnicity and SES.

# 2 Theoretical framework and current state of research

## 2.1 General understanding of the country South Africa

### 2.1.1 Apartheid

South Africa is still dealing with the aftermath of the apartheid regime, architectured and implemented by leader and politician Hendrik Frensch Verwoerd in 1948 and put to end with the help of famous President Nelson Mandela in 1994. The apartheid legislation enforced multiple laws such as the Race Classification Act, the Mixed Marriages Act and the Group Areas Act, discriminating against black people and all other non-white citizens. Today in South Africa, the major population groups are classified and named by the still common terminology of black people (black African), coloured people (mixed race) and others, including Indians, whites, mixed and other ethnic groups. It goes without saying that in this paper these terms are used in a neutral way and do not imply any judgment or discrimination.

People suspected of being of non-European origin were classified according to race (Reclassification Act) and interracial marriages were strictly prohibited (Mixed Marriages Act). The enforcement and relocation of non-white people to designated areas for black people and into municipal housing for coloured people (Group Areas Act) in the outskirts of the cities was conducted and affirmed by the law (South African History Online, 2019a; Christopher, 1987). Black people, together with all other non-white citizens suffered and to this day still suffer from political, educational, social and residential disadvantages, creating a racial hierarchy favouring white people over the coloureds and black citizens in all aspects of life.

This racial segregation in many cities across South Africa, the unequally distributed wealth and the legally determined unequal and inequitable human rights caused by the apartheid legacy are still clearly noticeable to the present day. It is one of the main challenges the current government faces in both provincial as well as national policies (Christopher, 2001).

### 2.1.2 Income and Delinquency

South Africa is currently home to around 58.8 million people and its population is consistently growing (Statistics South Africa, 2019). It is classified as an upper-middle-income country and since the beginning of its democracy in 1994 its economy has been globally growing with a current GDP of 368.3 billion USD. Nevertheless, the unemployment rate is at 30% ranking the country on position four of worldwide unemployment (Trading Economics, 2020). More than half of the population lives below the poverty level, which in South Africa lies at R992 per month (The World Bank, 2020).

Among the many different origins of the population in South Africa, the black Africans are the ones most exposed to poverty. As can be seen in Figure 1, more than half of the black population are below the poverty line (64.2% in 2015), followed by the coloured population (41.3%). 5.9% of the Indians and Asians in South Africa live in poverty, and only 1.0% of the white population is affected.

In all ethnic groups, women and children under 17 years seem to be more affected than men and adults, as well as people from rural areas in the provinces Eastern Cape (including Port Elizabeth) and Limpopo, and those without education (Statistics South Africa, 2017).
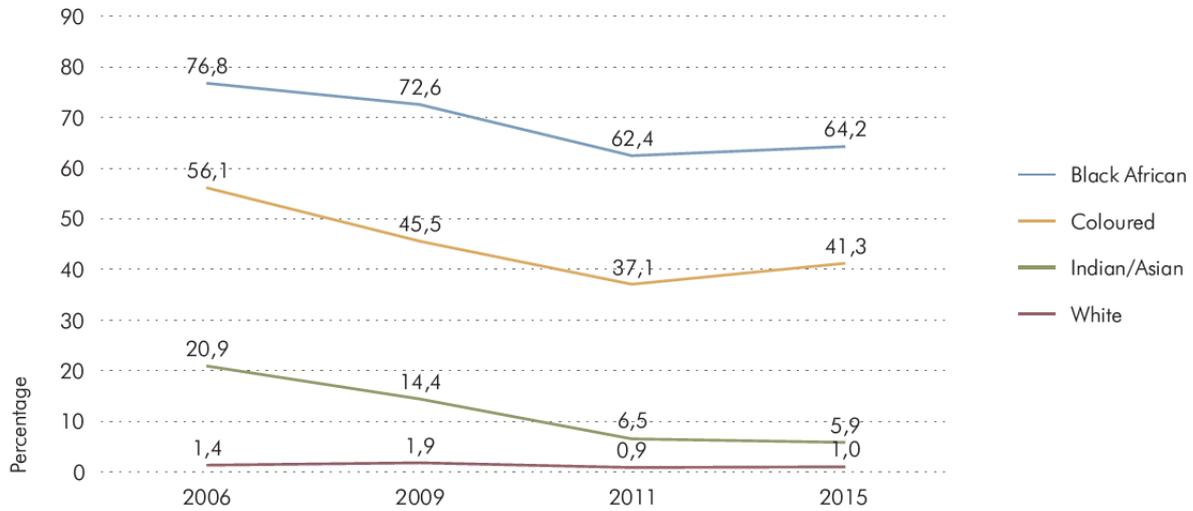


Figure 1. Poverty headcount by population group between 2006 and 2015 (Statistics South Africa, 2017)

The large gap between the population groups living in poverty can very likely be linked to the persistent significant social discrepancies in poverty among South African citizens. It should come as no surprise that these circumstances contribute to several incongruities such as high crime rates, especially in urban areas and general violence and political unrest. Experts assess travelling to South Africa as dangerous, where well-informed preparations and caution during a stay in the country is needed (EDA, 2019).

**2.1.3 South Africa today**

The diversity in culture and language is one of the reasons South Africa is also called the "Rainbow Nation". Eleven different official languages and the population being grouped into the four main ethnicities black, coloured, Indian/Asian and white represent that diversity. The black population can be divided into four more groups: the Nguni groups (Zulu, Xhosa, Ndebele, and Swazi people), the Sesotho-Setswana groups, the Shangaan-Tsonga groups and the Venda groups, most of them speaking their own native language. Among the white population about 60% speak Afrikaans and the remaining 40% are English-speaking. The coloureds with a mixed lineage are mostly of indigenous Khoisan origin. Lastly, the people of Indian/Asian background based mainly on the east coast of the country (Kwazulu-Natal), are predominantly English speaking. Many, however, also speak Tamil, Hindi, Telegu, Gujarati or Urdu (South African History Online, 2019b).

The freedom of cultural, religious and linguistic expression is strongly embedded in the Constitution of the Republic of South Africa of 1996. The Constitution states that South Africa

represents *«a country where creative expression flourishes and its cultural diversity are embodied in its arts and culture»* (South African History Online, 2019b). When it comes to religion, Christianity, Islam, Hinduism, traditional African religions and Judaism are the most practiced faiths. The greater goal of the new South African approach to religious harmony, however, is to achieve greater understanding and to practise tolerance, rather than to separate people based on beliefs, as was done in the past of the country.

However, despite the segregation laws having been overridden, the consequences of the apartheid regime are still visible in social structure and are a part of many South African's everyday lives. Of the six largest municipalities in the country, the Nelson Mandela Bay, including the city Port Elizabeth, is considered the most racially segregated of all. The townships around Port Elizabeth are mainly inhabited by black people (Motherwell, iBhayi, New Brighton and Wallmer), while coloured people predominantly live in the Northern part of the city, for example in townships near Bethelsdorp and Korsten (Statistics South Africa, 2016).

## 2.2 Psychosocial health in South Africa

Human health is often understood in three dimensions: physical, psychological and social health (Richter & Hahn, 2011). Defining them separately is a challenge, as they are often interlinked and dependent of each other. Even experts have not yet agreed on an accepted definition of the term psychosocial health. Today, the interaction and origin of cognition and emotion in the brain are matters of intense neuroscience research but have not yet been sufficiently examined to make conclusions about the consciousness or psyche of the individual. However, the World Health Organization (WHO) offers a pragmatic approach of a definition of mental, and thus psychological health, considering it a personal wellbeing and meaningfulness, incorporating the realisation of the personal potential (WHO, 2007; Richter & Hahn, 2011; Biddle & Mutrie, 2001). Another more extensive definition of mental health is provided by the U.S. Department of Health and Human Services (DHHS) in 2000, which describes it as *«the successful performance of mental function, resulting in productive activities, fulfilling relationships with other people, and the ability to adapt to change and to cope with adversity; from early childhood until later life, mental health is the springboard of thinking and communication skills, learning, emotional growth, resilience, and self esteem»*. Mental health is therefore an essential aspect of health, crucial to the overall wellbeing of the individual as well as society (WHO, 2007).

In South Africa, The National Mental Health Policy Framework and Strategic Plan 2013-2020 of the National Department of Health (DoH) is the current document in which efforts and the outline of guiding the country towards a higher health standard are listed (Department of Health, 2013). The four key aspects of the framework are an effective leadership and governance for new health policies, mental health and social care services, the implementation of strategies to promote mental health and prevent mental illness, and to strengthen information systems enabling evidence and research to be done. The government is convinced that in order to

achieve a *«long and healthy life for all South Africans»* mental health needs to be improved as it is a central element to people's overall health (Department of Health, 2013).

In the time after apartheid and the beginning of democracy in South Africa there has been an increase in awareness concerning mental health. Together with the framework and strategic plan 2013-2020, the continuously reformed Mental Health Care Act of 2002 emphasizes the basic human rights of the mentally ill. The goal is to provide care, treatment and rehabilitation for people suffering from a mental illness, to determine the procedure of a cure, to establish review boards, to abrogate certain laws and to provide for further matters that are connected to the issue (Stein, 2014).

## 2.3 Mental health in South Africa

Despite the integration of mental health into Public Health Care, constituted in the White Paper and the Mental Health Care Act, efforts and reforms still seem to lack consequences. Mental disorders are predominantly treated by simple medication and heavy reliance on psychiatric hospital treatment (Lund & Flisher, 2003), excluding less severe cases and the treatment of other mental disorders like depression and anxiety (Petersen et al., 2009). Many ongoing challenges remain in South Africa's mental health situation, as the country lacks an official national Mental Health Policy (Draper et al., 2009), public awareness of the issue, systematically collected data regarding mental health problems and its service provision, as well as sufficient monetary funds and resources in general (Lund, Boyce, Flisher, Kafaar & Dawes, 2009). Mental health care still seems to be viewed as less important than other health issues despite neuropsychiatric disorders being ranked as the third most common of all disease burdens in South Africa after HIV (Human Immunodeficiency Virus) and AIDS (Acquired Immunodeficiency Syndrome) and other infectious diseases (Bradshaw, Norman & Schneider, 2007).

Of all school-going children and adolescents, around 20% have suffered at some point from mental health issues in the form of social, emotional and behavioural difficulties (Caldarella, Christensen, Kramer & Kronmiller, 2009). This increases the chances of academic underachievement and negatively affects the quality of the children's lives (Rothì & Leavey, 2006). This is where teachers come into play: In order to promote mental health in schools, teachers are challenged to face the issue and to identify mental health problems of their schoolchildren. In South Africa, teachers and school health nurses can rely on and must adhere to guiding policies of both the DoH for the health sector and the of Basic Education (DBE) for the educational sector. Due to their strong collaboration, an integrated school health policy has been developed, which declares mental health as part of the foundation of the individual's wellbeing, for it relates directly to the child's physical, social and emotional health (Ekornes, Hauge & Lund, 2012).

## 2.4 PA and health in South Africa

PA, as defined by the WHO, includes *«any bodily movement produced by skeletal muscles that requires energy expenditure»*, independent of the setting (work, travelling, household, etc.) of the activity (WHO, 2015). It is to be distinguished from "exercise", which describes a more organised and structured form of activity, in order to purposely increase physical fitness. According to WHO recommendations, children and adolescents of 5 to 17 years should engage in PA around 60 minutes per day, with a moderate-to-vigorous intensity (MVPA, 3-6 METs and more). MET is the metabolic equivalent and objectively describes the expended energy of a person sitting quietly, where 1 MET corresponds to 3.5 ml oxygen/kg/min (Jetté, Sidney & Blüemchen, 1990). Adults should spend at least 150 minutes a week participating in moderate-intensity (3 - 6 METs), or no less than 75 minutes of vigorous-intensity (> 6 METs) physical activities. The same recommendations are given to people above 65, an age group where balance and fall prevention are of major importance (WHO, 2015).

Globally, physical inactivity is the fourth leading risk factor for all deaths. Following high blood pressure (13%), tobacco use (9%) and high blood glucose (6%), physical inactivity corresponds to a mortality rate of 6%, whereas mortality due to being overweight and obese is only 5% (WHO, 2009).

In many countries, physical inactivity and therefore the prevalence of non-communicable diseases such as cardiovascular disease, diabetes and cancer is increasing, which in turn decreases the general health of people. Several comorbidities such as breast and colon cancer (21-25%), diabetes (27%) and ischaemic heart disease (30%) are described as being directly related to physical inactivity. An estimated 60% of all deaths are attributed to noncommunicable conditions (WHO, 2009; WHO, 2008).

In a recent report from the Lancet Physical Activity Series, 27.5% of Africa's population is physically inactive. Luckily, this ranks below the worldwide average of 31.1% of all adults being inactive. However, a high number (80%) of the continent's 13-15 years old children do not meet the current recommendations of daily exercise (Hallal et al., 2012).

In South Africa the physical inactivity of children and adolescents is increasing as well. Rapid urbanization, population-ageing and nutrition transition due to globalization are some of the reasons for unhealthy environments and behaviours (Micklesfield et al., 2014). An estimated 43-49% of all individuals aged 15 and above are physically inactive, performing little to no physical engagement at work, home or in an ambulatory transportation activity. The latter seems to contribute significantly to the shift towards adiposity and away from physical movement, as many South Africans used to walk more than they do now (Joubert et al., 2007).

### 2.4.1 PA and age and gender

The Physical Activity Questionnaire (PAQ, and PAQ-C for children) is an established tool to assess PA levels. It consists of questions covering a broad spectrum of different activities such as physical education, activity during break time, but also activities at home during the day and

evenings, throughout the week and over the weekend. Answers are self-reported and include information about the frequency and intensity of the activities (Kowalski, Crocker & Donen, 2004).

In the cross-sectional study by Minaar, Grant and Fletcher (2016) with a small sample of participants (n=78) rural South African males from 9 to 14 years old reached around 27.5% more steps than females of the same age. Steps were assessed with the help of a piezoelectric pedometer, which the children wore for seven consecutive days. While the girl's PA level was reduced with age, the aerobic activity level increased. Of all the boys assessed, those aged between 9 and 11 were found to be the most active. Minaar et al. (2016) therefore consider this age range to be most suitable for gender-specific sport intervention programs.

Similar findings are found by another study of McVeigh and Meiring (2014) with urban children (n=767) aged 5 to 18 in South Africa. According to own estimations in the PAQ, girls reported less time (minutes per week) engaging in MVPA than their male counterparts ($p = 0.012$).

A third study by van Biljon, McKune, DuBose, Kolanisi and Semple (2018) with a much higher number of participants (n= 7'348) confirmed the trend. Males (aged eight to 14) significantly engaged more often in PA than females, with a differing mean PAQ-C score of 2.85 (95%-CI 2.82-2.87) and 2.64 (95%-CI 2.61-2.66) respectively. The overall sample score was 2.75 (SD 0.73), revealing that 31% (n=2247) of all included learners do not meet the international recommendation regarding MVPA level. In the study, 14-year-old girls and eight-year-old boys seemed to be the least active, with an average PAQ-C score of 2.18 and 2.53. On the other hand, 9-year old females and 11-year-old males reported most PA (2.98 and 2.74). This means that the females' PA level decreases with age, whereas for boys it seems to increase. The overall results of the study however show that general PA levels decline with age from elven to 14 years by 14% for males, and by 20% for females (van Biljon et al., 2018).

The results of various studies (van Biljon et al., 2018; McVeigh & Meiring, 2014; Minaar et al., 2016) all confirm and agree on the existing gender differences in PA levels among South African learners, and the decrease of time spent in PA with age.

### 2.4.2 PA and SES

In a study conducted by Micklesfield et al. (2014), 381 out of 3'511 randomly selected children (of another study group) from a poor rural community in South Africa's province Mpumalanga were subjects in a study that investigated on their PA and sedentary behaviour patterns. Along with the individual SES, further socio-demographic information was included and elaborated on in this study. As a result, lower SES was *«significantly associated with less sedentary time [such as television-watching or reading], more walking for transport and lower moderate-vigorous physical activity in school and clubs»* (Micklesfield et al., 2014).

These findings stand in opposition to the conclusion of McVeigh, Norris and De Wet (2004) study. They reported an association of lower SES with less leisure-time activity in 9 year-old-

children living in Johannesburg, as well as an increase in television time (McVeigh et al., 2004). One explanation for this difference may be the different level of assistance in household activities. Sharing the same SES, children in urban Johannesburg may not engage with the same intensity in such work, while children of rural settings in Mpumalanga may have more of such responsibilities at home.

However, the examination of the relationship between lifestyle factors such as PA and SES is part of complex set of investigations since the results might also differ depending on the environment. Data from Europe and the US for example relate higher SES to higher levels of MVPA, but unlike the findings of South Africa also report higher walking and less television-viewing time with increased SES (Gordon-Larsen, McMurray & Popkin, 2000; De Cocker et al., 2010). Possible reasons for these differences might be due either to the difference between low middle-income countries (LMIC) and high-income countries (HIC), or to differences between living conditions in rural and urban areas. These possible interrelations require further detailed investigation (Micklesfield et al., 2014).


### 2.4.3 PA and ethnicity and home language

Investigations about the association between PA and the ethnic background of young South African people have been conducted before. One example is the study of McVeigh and Meiring (2014) where one of the aims of the study was to describe race related patterns on physical and sedentary activity levels, also taking into consideration body mass statuses. Results state that for all included races (black, white and Indian) MVPA levels declined with higher age (5 to 18 years old) and consistently showed higher levels for boys than for girls. Not surprisingly, passive sedentary activity of boys and girls therefore increased with age, independent of the race group. However, the amount of inactive time correlated significantly and positively with body mass for all ethnicities and in a similar way for boys and girls. In general, black and Indian schoolchildren engaged in less PA than white learners, where black children spent more time in sedentary activity, resulting in the highest proportion of overweight participants (30%) and underweight participants (13%) for Indian children. The study concludes that ethnic and gender disparities exist in PA and sedentary activity levels, which might reflect various biological and cultural reasons (McVeigh & Meiring, 2014).

