The effect of HOPSports Brain Breaks® on physical fitness and attitudes towards physical activity on Grade 6-learners

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CONTRIBUTION OF AUTHORS

This dissertation is written in article format and was implemented by three authors. The contribution and the role of each author are represented in the table below.

Name and surname of author	The role of the author in the study
Mrs. Jacqueline Bonnema (JB) (M.A. Kinderkinetics)	All three authors were responsible to complete this study and to collect data. JB is the first author, DC the second author and AL the third author in both articles.
Prof. Dané Coetzee (DC) (PhD. Human Movement Science)	DC was the supervisor and was responsible for all aspects of this study with the help of JB. DC contributed significantly with the write of the articles.
Dr. Anita Lennox (AL) (PhD. Human Movement Science)	AL was the assistant supervisor and contributed significantly to the write of the articles.

Affirmation by supervisor and assistant supervisor

I declare that the articles above have been approved and my role in the study as set out above is correct and reflects my part in the study. I further authorise that the articles, as part of the dissertation of Mrs. Jackie Bonnema, may be published.

Prof. Dané Coetzee

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PREFACE

I would like to express my sincere gratitude towards each person who contributed to the study:

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SUMMARY

The effect of HOPSports Brain Breaks® on physical fitness and attitudes towards physical activity on Grade 6-learners

Various researchers have reported that negative attitudes towards physical activity (PA) influence the PA levels of children, and whether or not they will be physically active. Moreover, several researches have been conducted which indicate that children's PA levels have the propensity to decline between the ages of 12- to 15-years. Research has subsequently confirmed the positive relationship that exists between inactivity and obesity and how it negatively impacts the development of children's physical skills.

The aim of this study was firstly to determine the effect of a three month HOPSports Brain Breaks® intervention programme on the attitudes of Grade 6-learners towards physical activity and fitness; and secondly to determine whether a three month HOPSports Brain Breaks® intervention programme will increase the physical fitness levels of Grade 6-learners.

To determine the first objective of the study, the Attitudes towards Physical Activity Scale (APAS) questionnaire was used. A total of 114 children (aged 11 to 12 years) participated in this study, whereas 75 children (44 boys and 31 girls) was part of the experimental group and 39 children (12 boys and 27 girls) in the control group. The mean age for the experimental group was 11.4 years (±0.54) and for the control group 11.71 years (± 0.49). The second objective was determined by the EUROFIT test battery and included 122 participants where 79 children (26 boys, 47 girls) were part of the experimental group with a mean age of 11.85 (±0.38), and 47 children (16 boys, 33 girls) in the control group with a mean age of 12.02 years (±0.31). The mean age for the total group was 11.92 years (±0.36).

SPSS for Windows (2016) was used to process the data of this study. An independent t-test was conducted to determine the differences between the two groups' attitudes towards physical activity and fitness, as well as to determine whether their physical fitness levels had improved. Secondly, paired-samples t-tests were used to determine the difference between each group's

pre- and post-tests, whereas the two-way frequency table was used to compare the two groups' classification of the EUROFIT.

The results of the study indicate that there is a statistical and practical significant difference between the experimental and the control group's attitudes towards physical activity; the experimental group reported improvements in their attitudes. The experimental group demonstrated statistically ($p \leq 0.001$) and practically significant ($d \geq 0.2$) improvements for six of the seven sections of the APAS questionnaire where section three only indicated practical significance difference. The results further indicate that the experimental group's physical fitness skills reported statistically and practically significant differences when compared to the control group. The experimental group indicated statistically ($p \leq 0.001$) and practically ($d \geq 0.2$) improvements for all the physical fitness components of the EUROFIT test as well as improvements in their classifications of the EUROFIT.

It is clear from the above results that the HOPSports Brain Breaks® intervention programme could contribute to improve children's attitudes towards physical activity as well as to improve their physical fitness skills and activity. Herewith it is recommended to incorporate this programme during class times and PE classes to address the problem of inactivity and the decline in 12-year-old children.

Keywords: Children; physical activity levels; barriers to physical activity; physical fitness; Brain Breaks; EUROFIT; intervention programmes.

OPSOMMING

Die effek van HOPSport Brain Breaks® op fisieke fiksheid en houding teenoor fisiese aktiwiteit van Graad 6-leerders

'n Verskeidenheid navorsers het reeds gerapporteer dat negatiewe houdings teenoor fisieke aktiwiteit die fisieke aktiwiteitsvlakke van kinders beïnvloed en dus bepaal of hulle fisies aktief sal wees al dan nie. Verskeie navorsingstudies is al uitgevoer en toon aan dat die fisieke aktiwiteitsvlak van kinders neig om af te neem tussen die ouderdomme 12 tot 15 jaar. Hiermee bevestig die navorsing die positiewe verband tussen onaktiwiteit en obesiteit en toon aan hoe dit 'n negatiewe invloed het op die ontwikkeling van kinders se fisiese vaardighede.