Another cross-sectional study (van Biljon et al., 2018) assessed PA levels in urban-based South African learners living in seven of nine South African provinces of Gauteng (GT), KwaZulu-Natal (KZN), Wester Cape (WC), North-West (NW), Eastern Cape (EC), Mpumalanga (MP) and Northern Cape (NC). Results with respect to race were different than in the above-mentioned study of McVeigh and Meiring (2014). Black learners scored higher PA levels than white or other ethnic groups learners, whereas the latter was again less active than their white peers. Figure 2 might allow some conclusions to be drawn about the levels of PA (PAQ-C score) in association with ethnicity or the primary spoken language at home. It is apparent that regardless of the province, male schoolchildren again reached higher PA levels than females.
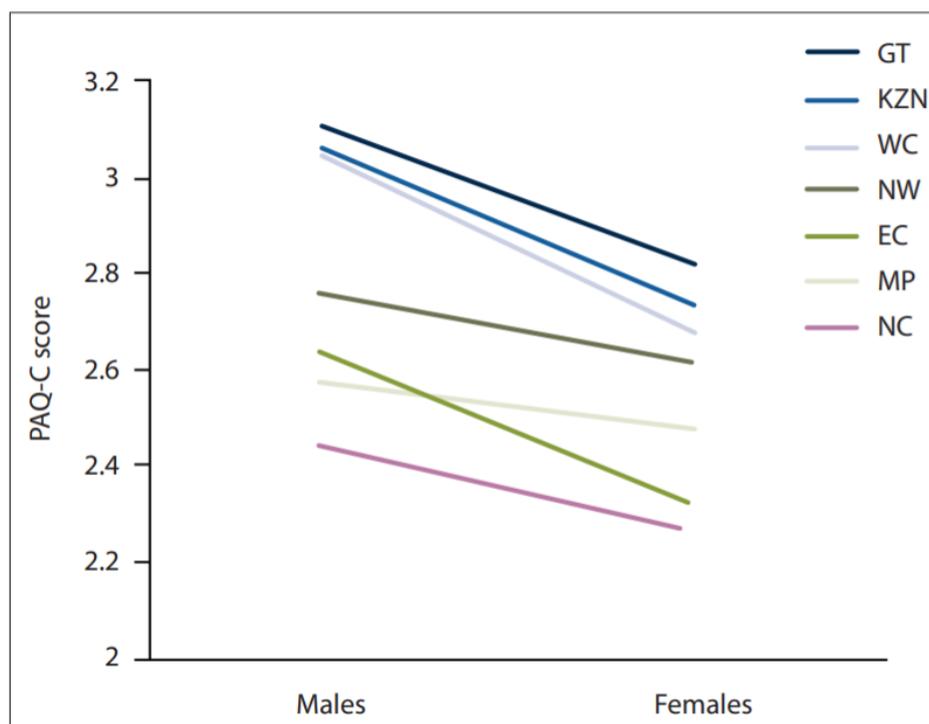
Figure 2. PAQ-C scores by province and gender (van Biljon et al., 2018)

Gauteng scored highest PA levels, where 78% of the learners meet the recommended guidelines of PA. It is followed by KwaZulu-Natal and Western Cape. In North West only 36% of all learners meet the recommendation and even less in Eastern Cape, Mpumalanga and North Cape.

Inequalities of PA levels among different ethnicities have been reported in South African children (McVeigh et al., 2004). A variety of factors come into play when trying to get a detailed insight of the differences' origins. While lower SES in black children compared to white children may cause lower levels of PA, differences in culture and leisure time preferences might be another reason. In this regard, information about free time activities of Indian children living in South Africa is scarce but should not be neglected when issuing PA and health matters, for the Indian ethnicity is widespread among the country's population (McVeigh et al., 2004; Kriska, 2000).

## 2.5 School education in South Africa

It is a right of all South Africans to get basic education. Through the Bill of Rights the country's government is obliged to enable education and make schooling accessible for everyone. The national DBE is responsible for the governance of all educational matters, aiming to *«develop, maintain and support a South African school education system»* (South African Government, 2020). The department is subordinate to the National Development Plan (NDP). A joined plan called "Schooling 2025" envisions several targets such as teacher recruitment, learner

enrolment, school funding and increasing literacy and numeracy, in order to develop and improve the overall quality of education. Another measure of the programme is the provision of meals to over 9 million schoolchildren each year in over 20'000 schools for children in need (South African Government, 2020).

South Africans attend compulsory primary school from age 7 to 15 years, frequenting grades 1 to 9. Three years of Secondary school (grade 10 to 12) can be followed until the age of 14, where upon completion National Senior Certificate (NSC) exams are taken. This certificate is needed in order to gain access to higher education, such as Vocational Secondary Education (grades 11 and 12) or any Post-Secondary or Tertiary Education enrolment (South African Government, 2020).

In year 2018, around 14.2 million learners attended school in South Africa, a country with a current population of approximately 58.8 million people (Statistics South Africa, 2019). This corresponds with a 97.4% participation rate of primary school age children in education institutions. Around three-quarters (74.5%) of the school goers continue their education until the age of 18, graduating from grade 12. This high number however includes learners (24.7%) that still attend secondary school up to the age of 20. Among the youth (age 20-34) around 13% are graduates (South African Government, 2020; Statistics South Africa, 2019).

As mentioned before, three-quarters of all 7 to 24-year old South Africans frequent classes in educational institution. Looking at metropolitan areas, Buffalo City (82.0%), Nelson Mandela Bay (80.6%) and Mangaung (78.7%) reach highest scores, whereas lowest attendance is found in Cape Town (67.2%) and eThekwini (70.5%). While Free State, Northern Cape and KwaZulu-Natal experience an increase in enrolment rates, Mpumalanga reports a decrease from the years 2002 to 2008. A particularly high percentage of 93.2% in school attendance is observed in Limpopo contrasting the numbers in Gauteng (79.8%) and Western Cape (84.3%) (South African Government, 2020).

With regards to the content of school education in South Africa, each level's curriculum has its specific cornerstones. As this master thesis' study focuses on primary children in grades 4 to 6, the curriculum of these levels will be discussed more in detail, especially with regards to the subject physical education.

The DBE communicates physical education as «*an integral component of the holistic education of learners*» (Department of Basic Education, 2019). Every learner is guaranteed access to physical education as part of the life orientation/life skill section of the curriculum. Added to the national Integrated School Sport Programme it serves as the fundament of sport in South Africa. The development of gross and fine motor skills and perception are primarily targeted at a young age. Physical and motor development is considered essential for the holistic development of young children, and significantly contributes to the learner's personal, social and emotional development and wellbeing. Besides supporting personal physical growth, sport including play, movement and games, also encourages the acquirement of positive attitudes, social behaviour and shared values towards others, expanding the development on a wider

perspective to beneficial effects on groups and communities around the individual (Department of Basic Education, 2019).

These aspects build the core of this paper's study, evaluating primary schoolchildren's personal and psychosocial wellbeing, and estimating whether additional lessons taught in physical education might affect the following parameters.

### 2.5.1 School satisfaction

A child should feel comfortable and good about themselves, as well as with the institution they visit daily. It is essential to understand the relationship between a child's psychological wellbeing, its engagement and motivation level, for absentee and dropout rates and behavioural or mental health problems (Ainley, 1991; Reyes & Jason, 1993). According to Verkuyten and Thijs (2002) *«school satisfaction follows from the cognitive interpretation of the fulfilment of psychological needs that are essential to child development»*.

Although children spend a lot of their time at school, few studies have been conducted regarding their personal SS. It is a topic seldom discussed in the field of research. Academic achievement and grading systems are given a lot more attention and little is known about children's actual enjoyment and their evaluation of school. Only few studies have examined possible determinants or predictors of the matter, whereas the consequences of SS levels are more widely discussed (Baker, 1998; Cock & Halvari, 1999; Huebner & McCullough, 2000; Huebner, Ash & Laughlin, 2001; Okun, Braver & Weir, 1990).

Another definition by Baker & Maupin (2009) declares *«school satisfaction as the subjective, cognitive appraisal of the perceived quality of school life»*. This is strongly interlinked with the larger understanding of indicators of wellbeing. A widely accepted indicator for happiness is the global life satisfaction (GLS), which incorporates cognitive awareness and appraisal of the quality of the individual's life. At young age GLS seems to be influenced mostly by five main aspects: family background, friendships, living environment, the self and school (Huebner, 1994). Measurements of SS are made possible by the subscale of the Multidimensional Students' Life Satisfaction Scale (MSLSS), consisting of eight items. It is developed from the earlier used 5-item-survey called the Quality of School Life Scale (QSL) by Epstein and McPartland (1976). Students' reactions are assessed in three fields: general satisfaction in school, commitment to the work in class and the attitude or quality of relationship towards teachers. Assessment about the general SS are conducted by statements asking the students to rate to which extent they agree with sentences for example about their enjoyment of going to school, participating in school activities or their dislike of having to frequent classes (Epstein & McPartland, 1976; Huebner, 1994; Suldo, Bateman & McMahan, 2014).

The later discussed KIDSCREEN-10 Index questionnaire (see chapter 2.6.1) includes the part where health-related quality of life (HRQoL) of children and adolescents is taken into account.

### 2.5.2 Perceived stress

Similar to school satisfaction, perceived stress also incorporates several different definitions. Matheny, Aycock & McCarthy (1993) suggest *«stress as the inequality between perceived demands and perceived resources of the individual»*. More specifically, Matheny et al. (1993) differentiate so-called student stressors originating in family surroundings and school environments. Dealing with them necessitates personal, social and cognitive resources.

Another influential stress model is found by Lazarus and Folkman (1984). Here, the individual and cognitive process of evaluation or perception of the individual is central to the cognitive approach of explaining the term "stress". At its origin is a potentially stress situation, in which the person decides usually automatically and intuitively, whether stress is perceived or not (Lazarus & Folkman, 1984; Kauffeld, 2011).

The transactional stress model by Lazarus and Folkman (1984) incorporates three different evaluation processes that do not necessarily follow an order but rather occur simultaneously. The first assessment estimates the interpretation of the stressor. The stimulus is either irrelevant, positive or dangerous, where the first two options do not result in the perception or further dealing of stress. Stress can be perceived as a damage, threat or challenge. If the sensation of threat is predominant, a second step is initiated, where personal resources, coping strategies and competences are assessed. If there is an imbalance between the perceived stressor and the capability to deal with it, stress is perceived. Depending on the person's estimation and capabilities the stimulus or situation is then re-evaluated. If the coping strategy is successful, the same stimulus loses power and will most likely be less stressful in the future (Lazarus & Launier, 1981; Lazarus & Folkman, 1984).

Although the impact of classified "objective" stressful situations is thought to be determined and influenced by the personal perception, this assumption is not backed up by the common psychometrical valid measurements regarding PS. An instrument called the Perceived Stress Scale (PSS) was developed in order to measure to which extent *«situations in one's life are appraised as stressful»* (Cohen, Kamarck & Mermelstein, 1983). The 14-item scale investigates about the frequency of feelings and thoughts of the individual during the period of the past month. It furthermore aims to provide additional information about the relationship of PS and other pathologies such as anxiety, depression or behavioural disorders on a global dimension (Cohen et al., 1983).

In order to easily evaluate and screen stress levels in children, the Perceived Stress Scale for Children (PSS-C) is used. The outcomes of this scale help to reveal relations to home and school performance, as well as general behaviour and health of the children. Results of a study assessing 153 US children aged 5 to 8 years suggest that the applied scale is a practical and effective instrument to discriminate between children with and without known anxiety or stress disorders (White, 2014). It therefore serves as a helpful means by which to identify children at risk of chronic stress early, making interventions and closer guidance possible in order to minimize poor school and home functional performance. Stressful environments or social

contacts impede cognitive performance and learning processes and increase the prevalence of overall physical and mental health problems (Blair, 2012; Maldonado et al., 2008; White, 2014).

Blair (2012) explains that elevated stress hormone levels interrupt the developing circuitry of a child's brain, reducing performances in higher cognitive tasks such as planning, emotional governance and impulse control, as well as attention. These so-called executive functions are essential for academic achievement.

### 2.5.3 Academic self-concept

A self-concept is the sum of self-perception and the ideal of what one could be. Self-perception – the perception of the self – is compared with the ideal. The awareness of own character traits, abilities, feelings and behaviour patterns are part of the self-concept. It is constantly influenced by processes of interaction and internalization of judgements of others but in general remains fairly steady (James, 2007). The estimation and perception of a scholar's or student's own academic abilities is what is called ASC. It is highly influential on the personal learning and cognitive functions, and thus a relevant variable in the academic world (Ordaz-Villegas, Acle-Tomasini & Reyes-Lagunes, 2013). The long-lasting and ongoing research on the topic is interesting in that it reflects associations between ASC and several outcomes in the field of education and behaviour, such as achievement, motivation, effort, educational and career aspirations and so forth (Marsh, 1990; Marsh & Craven, 2006).

The term academic self-concept is often interlinked or mentioned together with academic achievement. Referring to the self-enhancement model, Calsyn and Kenny (1977) explain the *«self-concept as a determinant of academic achievement»,* whereas the skill-development model posits that the *«academic self-concept is a consequence of academic achievement».* In other words, one's personal achievement influences the self-concept (skill-development model) and the academic self-concept affects the achievement (self-enhanced model) (Calsyn & Kenny, 1977; Guay, Marsh & Boivin, 2003; Marsh & Martin, 2011).

The discussion is similar to the one about the chicken and the egg, and what comes first. In order to standardize measurements, an Academic Self-Concept Scale (ASCS) was developed and investigates in four global dimensions: self-regulation, general intellectual abilities inside and outside school, motivation and creativity. Comparable to the answering process in the above-mentioned MSLSS or QSL questionnaires measuring life and school satisfaction, the respondents rate their agreement to given statements about their self-assessed schooling performance and behaviour on a five-grade scale ranging from "never" to "always" (Ordaz-Villegas et al., 2013).

## 2.6 PA questionnaires

*«An important challenge in determining the relationship between health and physical activity is valid assessment»* – Kowalski et al., 2004.

As is defined before (WHO, 2015) PA includes any bodily movement which requires skeletal muscles which in turn expend energy. Next to other components of this energy expenditure such as the basal metabolic rate and the thermic effect of food, PA is the most variable and includes regular daily activities like bathing, cleaning, eating, sports and leisure time activities and activities performed at work (Kriska & Caspersen, 1997). Hence, it is obvious that the more active the individual the greater the part of physical activity in the total energy expenditure.

In order to validly and appropriately measure PA the measurements must be understood as a complex task where the components beneficial to health can vary significantly among individuals and populations. What is good for one individual might not be beneficial for the other. Many health-related dimensions such as aerobic intensity, weight bearing, strength and flexibility must be taken into account in order to approach a valid statement of the personal health benefits (Caspersen, 1989). Besides these quantitative aspects, the quality of the PA itself, but also of its accuracy of measurement must be given closer attention or the ability to significantly convey associations between PA and its outcomes may be limited (LaPorte, Montoye & Caspersen, 1985).

When measuring PA, the main focus lies on energy expenditure. The advantages and disadvantages of this one-sided approach depend on the research objectives and the population under investigation (Kriska & Caspersen, 1997). Although PA questionnaires may not be the most precise estimates of energy expenditure, compared to for example the respiratory chamber or double labeled water technique, the advantages when it comes to the usage of PA questionnaires in population studies are manifold. There are no behaviour alterations of the surveyed person (non-reactiveness), the questionnaires have a high practicality as costs can be kept low and the conduction is fairly convenient for the participants, and applicability to suit the questioned population as well as high accuracy can be achieved through manageable reliability and validity (LaPorte et al., 1985; Montoye & Taylor, 1984). The results obtained are valuable and individuals or subject groups within a population can be easily categorized, which can be of use for further investigation. The time frame being surveyed may vary from inquiries of performed activities about the past week, month, year or a complete lifespan, as well as questions about frequency (how often) and duration (how long). Questionnaires with a longer time frame (> 1 year) may reflect the usual activity pattern, whereas short time frames show less vulnerability to recall bias and more validity with objective tools (Kriska & Caspersen, 1997).

For the *KaziBantu* study, the focus of this master thesis study, separate surveys were established. Contents build on the pre-existing and well-proven questionnaires KIDSCREEN-10, Health Behaviour in School-aged Children (HBSC) and the Physical Activity Questionnaire for Children (PAQ-C), each of which will be explained briefly in the next chapters.

### 2.6.1 KIDSCREEN-10

With the collaboration of 13 European countries the KIDSCREEN project was brought to life in order to conduct measurements of HRQoL for young people. It aimed to create, develop and standardize a screening instrument to assess the quality of life for children and adolescence from 8 to 18 years old. The surveys function as a tool to conduct representative national and European wide health studies, aiming to identify, monitor and evaluate children's subjective health risks and therefore contributing to a better understanding of perceived health and making interventions possible (Ravens-Sieberer et al., 2007).

Today, three versions of the KIDSCREEN questionnaire specifically target either children, adolescents or parents. The surveys have been translated into various languages and can be applied in a wide field of study. KIDSCREEN-52 is the most extensive version covering ten HRQoL dimensions, whereas the shorter version KIDSCREEN-27 covers five. KIDSCREEN-10 the questionnaire of interest for this master thesis' study encloses a global measurement of HRQoL with the goal to elaborate information from the children's point of view regarding physical, mental and social wellbeing (Kidscreen Project, 2011).

The KIDSCREEN-10 Index is the version used in the framework of this study. It is based off of the longer KIDSCREEN-27 and consists of ten items. The ten questions allow for statistical analyses to be performed and differentiations between various groups to be observed. Low scores regarding material family wealth, behavioural problems and a high number of psychosomatic complaints in the test result in lower health related quality of life (Kidscreen Project, 2011).

### 2.6.2 Health Behaviour in School-aged Children (HBSC)

The Health Behaviour in School-aged Children (HBSC) study was one of the first international surveys on health of children and adolescents. Starting out as a tool to investigate smoking behaviour the WHO later encouraged the establishment of surveys in additional health topic areas, collecting data on adolescent health and health behaviour. Although fieldwork was faced with various challenges and was limited to only three countries at first, over 40 countries take part in the study today with more countries continuing to join. The HBSC is engaged in the establishment of monitoring tools in policy development and conducts research in the field of adolescent health (Roberts et al., 2009).

Questionnaires used in the HBSC study are self-reported and school-based, meaning that the surveys are completed in classroom settings. Each questionnaire encompasses three packages of questions in order to create a national survey instrument as well as to reach international standardization. Core questions create an international dataset, the second part is an optional choice of questions on specific topic areas, and country-specific questions address national issues of importance. A variety of health indicators and health-related behaviours provide information about the life circumstances of the investigated young people. In the core questions

they are asked about demographic factors, social background information, health behaviour and outcome and risk behaviour (Currie et al., 2008; Roberts et al., 2009).

### 2.6.3 Physical Activity Questionnaire for Children (PAQ-C)

To assess PA levels the Physical Activity Questionnaire (PAQ-A for adolescents and PAQ-C for children) is an established tool that provides a general measure of PA from age 8 to 14, and 14 to 20 (grade 4 to 12), respectively. It consists of questions covering a broad spectrum of different MVPA levels such as physical education, activity during break time at school, but also activities at home during the day and in the evening. Answers are self-reported and include information about frequency and intensity of the activities during a regular week including the weekend. Like the HBSC questionnaire, the PAQ-C can be administered in a classroom setting. The survey consists of 9 items, each of which is scored on a 5-point Likert scale. Upon completion, a final PA score is portrayed (Kowalski et al., 2004).

Advantages of the PAQ-C and the PAQ-A are the low cost and the high practicality of the questionnaire. It is a reliable and valid assessment tool of PA in childhood and adolescence and its feasible administration may contribute to large-scale studies (Kowalski, Crocker & Faulkner, 1997). Moore et al. (2007), however, observed that the PAQ-C was mainly used in studies with white Canadian children. In his findings of the comparison of two studies with independent samples, he concluded that reliability and validity of the PAQ-C varied between races and that therefore modifications of the questionnaire should be considered.

### 2.7 Association between PA and mental health

*«Exercise dissipates tension, and tension is the enemy of serenity.»* – Mandela, 1994

This is yet another famous and very true quote of Nelson Mandela's. Many researchers of the field have come to similar conclusions: physical activity is in many ways highly beneficial for psychological wellbeing, as well as for the absence of diseases (Biddle & Mutrie, 2001; Bouchard & Shephard, 1994; Checkroud et al., 2018; Crone et al., 2005; Doré et al., 2020; Morgan, 1997; Saxena et al., 2005; Siefken, Junge & Laemmle, 2019). It affects a broad range of aspects of mental health such as the previously discussed HRQoL, emotions and mood, enjoyment and self-esteem, personality and psychological adjustments, exercise and sleep, and many more (Biddle & Mutrie, 2001). Physical activity also encourages handling and coping with adequate strategies when faced with difficulties in life (Bouchard & Shephard, 1994). PA of a moderate level (3-6 MET) has proven to reduce anxiety and stress reactivity has a beneficial effect on depression, improves self-esteem and has favourable impact on self-perception as well as mood and psychological wellbeing. In addition, it is associated with positive effects on cognitive functioning – the mental processes that lets us perform tasks - and psychological adjustment, which is the behavioural process of balancing contradictory needs in a person's environment (Biddle et al., 2000; Morgan, 1997).

While there is little to no dissension on the improved health outcomes and benefits due to physical activity, the causal link is much more complex. The mechanisms underlying the relationship of PA and mental health, on the other hand, remain rather unsatisfactorily explored, as multi-dimensional health outcomes and the range of benefits are vast. More evidence from investigation is needed as well as the further study of the correlation between the variety of factors involved (Biddle & Mutrie, 2001; Crone et al., 2005).

To research this complexity in more in detail, participants of the recently published study by Doré et al. (2020) provided data of their levels of physical activity every 4 months over a timespan of 6 years. The researchers were interested in examining the correlation of the amount of time spent on PA and the perception of three basic psychological needs; namely autonomy, competence and relatedness – the latter dealing with the social nature and the connectedness with other human beings. Results suggest an association of 27-31% between MVPA and all three psychological aspects, conveying that around one third of the participants reported perception of the three basic psychological needs are caused by PA, which in turn may foster mental wellbeing (Doré et al., 2020).

In another largely set-up study by Chekroud et al. (2018) the association between exercise and mental health was examined against the backdrop of the influence of the type, duration, frequency and intensity of the exercise. Data from around 1.5 million Americans (<18 years) was analysed. The amount of self-reported "bad" mental health days was counted and compared between two groups of people: those who exercised and those who did not. Individuals who partook in physical exercise showed ±1.49 fewer days of decreased mental health in the past month than their counterparts. Different exercise types have been singled out: team sports (22.3% lower) showed largest associations to lower mental health burden, followed by cycling (21.6% lower), and aerobic and gym activities (20.1% lower). The effect of the association was greatest with PA durations of 45 minutes and frequencies of three to five times per week (Chekroud et al., 2018).

Similarly, Siefken et al. (2019) aimed to gain greater understanding of the relationship of PA in leisure-time and the prevalence of depression and anxiety, and if these relationships vary by the parameters amount, context, intensity and type of PA. Results suggest that participants who met the WHO PA recommendations (moderate-intensity, 150 min/week) reported lower depression scores, where under specific circumstances, high depression scores were found in vigorous-intensity PA levels. Indoor team athletes scored lower on depression and anxiety than outdoor individual members, but the decisive factor was the sport discipline. No linear dose-response relation was detected in participating in PA and symptoms of depression and anxiety.

With regards to the mental health burden in Sub-Saharan Africa (SSA), a study by Vancampfort et al. (2017) showed that 33 out of 48 SSA-countries possess a specific mental health policy. Although evidence is clear about the benefits of PA in the prevention and rehabilitation of mental diseases only a few (2 of 22 screened) include PA recommendations. Further education and a rise in public health awareness regarding the role of PA in treatment or prevention of

depression and other mental health burdens is needed in order to determine and improve PA programs as a necessity in the mental health care system of SSA (Vancampfort et al., 2017).

## 3 Purpose of study and research question

The fact that mental health problems in childhood and adolescence are increasingly threating public health is recognized by many experts, as is the evidence that PA can both prevent and help recover from these types of issues (Callaghan, 2004; Chekroud et al., 2018; Crone et al., 2005; Doré et al., 2020).

Studies estimate that one in five children and adolescents in high, middle- and low-income countries suffer from mental disorder, independent of the average income of the country (Fisher et al., 2012). Longtermly, consequences of mental disorders often affect adulthood, as the risk for additional comorbidities such as HIV-infection, drug addiction and other traumas increases. Preventing mental health from becoming a burden in young children's lives is crucial for a healthy, sustainable and flourishing future of a country and its people (Draper et al., 2009; Flisher et al., 2012).

Within the framework of the ongoing study *«Effects of a school-based health intervention program in marginalised communities of Port Elizabeth, South Africa: The KaziBantu project»* by Müller et al. (2019) this master thesis elaborates the possible effect of the PA intervention on self-reported mental health aspects of schoolchildren in grades 4 to 6 of marginalized schools in Port Elizabeth. Here, mental health is defined by three main parameters of self-reported PS, SS and ASC. Additionally, the following five co-variables and their potential effect on the outcome will be taken into consideration: age, gender, ethnicity, home language and SES. The aim is to elaborate how the outcome of the main parameters of follow-up testing period T2 (June to October 2019) differ from the baseline testing period T1 (January to March 2019). These findings will be then discussed in the light of the health intervention that has taken place in between the two testing phases. The school-based health intervention consisted of three main aspects: a PA intervention through physical education, moving-to-music or dance lessons and a classroom-based education regarding health, hygiene and nutritional matters.

The research questions of this thesis are the following:

1. How does the PA intervention affect PS, SS and ASC compared to the control group among primary schoolchildren in marginalized neighbourhoods of Port Elizabeth, South Africa?

2. Do the co-variables age, gender, home language, ethnicity and SES show an effect on PS, SS and ASC before and after the PA intervention?

# 4 Hypotheses

In the framework of this study, the following hypotheses are formulated and assessed.

1. PS is lower after the PA intervention compared to the control group. PS correlates negatively with the intervention.

2. SS is higher after the PA intervention compared to the control group. SS correlates positively with the intervention.

3. ASC is higher after the PA intervention compared to the control group. ASC correlates positively with the intervention.

4. Age, gender, home language, ethnicity and SES have a potential impact on PS, SS and ASC.

   a. Age does not significantly affect PS, SS and ASC.

   b. Gender does affect PS, SS and ASC.

   c. Among different home languages the effect on PS, SS and ASC will differ significantly.

   d. Among different ethnicities the effect on PS, SS and ASC will differ significantly.

   e. Among schoolchildren with different SES the effect on PS, SS and ASC will differ significantly.

# 5 Methods

In the following paragraph, the master thesis and the methods derived from the *KaziBantu* project are described. The overall purpose of the *KaziBantu* project is to increase wellbeing, to raise awareness and increase the understanding of a healthier lifestyle for schoolchildren as well as their teachers. Various tests were conducted. For this master thesis, parts of the «*Survey on schoolchildren's social and demographic background, physical fitness and psychosocial health in Port Elizabeth, South Africa*» (T1) and the «*Survey on schoolchildren's physical fitness and psychosocial health in Port Elizabeth, South Africa*» (T2) are of relevance.

## 5.1 Study design

### 5.1.1 The *KaziBantu* project

The study design of this master's thesis is based on the *KaziBantu* project (*Kazi* – active, *Bantu* – people). The project is, as its own websites postulates, *«a specially tailored school-based intervention programme aimed at consolidating the practice of physical education and ensuring the physical literacy and healthy active living of schoolchildren and teachers»* (KaziBantu, 2018). It is built on two main pillars, called *KaziKidz* and *KaziHealth*, both of which will be explained more in detail in the next chapter. The programme's highest goal is to create

sustainable positive impact on health and to support and provide opportunities for PA. With this multi-faced approach, health related topics are addressed in order to deal with the problems in disadvantaged settings in LMIC (KaziBantu, 2018).

### 5.1.2. *KaziBantu* **study design**

The *KaziBantu* project is a randomized controlled trial with intervention and control groups. This longitudinal study is based on cross-sectional data collected during baseline and follow-up testing periods. Data was gathered in the field from eight schools divided into four intervention and four control-schools, all located in marginalized neighbourhoods in Port Elizabeth, South Africa. Public schools in the country are divided into quintiles 1 to 5, where schools in quintile 1 are financially poorest and accordingly in quintile 5 least poor. This division is based on the socioeconomic status of the school location's community (Hall & Giese, 2009; Müller et al., 2019).

After baseline assessment, the intervention period with *KaziKidz*, the holistic school-based health promotion program, was initiated. It includes teaching material about physical education, moving-to-music lessons and education regarding hygiene and nutrition. For the intervention schools, 40 minutes of physical education and one lesson of moving-to-music per week was foreseen, as well as three additional health education and three nutrition lessons of 40 minutes each. The control schools without intervention were asked to report their load of physical education and sports activity taking place at the school. Teachers were introduced to yet another toolkit: *KaziHealth.* It is designed to raise their physical activeness and health. For six months, teachers were tested on aspects about their individual health and risks and educated about their personal health behaviour, as well as given input of possibilities for improvement of it.

## 5.2 Participants

In eight participating schools, grades 4 to 6 schoolchildren aged 9 to 16 years old were assessed in the baseline and follow-up testing in 2019. Only schoolchildren that were available for both testing periods and therefore could provide the project with baseline as well as follow-up data are included in the assessment of this master thesis, resulting to a representative sample of exactly 852 schoolchildren.

Participation was on voluntary base, and participants could at any moment withdraw from the project with no further consequences. The schools and participants were informed about the process, the objectives and the potential risks of the study in advance. Assessment of the individuals only took place with the parent or guardian's written consent form.

## 5.3 Study area

The participating schools are all located in marginalized neighbourhoods, previously also referred to as marginalized areas in Port Elizabeth, South Africa. Characteristically, people's living standards in these areas are lower: low socioeconomic status, high unemployment rate and a lack of future opportunities, which results in high crime rate. This all affects schooling conditions, where class sizes are often large, teaching staff is less qualified, and physical education is given little to no attention (Müller et al., 2019). The eight project schools can be seen in Figure 3. The yellow marked schools are located in so called "Township Areas", typically frequented by the black population which is isiXhosa speaking. The green markers are schools in the coloured suburbs, also referred to as the "Northern Areas", typically with an Afrikaans speaking population. This division into ethnicities unfortunately has not changed much ever since the abolishment of Apartheid laws in the early 1990's. The schools were selected by different criteria: size in number of the learners, geographical location, representation of the different target communities and commitment to support the project activities (Müller et al., 2016).
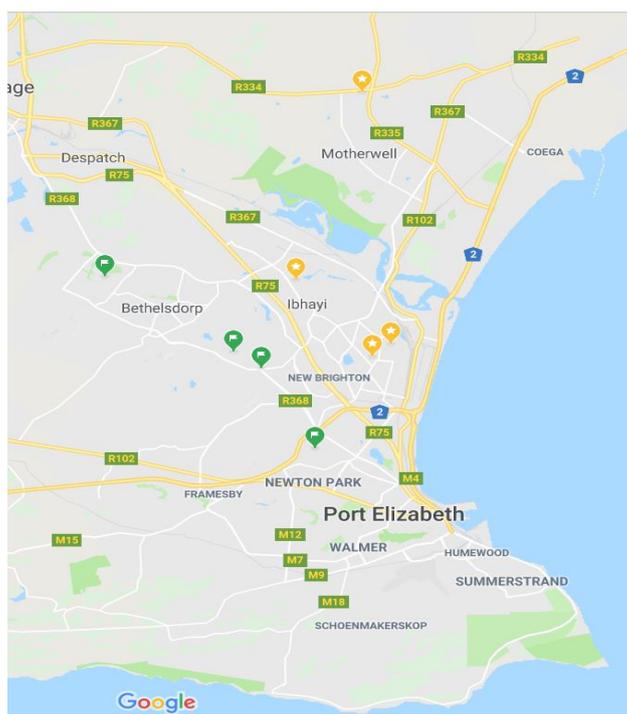


Figure 3. Participating schools in *KaziBantu* 2019

## 5.4 Study procedure

The health intervention programs of *KaziKidz* were conducted in randomly selected primary schools in and around Port Elizabeth. The intervention is created as a ready to use toolkit for primary school teacher, with the aim to enhance children's overall health in South African primary schools through the implementation of physical education, moving-to-music dance

lessons and addressing different health aspects such as health in general, hygiene and nutritional topics. The relationship between PA of the *KaziKidz* toolkit and the psychosocial health (PS, SS and ASC) is assessed, and the effect put into association with the specific social background factors gender, age, ethnicity, home language and SES. Results are sought and evaluated with the help of various statistical analyses. The schematic graph in Figure 4 aims to visually explain the content of this master thesis.
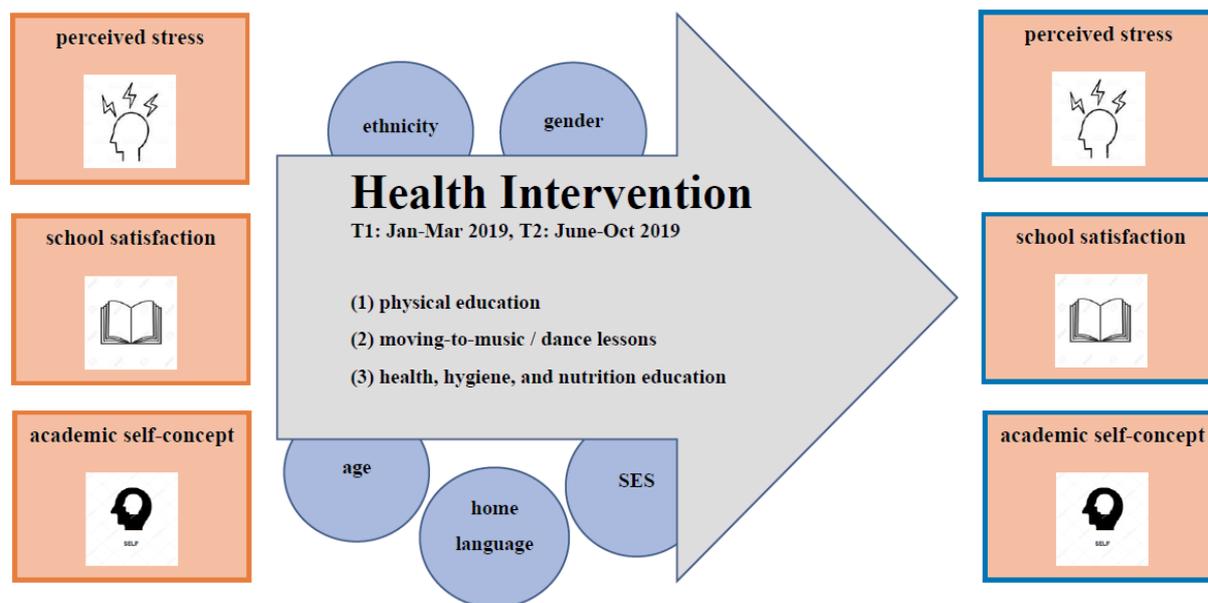


Figure 4. Schematic graph of content of this master thesis (own figure)

## 5.5 Data collection

This master thesis quantitatively approaches the focus on three major aspects of psychosocial wellbeing of the individual schoolchild. The main parameters are PS, SS and ASC. To assess these values, a questionnaire was conducted in both testing phases T1 and T2 at the above-mentioned project schools in Port Elizabeth, retrieving answers from the tested schoolchildren in grades 4 to 6. The questionnaires are divided into several chapters addressing the social and demographic background, general and psychosocial health, PA, PS, SS and ASC. All answers are self-reported. In Figure 5, an extract of the used questionnaires in the baseline testing can be seen.

**Perceived stress, school satisfaction and academic self-concept**

| | I don't like it at all | I don't like it very much | I like it a bit | I like it a lot |
|---|---|---|---|---|
| 6.1 How do you feel about school at present? | ☐ | ☐ | ☐ | ☐ |

| | Not at all | A little bit | Some | A lot |
|---|---|---|---|---|
| 6.2 How pressured do you feel by the schoolwork you have to do? | ☐ | ☐ | ☐ | ☐ |

| | Worse than most others | Same as most others | Good | Very good |
|---|---|---|---|---|
| 6.3 In your opinion, what does your class teacher(s) think about your school performance compared to your classmates? | ☐ | ☐ | ☐ | ☐ |

**Social and demographic background**

**7.1 What is your ethnic background?**
☐ Black   ☐ Mixed   ☐ White
☐ Coloured   ☐ Indian   ☐ Other

**7.2 What is your primary language at home?**
☐ Xhosa   ☐ English   ☐ Other
☐ Afrikaans

**7.3 Which of the following items do you have at home?** (You can tick more than one answer)
☐ Washing machine   ☐ Fridge   ☐ Freezer
☐ Television   ☐ Computer   ☐ Car
☐ Landline phone   ☐ None of these items

**7.4 Do you live in a...**
☐ Backyard shack / room   ☐ Shack in informal settlement   ☐ RDP house
☐ Council house   ☐ Privately built house   ☐ Other

**7.5 How many bedrooms does your home have?**
☐ 1   ☐ 3   ☐ 5 and more
☐ 2   ☐ 4

Figure 5. Questionnaire *KaziBantu* T1 – March 2019

Data was collected in the field at the previously mentioned schools. The schoolchildren were asked to leave class for a short period, in order to fill in the questionnaires. Assistance of the volunteering co-workers, speaking the local language, was provided. After data collection, the questionnaires were uploaded and processed via the EvaSys software, an online evaluation system for automated surveys. According to the adequate codebooks, the data was compromised and transferred onto the "Masterfile", where all the information was put together on one Excel sheet. Statistical analyses for this master thesis are conducted with the IBM SPSS Statistics (version 26) and STATA program (version 15.1) from College Station, USA.