Die doelwitte van hierdie studie was eerstens om vas te stel wat die uitwerking van 'n drie maande HOPSports Brain Breaks® intervensieprogram op die houdings van Graad 6-leerders teenoor fisieke aktiwiteit en fiksheid sal wees, en tweedens om te bepaal of 'n drie maande HOPSports Brain Breaks® intervensieprogram 'n toename in die fisieke fiksheidsvlakke van Graad 6-leerders sal bewerkstellig.

Om die eerste doelstelling van die studie te bepaal het, is die *Attitudes towards Physcial Activity Scale (APAS)* vraelys aangewend. 'n Totaal van 114 kinders, 11 tot 12 jaar oud, het aan die studie deelgeneem; 75 kinders (44 seuns en 31 dogters) het die eksperimentelegroep verteenwoordig, terwyl 39 kinders (12 seuns en 27 dogters) die kontrolegroep verteenwoordig het. Die gemiddelde ouderdom van die eksperimentelegroep was 11.4 jaar (±0.54) en van die kontrolegroep 11.71 jaar (±0.49). Die tweede doelwit was deur die EUROFIT toetsbattery bepaal en het 122 deelnemers ingesluit, waarvan 73 kinders (26 seuns en 47 dogters) die eksperimentelegroep verteenwoordig het en 49 kinders (16 seuns en 33 dogters) die kontrolegroep. Die gemiddelde ouderdom van die eksperimentelegroep was 11.85 jaar (±0.38), en die kontrolegroep 12.02 jaar (±0.36).

SPSS vir Windows (2016) is gebruik om die data vir hierdie studie te prosesseer. ’n Onafhanklike t-toets is uitgevoer om die verskille tussen die twee groepe se houdings vas te stel teenoor fisieke aktiwiteit, asook om vas te stel of hulle fiksheidvlak verbeter het. Tweedens is ’n afhanklike t-toets gebruik om die verskil tussen die voor en na-toetse van elke groep te bepaal, terwyl die tweerigting frekwensietabel gebruik is om die twee groepe se klassifikasie in die EUROFIT te bepaal.

Die resultate van die studie het getoon dat daar statistiese sowel as praktiese betekenisvolle verskille tussen die eksperimentele en die kontrolegroepe se houdings teenoor fisieke aktiwiteit voorgekom het; waar die eksperimentelegroep verbeter het ten opsigte van hul houdings. Die eksperimentelegroep het statistiese ($p \leq 0.001$) sowel as praktiese betekenisvolle ($d \geq 0.2$) verbeterings getoon vir ses van die sewe afdelings van die *APAS* vraelys, waar afdeling drie alleenlik ’n praktiese betekenisvolle verskil getoon het. Die resultate dui verder aan dat die eksperimentelegroep se fisieke fiksheidvaardighede statiese en praktiese betekenisvolle verskille toon wanneer hulle vergelyk word met die kontrolegroep. Die eksperimentelegroep het statistiese ($p \leq 0.001$) sowel as praktiese ($d \geq 0.2$) betekenisvolle verbeterings aangedui vir al die EUROFIT komponente sowel as verbeterings in hulle klassifikasies van die EUROFIT.

Die gevolgtrekking kan vanuit die resultate gemaak word dat die HOPSports Brain Breaks® intervensieprogram daartoe bydra om kinders se houdings teenoor fisieke aktiwiteit te verbeter, asook om hulle fisieke fiksheidsvaardighede en aktiwiteit te verbeter. Gevolglik beveel die studie aan dat die program tydens klastye en Fisiese Aktiwiteitsperiodes inkorporeer word ten einde die probleem van fisiese onaktiwiteit en die toename daarvan by 12-jaar-oud leerlinge aan te spreek.

Sleutelwoorde: Kinders; fisieke aktiwiteitsvlakke; belemmering tot fisieke aktiwiteit; fisieke fiksheid; Brain Breaks; EUROFIT; intervensieprogramme

TABLE OF CONTENT

LIST OF ABBREVIATIONS

ACSM	American College of Sport Medicine
AHKA	Active Healthy Kids Australia
APAS	Attitude toward Physical Activity Scale
BMI	Body mass index
CAPS	Curriculum and Assessment Policy Statement
CDC	Centre of Disease Control
CG	Control group
d	Practical significance
DBE	Department of Basic Education
DDR®	Dance Dance Revolution
DF	Degrees of freedom
E.G.	For example
EG	Experimental group
EUROFIT	European test of physical fitness
HAKSA	Healthy Active Kids South Africa
HBSC	Health Behaviour of School Children
m	Mean
METS	Metabolic equivalent tasks
n	Number
p	Statistical significance
PA	Physical activity
PE	Physical education
PoT	Post-test
PrT	Pre-test
PYFP	Presidential Youth Fitness Program
reps	Repetitions
SD	Standard deviation

LIST OF ABBREVIATIONS

SES	Socio-economic status
t	t-value
UK	United Kingdom
USA	United States of America
WHO	World Health Organisation
YPAP	Youth Physical Activity Promotion
YRBS	Youth Risk Behaviour Survey

LIST OF TABLES

CHAPTER 4

ARTICLE 2: THE EFFECT OF A THREE MONTH HOPSPORTS BRAIN BREAKS® INTERVENTION PROGRAM ON THE PHYSICAL FITNESS LEVELS OF GRADE 6-LEARNERS.