## 5.6 Ethical clearance

Because this master thesis is written within and for the *KaziBantu* project, all ethical assessments have already been proofed and are consistent with the Declaration of Helsinki. Participation in the study is voluntary, and withdrawal was possible at any time with no further consequences. Collected data of the study participants is treated confidentially. The gathered data will be stored during 10 years at the Department of Human Movement Science at the Nelson Mandela University, Port Elizabeth, South Africa, after which it will be deleted irreversibly.

Ethics Committees of South Africa and Switzerland (Ethical committee of Northwestern and Central Switzerland, EKNZ), Nelson Mandela University Human Ethics Committee (NMU REC-H), Eastern Cape Department of Health (ECDoH) and Eastern Cape Department of Education (ECDoE) have given their approval for this study. The letters of ethical clearance can be found in Appendix 2. For further details about the study, the study protocol and further information can be consulted (Müller et al., 2019).

## 5.7 Data assessment

Data was gathered from questionnaires in which all participating schoolchildren gave self-reported answers to a set of questions about their current physical fitness and their psychosocial health. The creation of the surveys and assessment of the individual reports is based on the already established questionnaires KIDSCREEN-10 Index (Ravens-Sieberer et al., 2007), Health Behaviour in School-aged Children (HBSC Network, 2014) and the Physical Activity Questionnaire for Children (PAQ-C) (Richardson, Cavill, Ells & Roberts, 2011).

The variables selected to answer the research questions are the answers provided by the examined schoolchildren, completing the two questionnaires *«Survey on schoolchildren's social and demographic background, physical fitness and psychosocial health in Port Elizabeth, South Africa»* (T1) and the *«Survey on schoolchildren's physical fitness and psychosocial health in Port Elizabeth, South Africa»* (T2). To fill in the questionnaires, the learners were assisted by the help of *KaziBantu* team members working in the field. The surveys were designed by the *KaziBantu* study project team and involved researchers from the Human Movement Science (HMS) department in Port Elizabeth, South Africa and the Department of Sports, Movement and Health (DSBG) in Basel, Switzerland (see Appendix 3).
For the purpose of this paper's study, the data regarding PS, SS and ASC was used. Additionally, demographic background information was collected to put the results into perspective with the five co-variables gender, age, home language, ethnicity and socioeconomic status.

### 5.7.1 Assessment of PS, SS and ASC

All results of the items SS, PS and ASC were retrieved from the above-mentioned questionnaires in both testing phases T1 and T2.

For each item, the following questions had to be answered (also visible in Figure 5):

  a) Question 6.1 about SS: How do you feel about school at present?

Four answers ranging from *«I don't like it at all»* (1), *«I don't like it very much»* (2), *«I like it a bit»* (3) to *«I like it a lot»* (4) were possible.

  b) Question 6.2 about PS: How pressured do you feel by the schoolwork you have to do?

Four answers ranging from *«Not at all»* (1), *«A little bit»* (2), *«Some»* (3) to *«A lot»* (4) were possible.

  c) Question 6.3 about ASC: In your opinion, what does your class teacher(s) think about your school performance compared to your classmates?

Four answers ranging from *«Worse than most others»* (1), *«Same as most others»* (2), *«Good»* (3) to *«Very good»* (4) were possible.


For questions 6.1 and 6.3 the following holds true: the more positive with regards to content the answer, the higher the resulting score (ranging from 1 to 4) in the statistical analysis. For question 6.2 about the PS the mechanism is the opposite.

Thus, answer *«I like it a lot»* in question 6.1 asking the following about SS, *«How do you feel about school at present?»*, amounted in score 4, whereas *«I don't like it at all»* valued 1. Accordingly, the answer *«Very good»* to question 6.3 measuring ASC, meaning that the students believe their teacher(s) thinks highly of their performance at school, resulted in score 4 and *«Worse than most others»* in score 1. Again, a higher score represents a more positive psychosocial wellbeing with regards to SS and ASC.

Question 6.2 measuring PS, the answer *«Not at all»*, meaning no pressure at all felt by the learner, is given score 1, and *«A lot»* score 4. So here, a higher score represents a more negative psychosocial wellbeing with regards to PS.

Within each item, the scores of the two testing phases were compared. In order to answer the hypotheses of this study, scores were divided into intervention and control schools, making a possible change in perception and psychosocial wellbeing of the individual detectable. Furthermore, these findings were put against the backdrop of five different co-variables concerning the learner's demographic background.


### 5.7.2 Assessment of demographic background information

Of each learner, information about age, gender, ethnicity, primarily spoken language at home and the socioeconomic status was retrieved directly from the above-mentioned questionnaires in the section about the social and demographic background.

Learners' ages were calculated in years with the information about date of birth and date of testing in testing-phase T2. Possible answers to the question about their gender were female and male. Ethnicity was grouped into the categories black, coloured, mixed, Indian, white or other. Options for primary home language were Xhosa, English, Afrikaans or other.

Information about the SES was gathered in the questionnaires and later re-coded and dichotomized. To estimate learners' SES, they were asked to answer 14 items, covering household-level living standards such as infrastructure and housing characteristics (type of housing, number of bedrooms, indoor toilet/bathroom and type of toilet, access to indoor water, electricity and how the food gets cooked) and questions related to ownership of seven durable assets (presence of a working refrigerator and freezer, washing machine, television, computer, landline phone and car). Many of these items were dichotomized (0 = poor quality, not available; 1 = higher quality, available). Other items were attributed higher scores, always with regards to content.

For example, in question 7.3 *«Which of the following items do you have at home? (You can tick more than one answer)»*, answers with higher prized objects were attributed higher numbers *(e.g. washing machine* results in score 1*, fridge* in 2*, freezer* 3*, television* 4*, computer* 5*, car* 6*, landline phone* 7*, none of these items* 0*)*. For question 7.4 *«Do you live in a…»*, the possible answers *«Shack in informal settlement* (1), *Backyard shack/room* (2), *RDP (Reconstruction and Development Programme) house* (3), *Council house* (4) or *Privately built house»* (5) were evaluated accordingly. This procedure of attributing items to the answers was conducted consistently for all questions regarding sociodemographic background. All items were then summed up to build an overall SES index, with higher scores reflecting higher SES (see Appendix 1). The validity of similar measures has been established in previous research (Gall et al. 2017).

## 5.8 Statistical analysis

All statistical analysis was performed with the SPSS statistic program IBM SPSS Statistics, version 26. Values of the descriptive statistics are shown as means (*M*) and standard deviation (*SD*) unless otherwise indicated. In the analysis, the main parameters PS, SS and ASC were first investigated individually. Changes in PS, SS and ASC in two times of measurement (T1 and T2) and control or intervention schools were investigated. Then they were put into relation to five co-variables: age, gender, home language, ethnicity and SES. In order to reach statistical significance, an alpha level of at least 0.05 ($p < .05$) must be achieved. Data is visualized in tables and graphs.

The assumption of normally distributed residuals did not seem to be fulfilled for any of the three variables (PS, SS and ASC) due to the test using a Q-Q plot. Similarly, the assumption of homoscedasticity of the residuals did not seem to be fulfilled due to the Tukey Anscombe Plot. The residuals showed distinct patterns for all three variables and do not have a similar dispersion over all estimated values (see Appendix 5). This is probably due to the ordinal scaling (1 to 4) and the continuous nature of the dependent variables PS, SS and ASC. In the context of this master thesis the author decided to treat the variables as if they were on an interval scale and the difference between two variables is meaningful (Doering & Hubbard, 1979).

Furthermore, uniformity of both the control and intervention group was not tested. However, a homogeneous distribution of conditions (e.g. same number of girls and boys) within each group can be assumed.

Despite the violation of the assumptions, the statistical method ANCOVA with repeated measures is used for further calculations of hypotheses 1 to 3. It should be noted, however, that due to the above-mentioned violations, the results of ANCOVA should be interpreted with caution. For hypothesis 4, regression models are used to assess the possible impact of the co-variables on PS, SS and ASC.

## 5.9 Data Clearing

The initial total sample size counted 948 4th to 6th grade children aged 9 to 16 years. Eleven children were excluded due to double entry during data capturing or having left school during T1-baseline or the following T2-testing phase. For the purpose of this paper, another 85 subjects were excluded due to lacking information about self-reported PS, SS or ASC during T2-testing phase. Of the remaining 852 subjects, 24 showed incomplete information about their home language and/or ethnicity. In this case, the subjects were only partially included in the according statistical analysis. The data clearing process with its excluding criteria are shown in the flow chart below (Figure 6).
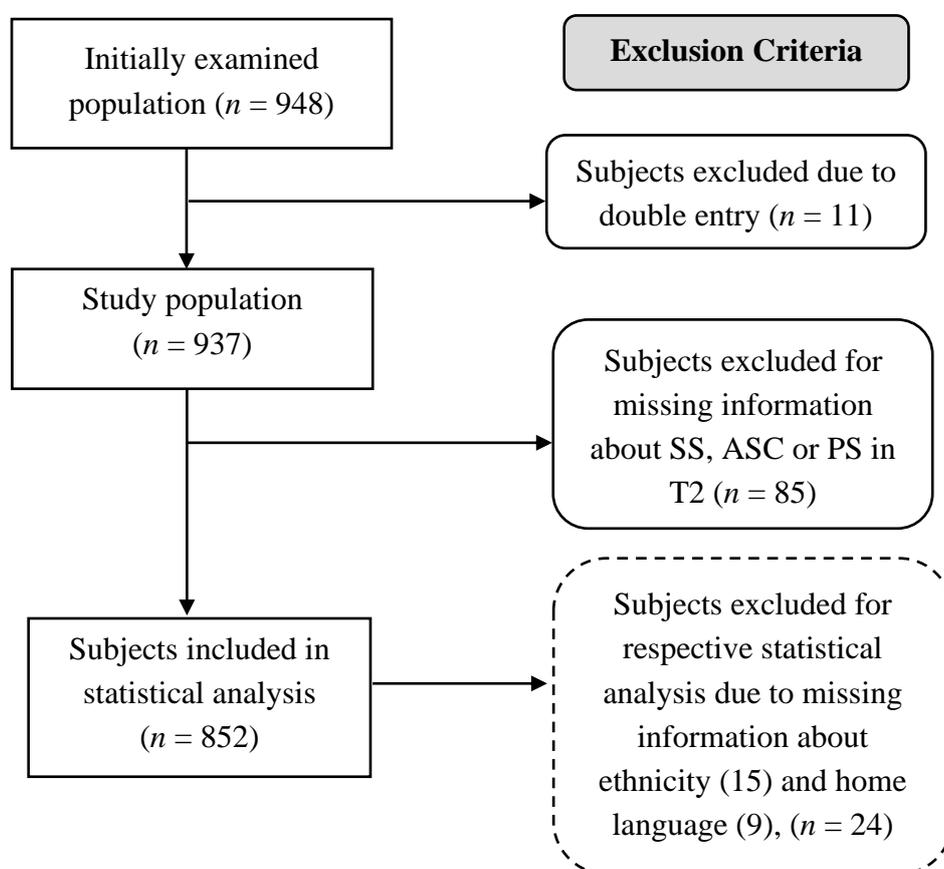


Figure 6. Flowchart of examined population and exclusion criteria

# 6 Results

The following results are deduced from two data sets gathered from the baseline assessment testing T1 and of the follow-up tests of T2 on behalf of the study *«Effects of a school-based health intervention program in marginalised communities of Port Elizabeth, South Africa: The KaziBantu project»* (Müller et al., 2019).

The findings try to answer the following main questions of this thesis:

How does the PA intervention affect the PS, SS and ASC among primary schoolchildren in marginalized neighbourhoods of Port Elizabeth, South Africa?

Do the co-variables age, gender, home language, ethnicity and the SES have an effect on the PS, SS and ASC?

## 6.1 Descriptive Statistics

The following paragraph and tables provide information about the overall data pool integrated in this study. It shows the mean (*M*) and standard deviation (*SD*) of all examined parameters in both testing phases. The total study population consists of 852 learners, 424 of which are part of the control group and 428 of the intervention group. 415 learners are girls (48.7%) and 437 are boys (51.3%). The age of the study participants ranges from 9 to 16 years, with an average age of 10.84 years (*SD* = 1.183) in T2. The study sample contains 543 black, 197 coloured, 76 mixed, 14 white, 6 children who identified as "others" and one Indian child. 15 children did not respond to the question and so the total study population with known ethnicity is 837. Regarding their primary home language, 843 children responded, reporting 572 Xhosa, 178 Afrikaans, 87 English and 6 individuals who speak languages other than the afore mentioned. SES scores were produced for the purpose of this study (see chapter 5.6.2) and range from score 12 to 51, with a mean of 31.9 (*SD* = 7.147).

As can be seen in Table 1, ages 15 and 16 are only represented by one learner each. Only one learner achieved an SES score above 50 and only one learner answered to be of Indian ethnicity. All mentioned learners are excluded from the respective statistical analysis.

Table 1. Frequency and percentage of co-variables in study population

|  | Frequency (*n*) | Percent (%) |
|---|---|---|
| Age (*n* = 852) |  |  |
| 9 | 108 | 12.7 |
| 10 | 248 | 29.1 |
| 11 | 260 | 30.5 |
| 12 | 156 | 18.3 |

| | | |
|---|---|---|
| 13 | 73 | 8.6 |
| 14 | 5 | .6 |
| 15 | 1 | .1 |
| 16 | 1 | .1 |
| **Gender (*n* = 852)** | | |
| Girl | 415 | 48.7 |
| Boy | 437 | 51.3 |
| **Ethnicity (*n* = 837)** | | |
| Black | 543 | 63.7 |
| Coloured | 197 | 23.1 |
| White | 14 | 1.6 |
| Indian | 1 | .1 |
| Mix | 76 | 8.9 |
| Other | 6 | .7 |
| **Home language (*n* = 843)** | | |
| Xhosa | 572 | 67.1 |
| Afrikaans | 178 | 20.9 |
| English | 87 | 10.2 |
| Other | 6 | .7 |
| **SES* (*n* = 852)** | | |
| 10-20 | 51 | 6.1 |
| 21-30 | 292 | 34.3 |
| 31-40 | 412 | 48.2 |
| 41-50 | 96 | 11.3 |
| >50 | 1 | .1 |

*SES is categorised for better legibility. The complete list of all learners' SES is visible in Appendix 1

### 6.1.1 PS, SS and ASC

The following Tables 2 and 3 present the findings including mean (*M*), standard deviation (*SD),* minimum (*Min)* and maximum (*Max*) of the main parameters PS, SS and ASC in testing periods T1 and T2. Tables illustrating values for PS, SS and ASC in T1 and T2 adjusted for the co-variables age, gender, home language, ethnicity and SES are shown in Appendix 4.

Table 2. PS, SS and ASC in T1 and T2 of all study participants

| *n* = 852 | T1 | | | | T2 | | | |
|---|---|---|---|---|---|---|---|---|
| | *Min* | *Max* | *M* | *SD* | *Min* | *Max* | *M* | *SD* |
| PS | 1 | 4 | 2.54 | 1.22 | 1 | 4 | 2.76 | 1.14 |
| SS | 1 | 4 | 3.65 | .72 | 1 | 4 | 3.63 | .69 |
| ASC | 1 | 4 | 2.99 | .84 | 1 | 4 | 2.90 | .84 |

It is evident that the overall experienced PS by all learners before and after the intervention period increased from 2.54 to 2.76. SS decreased slightly from 3.65 to 3.63 and can therefore be considered as having remained stable over time. ASC too decreased only marginally from 2.99 to 2.90. Minimum and maximum scores possible in the self-reported answers ranged from 1 to 4.

Table 3 provides information regarding the means of the reached scores in PS, SS and ASC in the baseline and follow-up assessments in the control and intervention schools. The separate findings will be elaborated on and discussed in the following subchapters.

Table 3. PS, SS and ASC in T1 and T2 in control and intervention schools

| *n* = 852 | T1 | | | | T2 | | | |
|---|---|---|---|---|---|---|---|---|
| | Control | | Intervention | | Control | | Intervention | |
| | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| PS | 2.55 | 1.20 | 2.52 | 1.24 | 2.83 | 1.08 | 2.70 | 1.18 |
| SS | 3.60 | .76 | 3.70 | .68 | 3.57 | .70 | 3.68 | .68 |
| ASC | 2.88 | .82 | 3.10 | .85 | 2.76 | .82 | 3.04 | .84 |

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## 6.2 Hypotheses results

In the next paragraphs, results of the four formulated hypotheses will be presented.

### 6.2.1 Hypothesis 1

PS is lower after the PA intervention compared to the control group. PS correlates negatively with the intervention.

Descriptive Analysis

Table 4. Mean (*M*) and standard deviation (*SD*) of PS of control and intervention schools

| *n* = 852 | T1 | | T2 | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Control | 2.55 | 1.20 | 2.83 | 1.08 |
| Intervention | 2.52 | 1.24 | 2.70 | 1.18 |
| Average | 2.54 | 1.22 | 2.76 | 1.14 |

In Table 4 the mean (*M*) and standard deviation (*SD*) of PS of the control and intervention schools over time can be seen. Before the intervention period took place, the average PS of all learners of the entire study population was 2.54. The average PS of the learners in control schools was 2.55, that of the learners in intervention schools 2.52.

After the intervention period, the average PS of all learners was 2.76. The average PS of the learners of control schools was 2.83 and of the learners of intervention schools 2.70.

The average PS values of all tested learners in both testing groups experienced an incline from 2.54 to 2.76, resulting in an average rise of 0.22. Learners of the control group reported a rise from 2.55 to 2.83, causing an incline of 0.28. Learners of the PA-intervention group reported an incline from 2.52 to 2.70, showing in an increase of 0.18.

The increase of PS experienced by learners of the control group compared to the intervention group appears to be slightly higher (0.10). These findings referring to hypothesis 1 can be seen in the graph in Figure 7.

Inferential Analysis

ANCOVA tests with repeated measures were run to answer hypotheses 1 to 3. Because there were only two study groups, calculations were made using linear regression models. The output of the test regarding PS is presented in Table 5.

Table 5. Correlation of PS and control and intervention schools

| Model | Unstandardized coefficients β | SD | Standardized coefficients β | t | Sig. | 95%-CI |
|---|---|---|---|---|---|---|
| Constant | 2.66 | .10 | - | 27.0 | .00 | [2.46, 2.85] |
| PS_T1 | .07 | .03 | .07 | 2.08 | .04 | [.00, .13] |
| Group indication | -.12 | .08 | -.054 | -1.57 | .12 | [-.28, .03] |

After checking for baseline values there was no statistically significant evidence ($p = 0.116$) that PS of the intervention group increased less than PS of the control group after the intervention period ($\beta = -0.12$, 95% CI: -0.28; 0.30, $p = 0.116$). Therefore, the observed difference in PS is most likely not caused by the division into the two school groups.
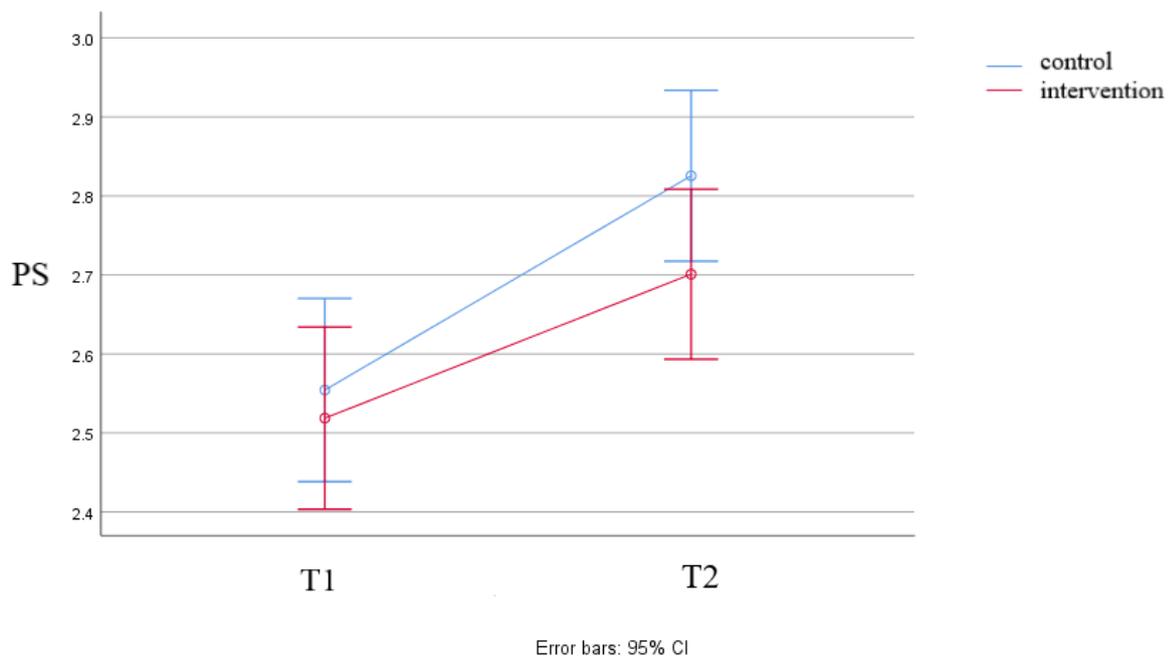


Figure 7. Graph for average PS in T1 and T2 for control and intervention schools

### 6.2.2 Hypothesis 2

SS is higher after the PA intervention compared to the control group. SS correlates positively with the intervention.

Descriptive Analysis

Table 6. Mean (*M*) and standard deviation (*SD*) of SS of control and intervention schools

| *n* = 852 | T1 | | T2 | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Control | 3.60 | .76 | 3.57 | .70 |
| Intervention | 3.70 | .68 | 3.68 | .68 |
| Average | 3.65 | .72 | 3.63 | .69 |

In Table 6 the mean (*M*) and standard deviation (*SD*) of SS of the control and intervention schools can be seen. Before the intervention period took place, the average SS of all learners of the entire study population was 3.65. The average SS of the learners in control schools was 3.60 and of the learners in intervention schools 3.70.

After the intervention, the average SS of all learners was 3.63. The average SS of the learners in control schools was 3.57 and of the learners in intervention schools 3.68.

The average SS values of all tested learners in both testing groups changed very slightly from 3.65 to 3.63, leaving the decline of 0.02 insignificantly small and therefore SS before and after the PA intervention period stable. Learners of the control group reported a neglectable reduction of 0.03 in SS from of 3.60 to 3.57. Learners of the PA-intervention group reported an even smaller decline of 0.02, from 3.70 to 3.68.

The decrease of SS experienced by learners of the control group compared to the intervention group appears to be slightly but negligibly higher (0.01). The findings referring to hypothesis 2 are visualized in the graph in Figure 8.

Inferential Analysis

The results to hypothesis 2 are retrieved from the ANCOVA test and are presented in Table 7.

Table 7. Correlation of SS and control and intervention schools

| Model | Unstandardized coefficients | | Standardized coefficients | t | Sig. | 95%-CI |
|---|---|---|---|---|---|---|
| | β | SD | β | | | |
| Constant | 3.21 | .12 | - | 26.32 | .00 | [2.97, 3.45] |
| SS_T1 | .10 | .03 | .11 | 3.08 | .00 | [.04, .17] |
| Group indication | .10 | .05 | .07 | 2.09 | .04 | [.01, .19] |

After checking for baseline values, statistically significant evidence ($p = 0.037$) was found that SS of the intervention group decreased more moderately after the intervention period than SS of the control group ($\beta = 0.10$, 95% CI: 0.01; 0.20, $p = 0.037$). The observed difference in SS may therefore be due to the division into the two school groups.
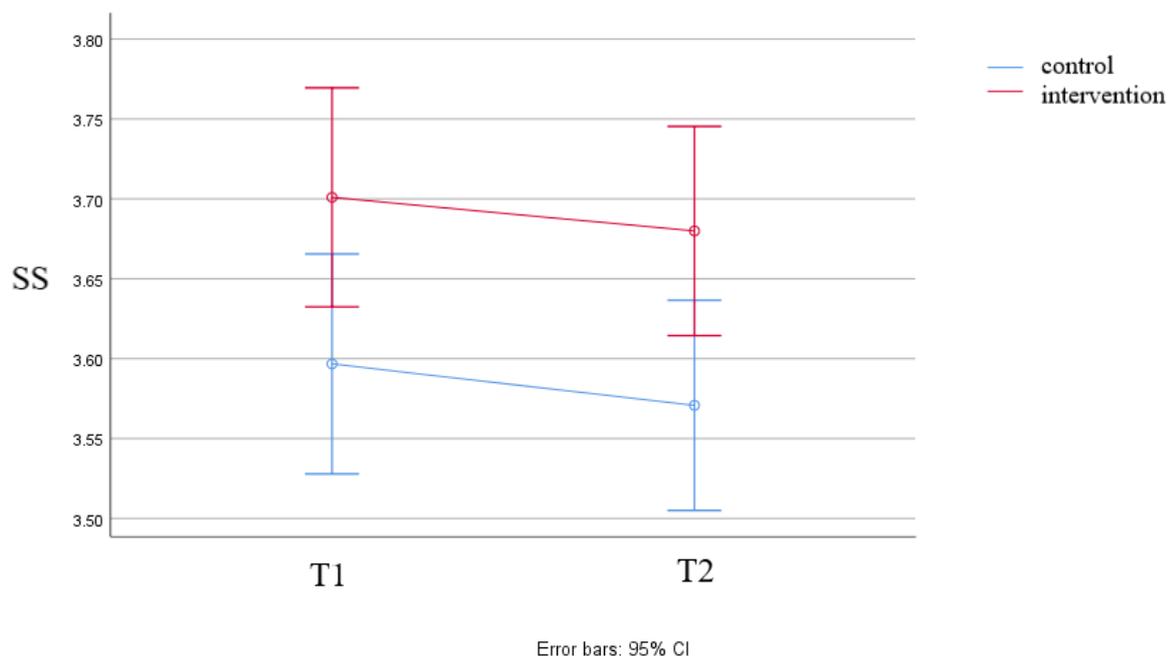


Figure 8. Graph for average SS in T1 and T2 for control and intervention schools

**6.2.3 Hypothesis 3**

ASC is higher after the PA intervention compared to the control group. ASC correlates positively with the intervention.

Descriptive Analysis

Table 8. Mean (*M*) and standard deviation (*SD*) of ASC of control and intervention schools

| *n* = 852 | T1 | | T2 | |
|---|---|---|---|---|
| | *M* | *SD* | *M* | *SD* |
| Control | 2.88 | .82 | 2.76 | .82 |
| Intervention | 3.10 | .85 | 3.04 | .84 |
| Average | 2.99 | .84 | 2.90 | .84 |

In Table 8 the mean (*M*) and standard deviation (*SD*) of ASC of the control and intervention schools can be seen. Before the intervention took place, the average ASC of all learners of the entire study population was 2.99. The average ASC of the learners in control schools was 2.88 and of the learners in intervention schools 3.10.

After the intervention, the average ASC of all learners was 2.90. The average ASC of the learners in control schools was 2.76 and of the learners in intervention schools 3.04.

The average ASC values of all tested learners in both testing groups experienced a decline from 2.99 to 2.90 over time, resulting in an average reduction of 0.09. Learners of the control group reported a reduction from 2.88 to 2.76, resulting in a decline of 0.12. Learners of the intervention group reported a marginal decline from 3.10 to 3.04, representing a decline of 0.06.

The reduction of ASC experienced by learners of the control group compared to the intervention group seems a little higher (0.06). The findings referring to hypothesis 3 are visualized in the graph in Figure 9.

Inferential Analysis

The results to hypothesis 3 are retrieved from the ANCOVA test and are presented in Table 9.

Table 9. Correlation of ASC and control and intervention schools

| Model | Unstandardized coefficients | | Standardized coefficients | | | |
|---|---|---|---|---|---|---|
| | β | SD | β | t | Sig. | 95%-CI |
| Constant | 2.44 | .11 | - | 23.00 | .00 | [2.23, 2.64] |
| ASC_T1 | .11 | .03 | .11 | 3.30 | .00 | [.05, .18] |
| Group indication | .25 | .06 | .15 | 4.44 | .00 | [.14, .37] |

After checking for baseline values, strong statistical evidence ($p = 0.001$) was found that ASC of the intervention group increased significantly more than ASC of the control group after the intervention period ($\beta = 0.25$, 95% CI: 0.14; 0.37, $p < 0.001$). The observed difference in ASC between the groups may therefore be due to the division into the two school groups.
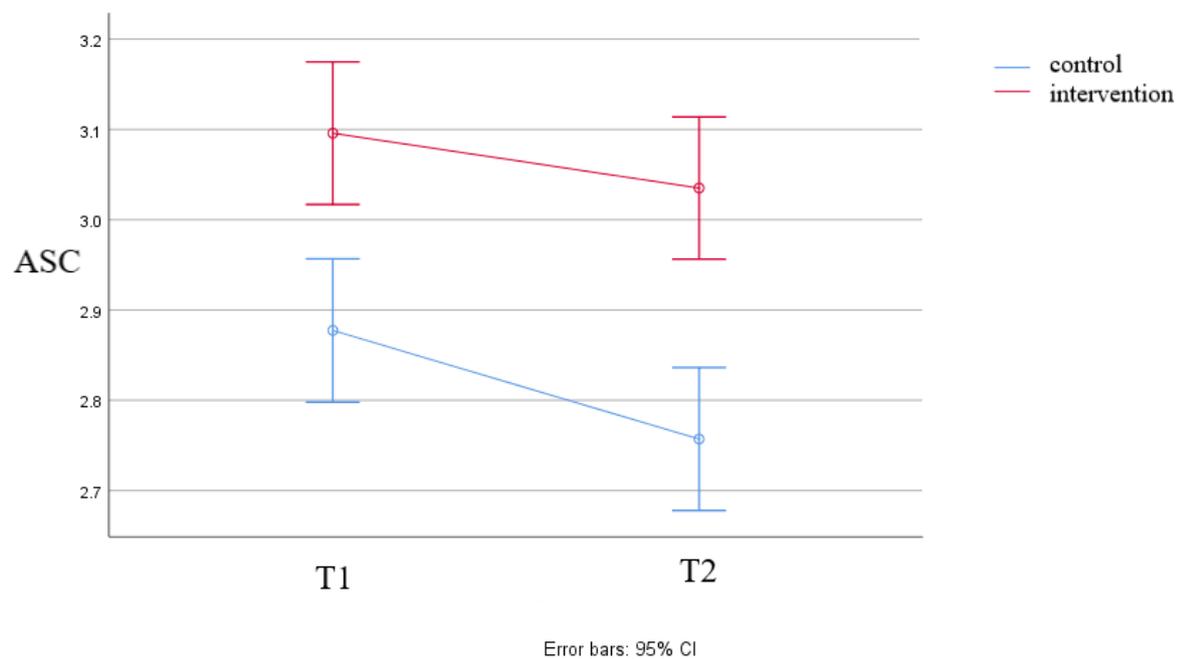


Figure 9. Graph for average ASC in T1 and T2 for control and intervention schools

### 6.2.4 Hypothesis 4

Age, gender, home language, ethnicity and SES have a potential impact on PS, SS and ASC.

Inferential Analysis

The different outputs of the linear regression models about the impacts of the co-variables age, gender, home language, ethnicity and SES on the dependent variables PS, SS and ASC are presented in Table 10. The results will be discussed in chapter 7.4.

Table 10. Impact of co-variables on PS, SS and ASC in T2

|  | Coefficients | SD | t | Sig. | 95%-CI |
|---|---|---|---|---|---|
| Age |  |  |  |  |  |
| PS | -.04 | .03 | -1.36 | .18 | [-.11, .02] |
| SS | -.00 | .02 | -.17 | .87 | [-.04, .04] |
| ASC | -.04 | .02 | -1.60 | .11 | [-.09, .01] |
| Gender |  |  |  |  |  |
| PS | -.04 | .08 | -.46 | .65 | [-.19, .12] |
| SS | -.07 | .05 | -1.51 | .13 | [-.16, .02] |
| ASC | -.09 | .06 | -1.54 | .13 | [-.20, .02] |
| Ethnicity |  |  |  |  |  |
| PS | .01 | .03 | .45 | .66 | [-.05, .07] |
| SS | -.10 | .02 | -5.60 | .00 | [-.14, .07] |
| ASC | -.00 | .02 | .20 | .84 | [-.04, .05] |
| Home language |  |  |  |  |  |
| PS | .01 | .03 | .27 | .79 | [-.06, .07] |
| SS | -.07 | .02 | -3.74 | .00 | [-.11, -.04] |
| ASC | .00 | .02 | .11 | .91 | [-.04, .05] |
| SES |  |  |  |  |  |
| PS | .01 | .01 | 1.41 | .16 | [-.00, .02] |
| SS | -.00 | .00 | -.13 | .90 | [-.01, .01] |
| ASC | -.00 | .00 | -.35 | .72 | [-.01, .01] |

# 7 Discussion

The following sections discuss the findings of this study with reference to the previously elaborated literature.

Key Findings

On average, schoolchildren independent of the school group (control or intervention) reported significant higher values in PS (+0.22; $p = 0.038$) and negligible lower values in SS (–0.02; $p = 0.002$) and ASC (–0.09; $p = 0.001$) in follow-up testing compared to the baseline testing. Therefore, an overall decrease of the learners' psychosocial wellbeing can be suggested. However, scores decreased less in learners of intervention schools compared to control school learners without intervention. Age, gender and socioeconomic status did not exert influence on PS, SS and ASC, whereas home language (mean difference: $−0.07$; 95% CI: $−0.11$ to $−0.04$; $p < 0.001$) and ethnicity (mean difference: $−0.10$; 95% CI: $−0.14$ to $−0.07$; $p < 0.001$) correlated negatively with SS.

## 7.1 Hypothesis 1

PS is lower after the PA intervention. PS correlates negatively with the PA intervention.

Against expectations, PS increases over time in both study groups of learners in control and intervention schools (+0.22; $p = 0.038$). However, learners of the control group without intervention report a greater increase in PS (+0.28) than learners of the intervention group (+0.18). The assumed negative correlation of PS with the PA intervention could not be detected.

As a crucial and influential factor on psychosocial wellbeing, self-perceived stress is highly sensitive to PA. As Bouchard and Shephard (1994) explain, it promotes and enhances adequate coping strategies to stressful situations in life. In many other studies, PA has proven to show positive effects on depression, self-perception and mood (Biddle et al., 2000; Morgan, 1997). It furthermore reduces anxiety and stress reactivity, the capacity to respond to stressors and increases cognitive performance. Besides reduction and adequate coping with stress, Biddle & Mutrie (2001) have shown many additional beneficial effects of PA - higher self-esteem, higher HRQoL, increased quality of sleep and physical health to name but a few - addressing a more general perspective on mental health. Because mental and physical health are closely interrelated and codependent, physical benefits of PA must not be omitted in discussing the many additional advantages of PA just listed. Gerber (2008) provides evidence that both the neural and endocrine processes are activated during as well as after bouts of exercise. Their activation in turn affects physiological stress regulation, letting more physically active people regenerate faster from stressors not caused by exercise.

While evidence of the possible benefits from PA is vast, little is known about the reasons for this behaviour. In Doré et al.'s study (2020) the correlation of PA and perception of three basic psychological needs (autonomy, competence and relatedness) were examined. Perception of

these psychological needs of around one third of the participants are traced back to PA. Another study by Chekroud et al. (2018) focused on the association between exercise and mental health, singling out the influences of different assets of physical exercise (type, duration, frequency and intensity). Physically active participants showed ±1.49 fewer days of decreased mental health than the physically inactive.

The underlying network of connectivity of the multiple factors mentioned is complex and remains insufficiently established to this day. As mentioned above, there are studies aiming to shed light on the relationships of PA and stress, but more evidence and further research is needed in order to create a better understanding for this sophisticated field of study. The difficulty in examining the general relationship between PA and stress may be due to methodological reasons or the complexity of stress itself (Biddle & Mutrie, 2001; Crone et al., 2005; Gerber, 2008).

With respect to the situation in SSA, only few countries include PA recommendations in their mental health policy, where stress could be addressed. In order to implement PA programs as part of the mental health care system of SSA, further education and increasing awareness of the benefits of PA is necessary (Vancampfort et al., 2017).

## 7.2 Hypothesis 2

SS is higher after the PA intervention compared to the control group. SS correlates positively with the intervention.

Against expectations, SS remains on the same level over time in both groups of learners in control and intervention schools ($-0.02$; $p = 0.002$). However, schoolchildren in the PA intervention group experience a minimally smaller decrease in SS (-0.02) than children in the control group with no PA intervention (-0.03). The assumed positive correlation of SS with the PA intervention could not be detected.

Three aspects seem to be predominant when it comes to SS: general satisfaction in school, commitment to in-class work and the attitude or quality of relationship towards teachers (Epstein & McPartland, 1976). These are the dimensions investigated in the QSL, and later MSLSS, assessing general SS of learners of primary, middle or high-school-age. For them it is crucial to feel positively reinforced and at ease at the school institution of daily visit (Ainley, 1991; Reyes & Jason, 1993). The individual mental wellbeing, motivation and absentee and dropout rates depend on the cognitive perception of whether psychological needs in school settings are met (Verkuyten & Thijs, 2002).

In general, very few studies investigate SS individually or in relation to PA. What is more widely discussed is the GLS and the association to PA. In young age, GLS is dependent on the following five factors: family background, friendship, living environment, the self-concept and concept of school (Huebner, 1994). A paper of Kleszczewska, Dzielska, Salonna and Mazur (2018) presents findings about PA and GLS in adolescents. It considers various background aspects like family affluence, relationships, psychological and school factors and PA. Results

of the SLSS scores showed that variability among the learners was mainly explained by self-esteem (36.9%), which in turn was highly influenced by PA. With decreasing family wealth, the impact of PA on self-esteem increased.

As to the reasons why no significant difference in SS between the two tested groups could be detected, only assumptions can be made. None of them are empirically elaborated within the scope of this thesis, but possible explanations and limitations are discussed in chapter 8.

## 7.3 Hypothesis 3

ASC is higher after the PA intervention compared to the control group. ASC correlates positively with the intervention.

Against expectations, ASC decreases over time in both study groups of learners in control and intervention schools ($-0.09$; $p = 0.001$). However, the reduction of ASC is smaller in learners of intervention schools (-0.06) experiencing a PA intervention than in learners of control schools (-0.12). The assumed positive correlation of ASC with the PA intervention could not be detected.

ASC is a predictor for personal learning and cognitive functions. Another term frequently used together with ASC is academic achievement. Depending on the models applied (self-enhancement or skill-development model), ASC is either a determinant of academic achievement, or it is its outcome. Either way, it holds true that there is a strong correlation between self-perceived ASC and educational behaviour, motivation, effort and educational aspiration (Marsh, 1990; Marsh & Craven, 2006).

While several studies elaborate on the connection between ASC and the general self-concept (Schneider, Dunton & Cooper, 2008; Babic et al., 2014) or the physical self-concept (Fernández-Bustos, Infantes-Paniagua, Cuevas & Contreras, 2019; Mohammadi & Hadiyan, 2013), there are no studies found which address the impact PA has on the academic aspect of the self-concept. Also, only few studies investigate learners of young ages, whereas several studies regarding the self-concept were conducted within university settings (Mohammadi & Hadiyan, 2013; Olmedilla, Ortega Toro & Abenza, 2016).

Looking at the issue from a broader perspective and considering previous discussions regarding the effect of PA on PS and SS, it can be assumed that PA has beneficial effects on ASC as well. Both Biddle & Mutrie (2001) and Kleszczewska et al. (2018) have shown an increase in individual's self-esteem with higher PA. Self-esteem could be argued to be an element of a wider understanding of ASC or the perception of the academic achievement. Then, PA might be regarded as positively affecting ASC.

The afore mentioned ASCS measures self-regulation, general intellectual abilities inside and outside school, motivation and creativity (Ordaz-Villegas et al., 2013). If these terms can be compared to self-perception (Bouchard & Shephard, 1994), cognitive performance (Biddle et al., 2000; Morgan, 1997) and autonomy, competence and relatedness (Doré et al., 2020)

respectively, it is likely that PA may have a positive effect on ASC. Further examination and scientific research is needed to gain data about the correlation of PA and ASC.

## 7.4 Hypothesis 4

Age, gender, home language, ethnicity and SES have a potential impact on PS, SS and ASC.

The co-variables age, gender and SES did not show any significant impact on PS, SS or ASC in the follow-up assessment ($p > 0.05$). However, the impact of the co-variables ethnicity and language on SS proved to be statistically significant ($p = 0.001$), whilst PS and ASC remained unaffected.

Against expectations, age, gender and SES of the schoolchildren did not seem to influence their self-reported answers to PS, SS and ASC over time. While South African boys seem to be more physically active than girls (Minaar et al., 2016; McVeigh & Meiring, 2014), no difference was found in this study regarding its effect on the three parameters assessed. A decrease of time spent with PA is assumed with increasing age, independent of gender. However, Biljon et al. (2018) report a slightly higher decrease for females (20%) than males (14%). Non of these occurrences seemed apparent in the results of hypothesis 4.

Similarly, no differences on the impact on PS, SS and ASC were found regarding higher or lower SES. Experts researching in this field have made contradictory observations regarding PA and sedentary behaviour patters in individuals with different SES. While Micklesfield et al. (2014) report higher PA levels among children with low SES, McVeigh et al. (2004) found PA engagement to decrease with lower SES. The examination of relationships between PA and SES are complex and seem not to be in complete agreement. This conforms to the findings of this study. However, many other lifestyle factors, environmental and familial settings may possibly contribute significantly to this discrepancy in the stated findings, thereby complicating the comparison between different SES levels. The complexity of these possible interrelations necessitates further examination.

Ethnicity and home language, however, seemed to play a significant role on SS. Because the two co-variables are closely related, they will be discussed together. Race related patterns on physical and sedentary activity levels have been investigated before (McVeigh & Meiring, 2014; Kriska, 2000; McVeigh et al., 2004). According to McVeigh and Meiring (2014), black children spend less time with PA compared to children of Indian and white ethnicity, resulting in a higher rate obesity. However, van Biljon et al. (2018) again report the opposite: higher PA levels among black schoolchildren than among white and other ethnic groups in South Africa. Controversial opinions and study findings regarding the impact of SES on PA levels seem to dominate the discussion, whereas general consent about age and gender influence exists.

To conclude, it can be assumed that differences in PA levels due to ethnicity, gender, SES and age exist. Singling out these correlations and providing valid evidence about the influences on PA need further research, for they might reflect various other factors like biological and cultural components.

# 8 Study limitations and strengths

The large sample size of the study population ($n = 852$) can be considered a representative number of participants. The equal distribution of learners in intervention ($n = 424$) and control ($n = 428$) schools and gender (415 girls and 437 boys) also provides an approximately even sample, making comparison possible.

Another advantage is the differentiated analysis of the study population. Factors such as age, gender, ethnic background and socioeconomics could influence mental health and PA levels of South African learners and are approached in hypothesis 4.

However, there are several factors that need to be kept in mind when analysing the set up and interpreting the findings of this study. Study participants are drawn from and limited to marginalized neighbourhoods of Port Elizabeth, South Africa. Therefore, no general or nationally effective statements can be made. Although sample size groups were randomised, the data of the cross-sectional study does not provide causality.

Further limitations are addressed in the following paragraphs.

## 8.1 Questionnaires

The content of this paper is based on answers of the self-constructed questionnaire of the study *«Effects of a school-based health intervention program in marginalised communities of Port Elizabeth, South Africa: The KaziBantu project»* (Müller et al., 2019). Besides personal and demographic information only three questions have been of interest for the elaboration of this paper's research question, namely questions 6.1, 6.2 and 6.3 regarding SS, PS and ASC.

SS is assessed by asking *«How do you feel about school at present?»*. Answering possibilities ranged from *«I don't like it all»* to *«I like it a lot»*. In omitting a time frame in which this personal "feeling" should be considered, it remains unclear, what "at present" implies. The present might for some learners mean today or even the very moment the questionnaires were filled in. Others might recollect feelings of the past week, the past month, or even a particularly incisive moment (of positive or negative nature) in the past. Furthermore, in several definitions of SS the *«cognitive interpretation of […] psychological needs»* (Verkuyten & Thijs, 2002) and *«cognitive appraisal of perceived quality»* (Baker & Maupin, 2009) are mentioned. In asking about a feeling, the cognitive aspect to the perceived satisfaction of the school setting is not addressed in the formulated question.

PS is investigated with the question *«How pressured do you feel by the schoolwork you have to do?»* with answering possibilities ranging from *«Not at all»* to *«A lot»*. Referring solely to schoolwork, the term "stress" is immensely reduced to this single aspect. This is valid if stressors of academic origin only are of interest. A more holistic and realistic understanding of stress would include relations to home environments, the general behaviour and health of the learners (White, 2014; Matheny et al., 1993).

ASC is assessed in the question *«In your opinion, what does your class teacher(s) think about your school performance compared to your classmates?»*. Answering possibilities ranged from *«Worse than most others»* to *«Very good»*. Whereas in the researched definitions of ASC the learner's own perception of the academic abilities is of relevance (Ordaz-Villegas et al., 2013; Marsh, 1990; Calsyn & Kenny, 1977; Guay et al., 2003) the question of the survey asks about the learner's perception of the teacher(s) estimation regarding their ASC. Hence it is no longer the self-estimated ASC, but the expected awareness of others, more specifically the teacher(s), that is assessed. Results to this question are expected to differ strongly, since the teacher's and the learner's perception of the academic ("self") concept may reflect great discrepancies. Moreover, the question technically explores the ability of the learner to put him- or herself in the teacher(s) position, which allows doubts about the validity of the question. Another ambiguity is the double-sided perspective in which the question could be understood. From the perspective of the learner the question might read: what does my class teacher(s) think about my school performance compared to my classmates? One possible answer might be: my class teacher(s) think worse of my school performance than most other classmates think of it. Or is the question: how does my class teacher(s) compare my school performance to the school performance of the other classmates? Then one possible answer might be: my class teacher(s) think my school performance is worse than most other school performances of my classmates. Overall, the question seems to be formulated too vaguely in order to eliminate crucial differences in interpretation.

Results are based on the self-reported answers of the learners. Depending on the cognitive and emotional development of the individual, learners from grade 4 to 6 may be too young to be capable to fully understand and answer these questions meaningfully. In this case, help and additional explanation was provided by the field workers. This in turn provokes possible inconsistency of administration of the surveys. Field working teams differed between T1 and T2 as well as within the testing phases. Therefore, inter-rater reliability, which represents the extent of agreement of the assessment results among different raters in empirical social research, must be questioned.

Lastly, social desirability and different cultural interpretations may hinder the accurate reporting of data in surveys, as well as include recall bias when it comes to PA (van Biljon et al., 2018). Also, the "unnatural" character of the classification of the answering possibilities must be considered. Compared to other factors such as blood pressure, BMI or height, aspects of psychosocial health seem to be less graspable and therefore more difficult to measure effectively and validly.

## 8.2 PA Intervention

In the framework of this master thesis mental health as well as PA levels are self-reported. The lack of an objective measurement of both means a restriction in the data and the interpretation of it.

Furthermore, the scope or content of the PA interventions has not been elaborated on. The duration of the data gathering phases as well as the actual sports intervention at the respective schools may therefore have differed significantly. This results in varying, possibly beneficial effects of the intervention on the individual learners, which must be respected in the interpretation of the analysis of the research questions. Performed physical education lessons are based on the toolkit *KaziKidz*. Execution, frequency and duration of the lessons as well as the adherence to the foreseen contents are not controlled and therefore can not be assumed. Also, the influence and motivation of the "KaziCoaches" conducting the PA intervention lessons should not be underestimated and should be considered. Furthermore, the amount of additional physical activation of the learners during their leisure time is not taken into account.

Needless to say, fieldwork and interventional/experimental study designs of this sort can not provide for a perfectly controlled and standardized setting. Also, thought should be given to the weather conditions in which the data gathering took place. The T1-baseline assessment was conducted in South African summer (January to March), whereas the T2-follow-up testing was done in wintery conditions (June to October).

To conclude, no causal correlations can be made between any of the analysed parameters (PS, SS and ASC) and PA. Physical exercise may have an effect on the mental health of young learners from grade 4 to 6 in marginalized schools in Port Elizabeth, but as to why or how this influence is effective, no reasons can be deduced from the analysis provided in this paper.

## 9 Conclusion and outlook

Mental health problems and the trend towards a sedentary lifestyle are core health challenges of this century (Collins et al., 2011; Tathiah, Moodley, Mubaiwa, Denny & Taylor, 2013). Globally, these psychological and physiological health burdens are a public health concern. Identifying and denominating protective factors for either sections is essential for preventing and tackling these major health challenges. This master thesis aimed at providing evidence for the link between PA engagement and the mental wellbeing of children of marginalized neighbourhoods in Port Elizabeth, South Africa.

The results of this study show effects of PA interventions on PS, SS and ASC. Although the wide spectrum of benefits of PA has long been recognized (Callaghan, 2004; Biddle et al., 2000; Saxena et al., 2005) an overall decrease with regards to content of all three parameters (PS, SS and ASC) over time is observed. However, scores decreased less in learners of intervention schools compared to control school learners. According to the statistical analysis, evidence was not significant in the increase of PS ($p = 0.116$), whereas the decreasing trends in SS ($p = 0.037$)

and ASC ($p = 0.001$) showed statistical significance ($p < 0.05$). Of the co-variables, only ethnicity and home language seem to have an impact on the learners' SS ($p = 0.001$ for both).

It is apparent that with all three parameters (PS, SS and ASC), average scores of the control schools were lower than scores of the intervention schools to begin with. As to the reasons why this is the case, only guesses can be made, for the distribution of boys and girls, Northern Areas or Township Areas schools and therefore ethnicities may be considered equal.

Reasons for this outcome could lead back to the methods used to assess the learner's PS, SS and ASC as well as the implementation of the PA intervention. Data regarding the main parameters was collected using self-reported answers to the questionnaires designed by the *KaziBantu* research team. Each parameter was approached with only one question, which may be too little to make a significant statement. The formulation of the questions, especially in ASC, and the lack of understanding of the learners are another limitation to the measurement, which makes it likely to have failed to measure the matter in question.

PA interventions were not supervised, or their implementation controlled. Therefore, they may differ in content, frequency and duration among the four intervention schools. Since in this paper the scope of the individual PA has not been considered, statements about effect size and/or dose-response are not possible.

Research examining specific correlations between PS, SS and ASC and PA is lacking. However, general physical and psychological benefits of the physical activation of the body are no longer doubted (Biddle & Mutrie, 2001; Saxena et al., 2005; Daley, 2002). In Africa, 80% of all 13 to 15 years-old children are estimated to not meet the current recommendations of daily exercise by the WHO (Hallal et al., 2012). In South Africa, physical inactivity increases with age and according to Micklesfield et al. (2014) around half of all 15 years-old teenagers and older are performing little to no PA. Promoting and encouraging a more active lifestyle and to increase physically active time in school settings for young learners in Port Elizabeth, South Africa, might improve far-reaching aspects of the health of young learners, including PS, SS and their ASC.

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# Appendices

## Appendix 1: Complete table of SES

| SES | Frequency (n) | Percent (%) |
|---|---|---|
| 12 | 1 | 0.1 |
| 13 | 1 | 0.1 |
| 15 | 3 | 0.4 |
| 16 | 4 | 0.5 |
| 17 | 4 | 0.5 |
| 18 | 9 | 1.1 |
| 19 | 13 | 1.5 |
| 20 | 16 | 1.9 |
| 21 | 17 | 2.0 |
| 22 | 25 | 2.9 |
| 23 | 26 | 3.1 |
| 24 | 27 | 3.2 |
| 25 | 27 | 3.2 |
| 26 | 28 | 3.3 |
| 27 | 31 | 3.6 |
| 28 | 27 | 3.2 |
| 29 | 54 | 6.3 |
| 30 | 30 | 3.5 |
| 31 | 48 | 5.6 |
| 32 | 59 | 6.9 |
| 33 | 52 | 6.1 |
| 34 | 47 | 5.5 |
| 35 | 29 | 3.4 |
| 36 | 24 | 2.8 |
| 37 | 53 | 6.2 |
| 38 | 41 | 4.8 |
| 39 | 29 | 3.4 |
| 40 | 30 | 3.5 |
| 41 | 22 | 2.6 |
| 42 | 6 | 0.7 |
| 43 | 22 | 2.6 |
| 44 | 13 | 1.5 |
| 45 | 15 | 1.8 |
| 46 | 7 | 0.8 |
| 47 | 4 | 0.5 |
| 48 | 2 | 0.2 |
| 49 | 5 | 0.6 |
| 51 | 1 | 0.1 |
| Total | 852 | 100.0 |

# Appendix 2: Ethical clearances

Province of the
## EASTERN CAPE
HEALTH

| | | |
|---|---|---|
| Enquiries: | Zonwabele Merile | Tel no: 083 378 1202 |
| Email: | Zonwabele.Merile@echealth.gov.za | Fax no: 043 642 1409 |

Date: 05 JUNE 2018

RE: EFFECTS OF A SCHOOL-BASED HEALTH INTERVENTION PROGRAMME IN MARGINALISED COMMUNITIES IN PORT ELIZABETH, SOUTH AFRICA: THE KAZIBANTU PROJECT. (EC_201804_007)

Dear Prof C. Walter and Prof R. Du Randt

The department would like to inform you that your application for the abovementioned research topic has been approved based on the following conditions:

1. During your study, you will follow the submitted amended protocol with ethical approval and can only deviate from it after having a written approval from the Department of Health in writing.

2. You are advised to ensure, observe and respect the rights and culture of your research participants and maintain confidentiality of their identities and shall remove or not collect any information which can be used to link the participants.

3. The Department of Health expects you to provide a progress on your study every 3 months (from date you received this letter) in writing.

4. At the end of your study, you will be expected to send a full written report with your findings and implementable recommendations to the Eastern Cape Health Research Committee secretariat. You may also be invited to the department to come and present your research findings with your implementable recommendations.

5. Your results on the Eastern Cape will not be presented anywhere unless you have shared them with the Department of Health as indicated above.

Your compliance in this regard will be highly appreciated.

SECRETARIAT: EASTERN CAPE HEALTH RESEARCH COMMITTEE

# NELSON MANDELA

## UNIVERSITY

Chairperson: Research Ethics Committee (Human)
Tel: +27 (0)41 504 2235
charmain.cilliers@mandela.ac.za

**Ref: [H18-HEA-HMS-001 / Approval]**

26 March 2018

Prof R du Randt and Prof C Walter
Faculty of Health Sciences
South Campus

Dear Profs Du Randt and Walter

**EFFECTS OF A SCHOOL-BASED HEALTH INTERVENTION PROGRAMME IN MARGINALISED COMMUNITIES IN PORT ELIZABETH, SOUTH AFRICA: THE KAZIBANTU PROJECT**

PRP:   Prof R du Randt / Prof C Walter
PI:      Prof R du Randt / Prof C Walter

Your above-entitled application served at the Research Ethics Committee (Human) for approval.

The ethics clearance reference number is **H18-HEA-HMS-001** and is valid for three years.  Please inform the REC-H, via your faculty representative, if any changes (particularly in the methodology) occur during this time.  An annual affirmation to the effect that the protocols in use are still those for which approval was granted, will be required from you.  You will be reminded timeously of this responsibility, and will receive the necessary documentation well in advance of any deadline.

We wish you well with the project.

Yours sincerely

*[signature]*

**Prof C Cilliers**
**Chairperson: Research Ethics Committee (Human)**

Cc:      Department of Research Capacity Development
           Faculty Officer: Health Sciences

Enquiries: B Pamla          Email: babalwa.pamla@ecdoe.gov.za          Date: 09 May 2018

Professor Cheryl Walter

Department of Human Movement Science

Nelson Mandela University

**Port Elizabeth**

**77000**

Dear Prof. Walter

**PERMISSION TO UNDERTAKE A RESEARCH PROJECT: EFFECTS OF A SCHOOL-BASED HEALTH INTERVENTION PROGRAMME IN MARGINALISED COMMUNITIES OF PORT ELIZABETH, SOUTH AFRICA – THE KAZIBANTU PROJECT**

1. Thank you for your application to conduct research.

2. Your application to conduct the abovementioned research involving 800 participants from four Primary Schools of Nelson Mandela Bay District under the jurisdiction of the Eastern Cape Department of Education (ECDoE) is hereby approved based on the following conditions:

    a. there will be no financial implications for the Department;

    b. consent will be sought from parents of minor children;

    c. institutions and respondents must not be identifiable in any way from the results of the investigation;

    d. you present a copy of the written approval letter of the Eastern Cape Department of Education (ECDoE) to the Cluster and District Directors before any research is undertaken at any institutions within that particular district;

    e. you will make all the arrangements concerning your research;

    f. the research may not be conducted during official contact time;

building blocks for growth

g.  should you wish to extend the period of research after approval has been granted, an application to do this must be directed to Chief Director: Strategic Management Monitoring and Evaluation;

h.  your research will be limited to those institutions for which approval has been granted, should changes be effected written permission must be obtained from the Chief Director: Strategic Management Monitoring and Evaluation;

i.  you present the Department with a copy of your final paper/report/dissertation/thesis free of charge in hard copy and electronic format. This must be accompanied by a separate synopsis (maximum 2 – 3 typed pages) of the most important findings and recommendations if it does not already contain a synopsis.

j.  you present the findings to the Research Committee and/or Senior Management of the Department when and/or where necessary.

k.  you are requested to provide the above to the Chief Director: Strategic Management Monitoring and Evaluation upon completion of your research.

l.  you comply with all the requirements as completed in the Terms and Conditions to conduct Research in the ECDoE document duly completed by you.

m.  you comply with your ethical undertaking (commitment form).

n.  you submit on a six-monthly basis, from the date of permission of the research, concise reports to the Chief Director: Strategic Management Monitoring and Evaluation

3.  The Department reserves a right to withdraw the permission should there not be compliance to the approval letter and contract signed in the Terms and Conditions to conduct Research in the ECDoE.

4.  The Department will publish the completed Research on its website.

5.  The Department wishes you well in your undertaking. You can contact the Director, Ms. NY Kanjana on the numbers indicated in the letterhead or email nelisa.kanjana@ecdoe.gov.za should you need any assistance.

**NY KANJANA**
**DIRECTOR: STRATEGIC PLANNING POLICY RESEARCH & SECRETARIAT SERVICES**

**FOR SUPERINTENDENT-GENERAL: EDUCATION**

Bareva eligoqambileyo!

# Appendix 3: Completed survey of *KaziBantu* T1

## Survey on schoolchildren's social and demographic background, physical fitness and psychosocial health in Port Elizabeth, South Africa

### ID and Date (filled out by the researcher)

ID Number **5 6 2 3**

First Name

```
1 ☐ ☐ ☐ ☐
2 ☐ ☐ ☒ ☐
3 ☐ ☐ ☐ ☒
4 ☐ ☐ ☐ ☐
5 ☒ ☐ ☐ ☐
6 ☐ ☒ ☐ ☐
7 ☐ ☐ ☐ ☐
8 ☐ ☐ ☐ ☐
9 ☐ ☐ ☐ ☐
0 ☐ ☐ ☐ ☐
```

Last Name

Date of Testing **0 5 0 2 2 0 1 9**

```
1 ☐ ☐ ☐ ☐ ☐ ☐ ☒ ☐
2 ☐ ☐ ☐ ☒ ☒ ☐ ☐ ☐
3 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
4 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
5 ☐ ☒ ☐ ☐ ☐ ☐ ☐ ☐
6 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
7 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
8 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
9 ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☒
0 ☒ ☐ ☒ ☐ ☐ ☒ ☐ ☐
```

*Use the following format:*

*DDMMYYYY*

*For example: 13th of January 2002 equals to: 13012002*

### Introduction

**2.1 Are you a girl or a boy?** ☒ Girl ☐ Boy

### General health

Thinking about last week...

|  | Poor | Fair | Good | Very good | Excellent |
|---|---|---|---|---|---|
| **3.1 In general, how would you say your health is?** | ☐ | ☐ | ☒ | ☐ | ☐ |

## Psychosocial Health

Thinking about last week...

|  | Never | Seldom | Sometimes | Often | Always |
|---|---|---|---|---|---|
| **4.1 Have you physically felt fit and well?** | ☐ | ☐ | ☒ | ☐ | ☐ |
| **4.2 Have you felt full of energy?** | ☐ | ☐ | ☐ | ☐ | ☒ |
| **4.3 Have you felt sad?** | ☐ | ☐ | ☒ | ☐ | ☐ |
| **4.4 Have you felt lonely?** | ☐ | ☒ | ☐ | ☐ | ☐ |
| **4.5 Have you had enough time for yourself?** | ☐ | ☐ | ☐ | ☐ | ☒ |
| **4.6 Have you been able to do the things that you want to do in your free time?** | ☐ | ☐ | ☐ | ☐ | ☒ |
| **4.7 Have your parent(s)/guardian(s) treated you fairly?** | ☐ | ☐ | ☒ | ☐ | ☐ |
| **4.8 Have you had fun with your friends?** | ☐ | ☐ | ☐ | ☐ | ☒ |
| **4.9 Have you got on well at school?** | ☐ | ☐ | ☐ | ☐ | ☒ |
| **4.10 Have you been able to pay attention at school?** | ☐ | ☐ | ☐ | ☐ | ☒ |

## Physical Activity

Physical activity 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.

**5.1 In the past 7 days, during your physical education (PE) classes, how often were you physically very active (playing hard, running, jumping, throwing)?**

| | |
|---|---|
| I don't do PE | ☒ |
| Seldom | ☐ |
| Sometimes | ☐ |
| Quite often | ☐ |
| Always | ☐ |

**5.2 In the last 7 days, what did you do most of the time at break time?**

| | |
|---|---|
| Sat down (talking, reading, doing schoolwork) | ☐ |
| Stood around or walked around | ☒ |
| Ran or played a little bit | ☐ |
| Ran and played hard most of time | ☐ |

## Physical Activity [Continue]

**5.3 In the last 7 days, what did you do most of the time at lunch (besides eating lunch)?**

| | |
|---|---|
| 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 time | ☐ |

**5.4 In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were physically very active?**

| | |
|---|---|
| None | ☒ |
| 1 time last week | ☐ |
| 2 or 3 times last week | ☐ |
| 4 times last week | ☐ |
| 5 times last week | ☐ |

**5.5 In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were physically very active?**

| | |
|---|---|
| None | ☒ |
| 1 time last week | ☐ |
| 2 or 3 times last week | ☐ |
| 4 or 5 times last week | ☐ |
| 6 or 7 times last week | ☐ |

**5.6 On the last weekend, how many times did you do sports, dance or play games in which you were physically very active?**

| | |
|---|---|
| None | ☐ |
| 1 time | ☐ |
| 2-3 times | ☒ |
| 4-5 times | ☐ |
| 6 or more times | ☐ |

**5.7 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 best.**

| | |
|---|---|
| All or most of my free time was spent doing things that involve little physical effort | ☐ |
| I sometimes (1-2 times last week) did physical things in my free time (e.g. played sports, went running) | ☒ |
| I often (3-4 times last week) did physical things in my free time | ☐ |
| I quite often (5-6 times last week) did physical things in my free time | ☐ |
| I very often (7 or more times last week) did physical things in my free time | ☐ |

## Physical Activity [Continue]

**5.3 In the last 7 days, what did you do most of the time at lunch (besides eating lunch)?**

| | |
|---|---|
| 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 time | ☐ |

**5.4 In the last 7 days, on how many days right after school, did you do sports, dance, or play games in which you were physically very active?**

| | |
|---|---|
| None | ☒ |
| 1 time last week | ☐ |
| 2 or 3 times last week | ☐ |
| 4 times last week | ☐ |
| 5 times last week | ☐ |

**5.5 In the last 7 days, on how many evenings did you do sports, dance, or play games in which you were physically very active?**

| | |
|---|---|
| None | ☒ |
| 1 time last week | ☐ |
| 2 or 3 times last week | ☐ |
| 4 or 5 times last week | ☐ |
| 6 or 7 times last week | ☐ |

**5.6 On the last weekend, how many times did you do sports, dance or play games in which you were physically very active?**

| | |
|---|---|
| None | ☐ |
| 1 time | ☐ |
| 2-3 times | ☒ |
| 4-5 times | ☐ |
| 6 or more times | ☐ |

**5.7 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 best.**

| | |
|---|---|
| All or most of my free time was spent doing things that involve little physical effort | ☐ |
| I sometimes (1-2 times last week) did physical things in my free time (e.g. played sports, went running) | ☒ |
| I often (3-4 times last week) did physical things in my free time | ☐ |
| I quite often (5-6 times last week) did physical things in my free time | ☐ |
| I very often (7 or more times last week) did physical things in my free time | ☐ |

## Physical Activity [Continue]

**5.8 Were you sick last week, or did anything prevent you from doing your normal physical activities?**

☒ Yes          ☐ No

**If _yes_, what prevented you?**

> I was sick of shortness of breath

## Perceived stress, school satisfaction and academic self-concept

| | I don't like it at all | I don't like it very much | I like it a bit | I like it a lot |
|---|---|---|---|---|
| **6.1 How do you feel about school at present?** | ☐ | ☐ | ☒ | ☐ |

| | Not at all | A little bit | Some | A lot |
|---|---|---|---|---|
| **6.2 How pressured do you feel by the schoolwork you have to do?** | ☒ | ☐ | ☒ | ☐ |

| | Worse than most others | Same as most others | Good | Very good |
|---|---|---|---|---|
| **6.3 In your opinion, what does your class teacher(s) think about your school performance compared to your classmates?** | ☐ | ☐ | ☒ | ☐ |

## Social and demographic background

**7.1 What is your ethnic background?**

☐ Black          ☒ Mixed          ☐ White
☒ Coloured       ☐ Indian         ☐ Other

**7.2 What is your primary language at home?**

☐ Xhosa          ☐ English        ☐ Other
☒ Afrikaans

**7.3 Which of the following items do you have at home?** (You can tick more than one answer)

☒ Washing machine    ☒ Fridge              ☒ Freezer
☒ Television         ☐ Computer            ☒ Car
☐ Landline phone     ☐ None of these items

**7.4 Do you live in a...**

☐ Backyard shack / room    ☐ Shack in informal settlement    ☐ RDP house
☐ Council house            ☒ Privately built house           ☐ Other

**7.5 How many bedrooms does your home have?**

☐ 1          ☐ 3          ☐ 5 and more
☐ 2          ☒ 4

**7.6 Do you have a bathroom / toilet inside your home?**

☒ Yes          ☐ No

## Social and demographic background [Continue]

**7.7 What type of toilet do you have at home?**

☒ Flush toilet          ☐ Pit toilet          ☐ Communal toilet
☐ Bucket

**7.8 How is the access to water?**

☒ Taps inside my home          ☐ Tap in the yard          ☐ Water tank
☐ Communal tap / tap shared with
  other families

**7.9 How many people live inside your home (you included)?**

☐ 1          ☒ 8          ☐ 15
☐ 2          ☐ 9          ☐ 16
☐ 3          ☐ 10         ☐ 17
☐ 4          ☐ 11         ☐ 18
☒ 5          ☐ 12         ☐ 19
☒ 6          ☐ 13         ☐ 20
☐ 7          ☐ 14         ☐ More than 20

**7.10 Does your home have electricity?**

☒ Yes          ☐ No

**7.11 How does your family cook food? With...** (You can tick more than one answer)

☒ Electricity          ☐ Gas          ☐ Paraffin stove
☐ Fire

Thank you very much for completing the *KaziBantu* Questionnaire.

Please hand the questionnaire directly to the investigator.

## Appendix 4: Descriptive results for co-variables

*Mean (M) and standard deviation (SD) of PS, SS and ASC in T1 and T2 with respect to age*

| n=852 | T1 | | | | | | T2 | | | | | |
| | PS | | SS | | ASC | | PS | | SS | | ASC | |
| Age | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 2.55 | 1.34 | 3.62 | .83 | 3.23 | .80 | 2.88 | 1.20 | 3.62 | .76 | 3.03 | .77 |
| 10 | 2.56 | 1.24 | 3.73 | .61 | 3.03 | .84 | 2.70 | 1.15 | 3.68 | .64 | 2.98 | .82 |
| 11 | 2.53 | 1.19 | 3.67 | .73 | 2.96 | .82 | 2.86 | 1.12 | 3.56 | .76 | 2.79 | .83 |
| 12 | 2.55 | 1.15 | 3.55 | .76 | 2.91 | .87 | 2.71 | 1.06 | 3.65 | .65 | 2.88 | .91 |
| 13 | 2.42 | 1.18 | 3.55 | .80 | 2.73 | .79 | 2.68 | 1.18 | 3.62 | .62 | 2.86 | .86 |
| 14 | 2.20 | 1.30 | 3.60 | .89 | 3.00 | 1.00 | 1.60 | .89 | 3.80 | .45 | 2.60 | .89 |
| 15 | 3.00 | . | 4.00 | . | 3.00 | . | 3.00 | . | 3.00 | . | 2.00 | . |
| 16 | 4.00 | . | 4.00 | . | 4.00 | . | 1.00 | . | 4.00 | . | 4.00 | . |

*Mean (M) and standard deviation (SD) of PS, SS and ASC in T1 and T2 with respect to gender*

| n=852 | T1 | | | | | | T2 | | | | | |
| | PS | | SS | | ASC | | PS | | SS | | ASC | |
| Gender | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Girl | 2.49 | 1.22 | 3.70 | .68 | 3.06 | .84 | 2.78 | 1.15 | 3.67 | .65 | 2.95 | .83 |
| Boy | 2.58 | 1.22 | 3.60 | .76 | 2.92 | .84 | 2.75 | 1.13 | 3.59 | .73 | 2.85 | .85 |

*Mean (M) and standard deviation (SD) of PS, SS and ASC in T1 and T2 with respect to home language*

| n=843 | T1 | | | | | | T2 | | | | | |
| | PS | | SS | | ASC | | PS | | SS | | ASC | |
| Home language | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Xhosa | 2.45 | 1.21 | 3.70 | .65 | 2.92 | .83 | 2.75 | 1.13 | 3.70 | .61 | 2.87 | .85 |
| Afrikaans | 2.70 | 1.25 | 3.56 | .86 | 3.15 | .86 | 2.75 | 1.21 | 3.52 | .78 | 2.97 | .86 |
| English | 2.75 | 1.15 | 3.49 | .76 | 3.07 | .83 | 2.84 | 1.03 | 3.34 | .90 | 2.91 | .77 |
| Other | 2.17 | 1.17 | 3.50 | 1.23 | 3.50 | .84 | 3.17 | .75 | 3.67 | .52 | 2.83 | .75 |

*Mean (M) and standard deviation (SD) of PS, SS and ASC in T1 and T2 with respect to ethnicity*

| n=837 | T1 | | | | | | T2 | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | PS | | SS | | ASC | | PS | | SS | | ASC | |
| Ethnicity | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| Black | 2.44 | 1.21 | 3.70 | .66 | 2.93 | .83 | 2.74 | 1.13 | 3.71 | .60 | 2.88 | .87 |
| Coloured | 2.72 | 1.23 | 3.52 | .85 | 3.18 | .84 | 2.73 | 1.16 | 3.40 | .87 | 2.97 | .84 |
| White | 2.71 | 1.20 | 3.36 | 1.01 | 3.00 | 1.04 | 3.07 | .92 | 3.79 | .58 | 2.93 | .73 |
| Indian | 1.00 | . | 4.00 | . | 2.00 | . | 2.00 | . | 4.00 | . | 3.00 | . |
| Mix | 2.72 | 1.22 | 3.59 | .77 | 2.95 | .80 | 2.97 | 1.15 | 3.55 | .66 | 2.83 | .70 |
| Other | 2.50 | 1.05 | 4.00 | .00 | 3.17 | .75 | 3.17 | 1.17 | 3.50 | .84 | 3.17 | .75 |

*Mean (M) and standard deviation (SD) of PS, SS and ASC in T1 and T2 with respect to SES*

| n=852 | T1 | | | | | | T2 | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | PS | | SS | | ASC | | PS | | SS | | ASC | |
| SES | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* | *M* | *SD* |
| 10-20 | 2.57 | 1.27 | 3.71 | .54 | 2.86 | 1.00 | 2.55 | 1.21 | 3.69 | .58 | 2.98 | .91 |
| 21-30 | 2.48 | 1.21 | 3.68 | .67 | 2.96 | .87 | 2.76 | 1.13 | 3.61 | .71 | 2.90 | .83 |
| 31-40 | 2.55 | 1.22 | 3.62 | .76 | 3.04 | .79 | 2.76 | 1.13 | 3.65 | .68 | 2.88 | .84 |
| 41-50 | 2.62 | 1.20 | 3.68 | .69 | 2.90 | .84 | 2.93 | 1.16 | 3.57 | .72 | 2.94 | .87 |
| >50 | 3.00 | . | 3.00 | . | 4.00 | . | 2.00 | . | 3.00 | . | 2.00 | . |

# Appendix 5: Q-Q plot and Tukey Anscombe plot of PS, SS and ASC

**Normal P-P Plot of Regression Standardized Residual**
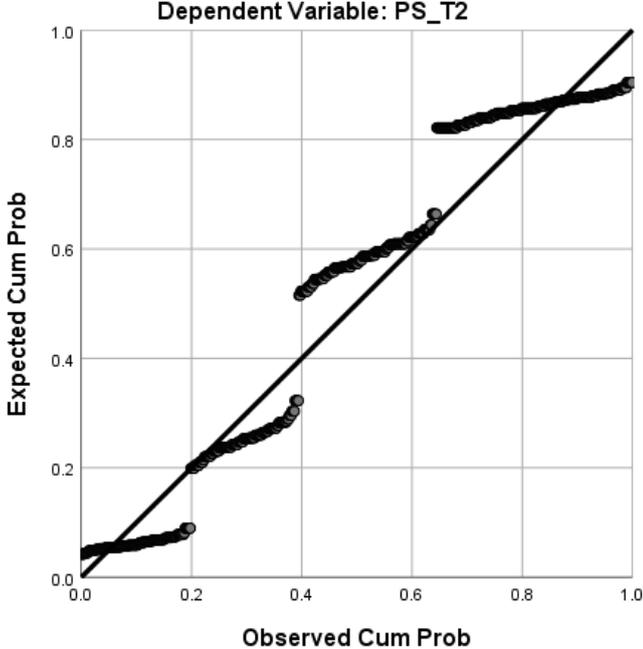
Dependent Variable: PS_T2



**Scatterplot**

Dependent Variable: PS_T2
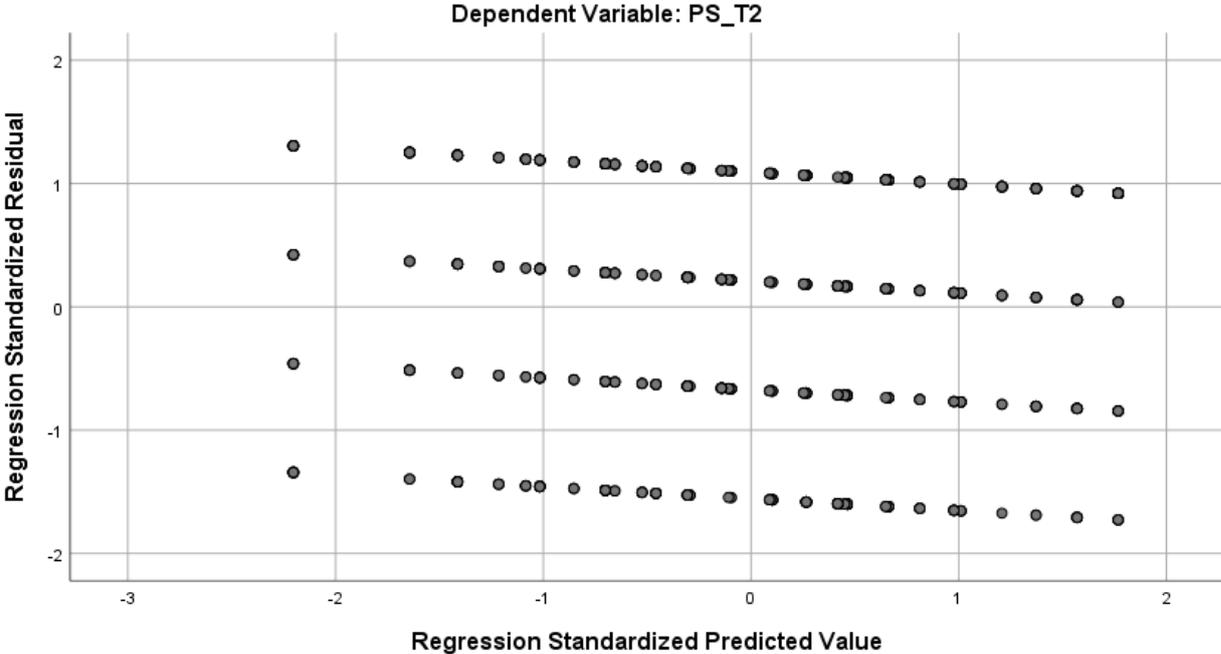
## Normal P-P Plot of Regression Standardized Residual

### Dependent Variable: SS_T2
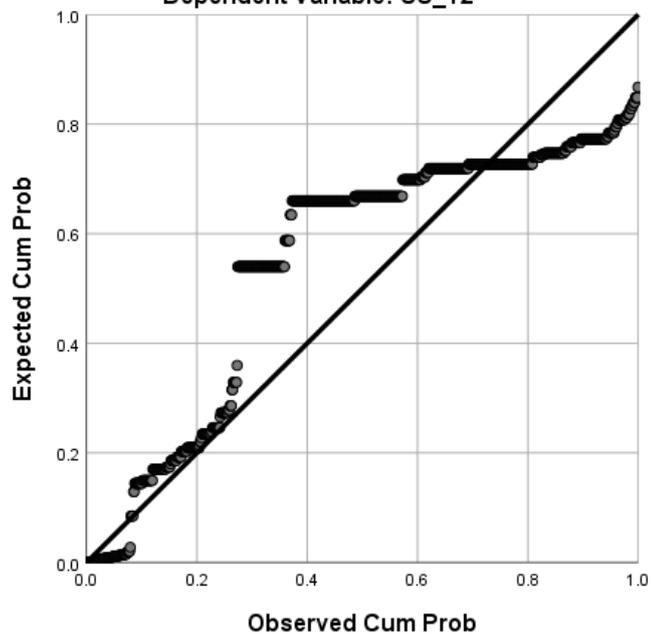


## Scatterplot

### Dependent Variable: SS_T2

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: ASC_T2



Scatterplot

Dependent Variable: ASC_T2
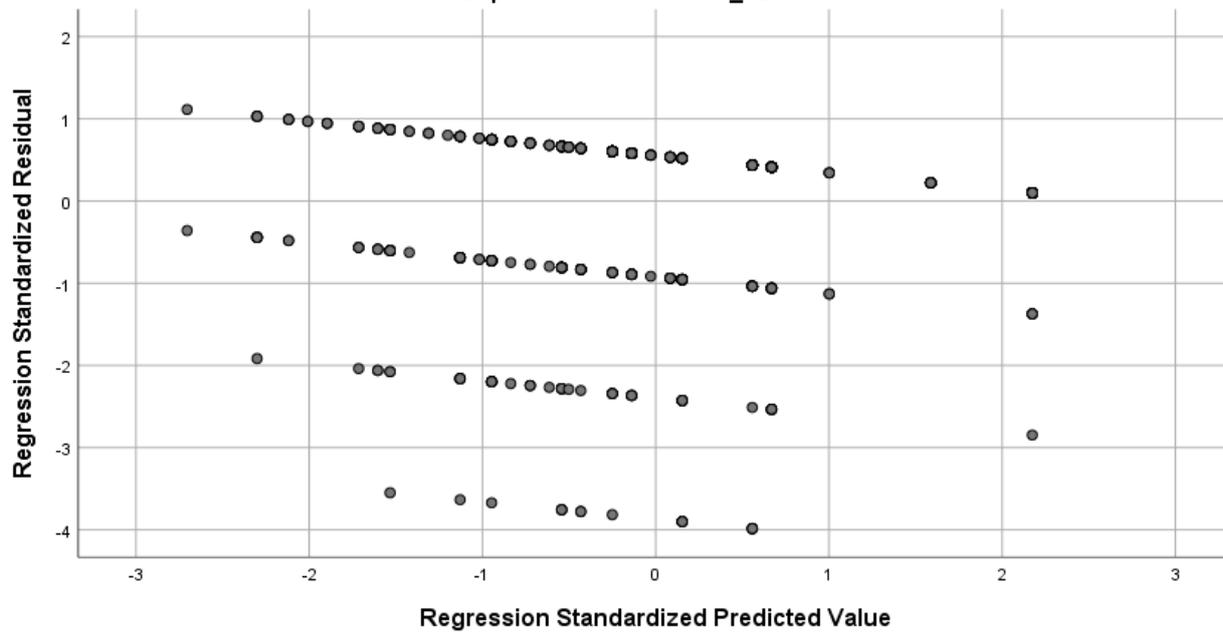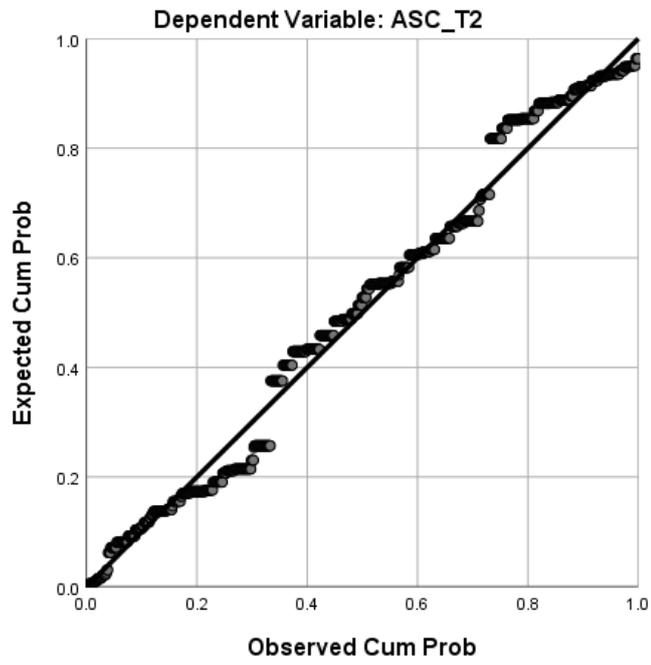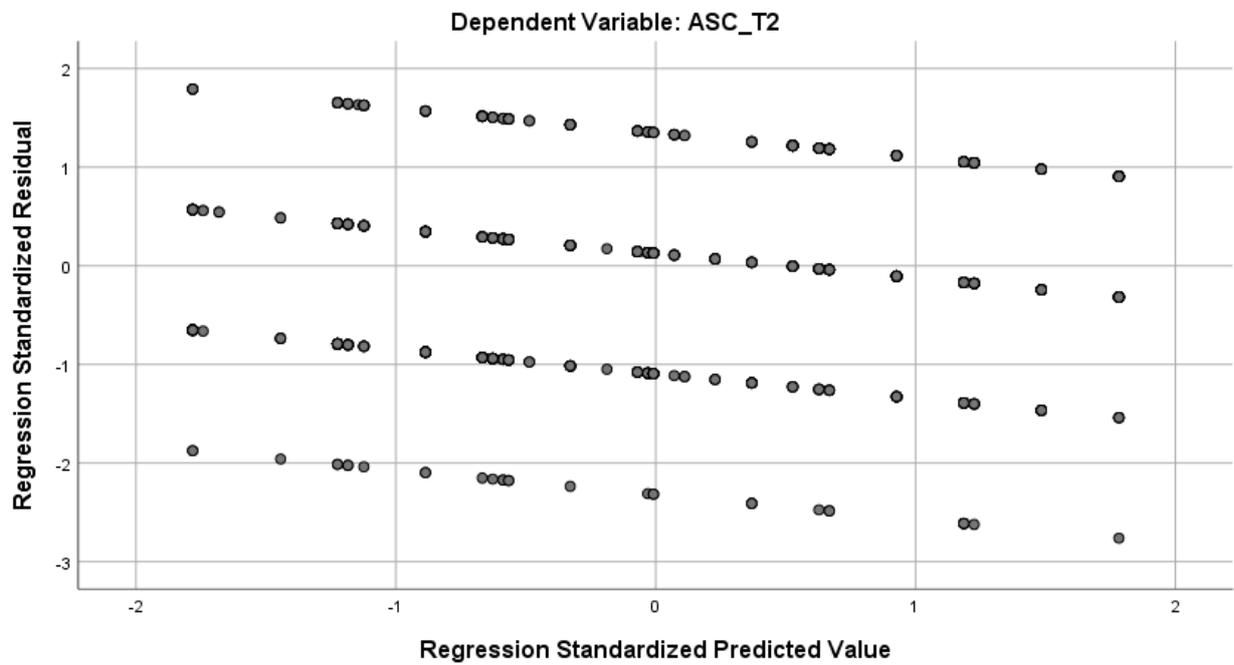
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Date:                                                    Signature:

20th April 2020

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20th April 2020

# *KaziBantu:* «Perceived stress, school satisfaction and academic self-concept before and after a physical activity intervention among 4th – 6th grade primary schoolchildren in marginalized neighbourhoods of Port Elizabeth, South Africa»

NELSON MANDELA UNIVERSITY — University of Basel — DSBG UNIVERSITÄT BASEL Departement für Sport, Bewegung und Gesundheit — Swiss TPH Swiss Tropical and Public Health Institute / Schweizerisches Tropen- und Public Health-Institut / Institut Tropical et de Santé Publique Suisse / Associated Institute of the University of Basel — Province of the EASTERN CAPE EDUCATION — Province of the EASTERN CAPE HEALTH — United Nations Educational, Scientific and Cultural Organization · UNESCO Chair on Physical Activity and Health in Educational Settings, University of Basel, Basel, Switzerland

## Background and Research Questions

Mental health problems and the trend towards a sedentary lifestyle are core health challenges of the 21st century[1]. Results of various studies draw conclusions about the benefits in mental health due to physical activity (PA), recommending exercise as an additional form in keeping the mind fit, or even treating mental illness[2]. Researchers also agree that the responsible mechanisms for this relationship are complex and represent a combination of different fields of study: biology, psychology, chemistry and others[3]. Through qualitative and descriptive research, results can shed light on the matter[4]. The holistic approach of this study measures psychosocial wellbeing of the individual schoolchildren with the parameters perceived stress (PS), school satisfaction (SS) and academic self-concept (ASC).

The main goal of the project is to support the health of children and for them to grow into a healthy nation, independent of their socioeconomic status (SES).

### Research Questions:

- How does the PA intervention affect PS, SS and ASC compared to the control group among primary schoolchildren in marginalized neighbourhoods of Port Elizabeth, South Africa?
- Do the co-variables age, gender, home language, ethnicity and SES show an effect on PS, SS and ASC before and after the PA intervention?

## Aim

The study aims to assess the correlation between self-reported mental health (PS, SS and ASC) and the PA intervention with primary schoolchildren, based on data from a cross-sectional survey conducted in baseline testing (T1) and follow-up testing (T2) in Port Elizabeth, South Africa. Interactions of the three parameters with age, gender, home language, ethnicity and SES are analysed.
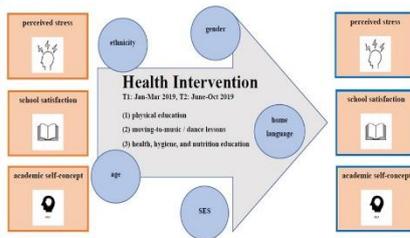


## Research Hypotheses

Following hypotheses were investigated:

- PS is lower after PA intervention
- SS and ASC is higher after PA intervention
- Age, gender, home language, ethnicity and SES have a potential impact on PS, SS and ASC

## Methods

- The *KaziBantu* study is a randomized controlled trial. This study is based on cross-sectional data collected during baseline and follow-up assessment (T1 and T2)
- All methods are proofed and consistent with the Declaration of Helsinki
- The *KaziBantu* study was approved by EKNZ, NMU REC-H, ECDoH and ECDoE
- Participation was based on voluntary agreement with written consent from the parent/guardian

**Baseline Assessment T1: Jan – Mar 2019**
**Follow-Up Assessment T2: Jul – Oct 2019**

| 8 Primary Schools | 4 Northern Area & 4 Township Area Schools Port Elizabeth, South Africa |
| 852 children | 4th to 6th grade (9 to 16 years old) |

### Measuring Instruments

| Questionnaires | Survey on schoolchildren's physical fitness and psychosocial health in Port Elizabeth, South Africa (T1 and T2) |
| Psychosocial Health | PS, SS and ASC in self-reported answers |

## Results

On average, schoolchildren independent of the school group (control or intervention) reported significant higher values in perceived stress (+0.22; p=0.038) and negligible lower values in school satisfaction (−0.02; p=0.002) and academic self-concept (−0.09; p=0.001) in follow-up testing compared to the baseline testing. An overall decrease of the psychosocial wellbeing can be suggested. However, scores decreased less in learners of intervention schools compared to control school without intervention. Age, gender and socioeconomic status did not have an influence, whereas home language (mean difference: −0.07; 95% CI: −0.11 to −0.04; p<0.001) and ethnicity (mean difference: −0.10; 95% CI: −0.14 to −0.07; p<0.001) correlated negatively with school satisfaction.

*n* = 852

|  | T1 | | | | T2 | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Control | | Intervention | | Control | | Intervention | |
|  | M | SD | M | SD | M | SD | M | SD |
| PS | 2.55 | 1.20 | 2.52 | 1.24 | 2.83 | 1.08 | 2.70 | 1.18 |
| SS | 3.60 | .76 | 3.70 | .68 | 3.57 | .70 | 3.68 | .68 |
| ASC | 2.88 | .82 | 3.10 | .85 | 2.76 | .82 | 3.04 | .84 |

Table 1. PS, SS and ASC in control and intervention schools (T1 and T2)
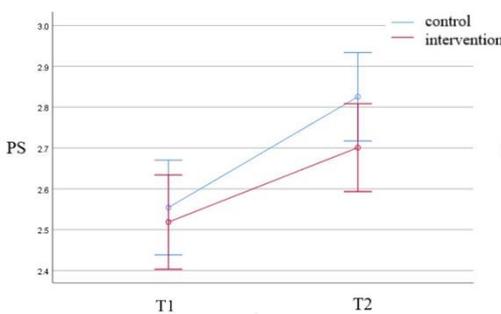


Figure 1. PS in control and intervention schools (T1 and T2)
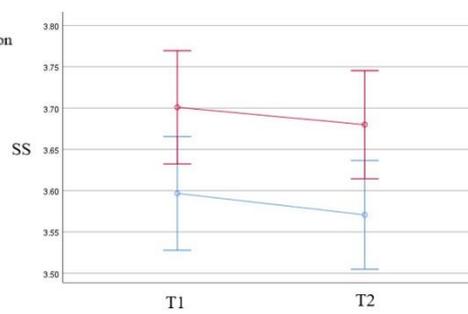


Figure 2. SS in control and intervention schools (T1 and T2)
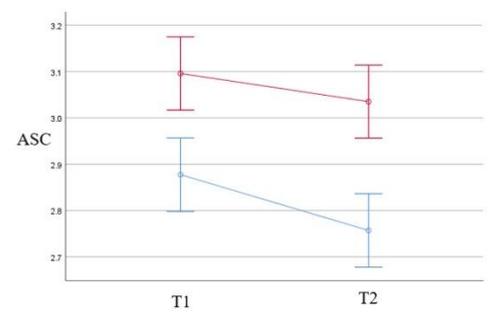


Figure 3. ASC in control and intervention schools (T1 and T2)

## Conclusion and Outlook

An overall decrease of the psychosocial wellbeing was detected after the intervention period. However, school children which experienced regular physical activity interventions reported fewer decreasing results than school children without intervention. This might be attributable to the beneficial effects of physical activity on mental health. Therefore, a more physically active schooling environment is recommended to improve far-reaching health aspects of young learners in disadvantaged primary schools in South Africa.

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