LIST OF FIGURES

CHAPTER 4

ARTICLE 2: THE EFFECT OF A THREE MONTH HOPSPORTS BRAIN BREAKS® INTERVENTION PROGRAM ON THE PHYSICAL FITNESS LEVELS OF GRADE 6-LEARNERS.

CHAPTER 1

CHAPTER 1
INTRODUCTION

1.1. INTRODUCTION

HOPSports Brain Breaks® is an online video programme, based on physical activity (PA). The mission of this programme is to improve the next generation into a healthier one by combining fitness, fun, learning and entertainment through movement (HOPSports, 2017). The programme uses technology in the form of videos to encourage children to participate in video exercises that are fun and not to just play video games. The content of the various two to five minute videos includes arts (dance and music), fitness skills (cardio and functional fitness), sports (skillastics, cycling, rowing), education (health issues, nutrition and hygiene) and classroom activities (fun fitness, dynamic Physical Education) (Brain-Breaks, 2017). Each video has a character who is a real or animated instructor to demonstrate the different exercises which improve children's motor and physical skills (Tumynaitė *et al.*, 2014:60; McNees, 2012:10; HOPSport, 2017). This programme was designed to capture the children's imagination and to improve their PA levels (Brain-Breaks, 2017). A global problem exists with regard to the decline in children's PA levels (Belton *et al*., 2014:123; Robbins *et al.*, 2014:21; Lindelof *et al.*, 2012:119; Okely *et al.*, 2004:245) which leads to the rising trends of obesity amongst children (McNees, 2012:6).

1.2. PROBLEM STATEMENT

The prevalence of childhood obesity has increased drastically over the past few years (Gao *et al*., 2015:349; Tumynaitė *et al*., 2014:58; Janse van Rensburg *et al.*, 2013:249) owing to increasingly low levels of PA. Recently, the World Health Organisation (WHO, 2017) showed that inactivity has been identified as the fourth leading risk factor for mortality in the general population (WHO, 2017). In addition, Martin *et al.* (2015:47) and Finn and McInnis (2014:235) state that sedentary activities (e.g. screen-based activities, video games and mobile phones) have increased among children, which results in less time for being physically active. This is supported with a study done by Monyeki (2014:323) regarding the PA and health of children from South Africa.

PA can be described as a movement produced by the musculoskeletal system (WHO, 2017), or

any bodily movement produced by muscle action, that results in energy expenditure (Powers & Howley, 2007:321). According to Ortega *et al.* (2008:1), physical fitness (agility, flexibility, strength and endurance) can be referred to as the ability to perform physical activities independently and can be seen as a result of PA (Corbin *et al*., 2014:26; Tumynaitė *et al*., 2014:57). PA can also be seen as different types of activities that form part of daily activities, for example playing outside, dancing and doing chores. In comparison, sedentary activities refer to time spent on activities such as watching television, with no increase in energy expenditure (Monyeki, 2014:326) or when not meeting the recommended guidelines for PA (Amusa *et al.,* 2012:993).

Recently, several authors (Gao *et al.,* 2015:349; Tucker *et al.,* 2014:1006; Lennox & Pienaar, 2013:155; Janssen & LeBlanc, 2010:41; WHO, 2017) have concluded that children and adolescents should do at least 60 minutes of moderate activity. Additionally, Amusa *et al.* (2012:995) and Janssen and LeBlanc (2010:41) recommend an extra 20 to 30 minutes of vigorous activity. Furthermore, not more than two hours per day screening time/non-active time is recommended. In this regard the WHO (2017) recommends that children aged five- to 17-years must include muscle and bone strengthening activities three times per week.

The problem stated by Monyeki (2014:330) is that more than 60% of the world's population fail to comply with the international recommendations of being physically active. Gao *et al.* (2015:349) agree with Monyeki (2014:330), and indicate that only 42% of American children between the ages of six- and 11-years participate in moderate PA.

The Healthy Active Kids South Africa (HAKSA) report card studies the current health status in children. South African children were graded with a D (21% - 40%) for their overall PA levels in 2014; however, in 2016 the overall PA improved to a C-grading (41% - 60%) (Uys *et al.*, 2016a:268; HAKSA, 2014:12). Tucker *et al.* (2014:1006) and Warburton (2013:252) indicated that 47.3% of American children spent more than two hours daily watching television in comparison with the 30.8% who spent less than two hours in front of the television daily. The 2016 HAKSA report card indicated that South African children's sedentary behaviour had not improved and was still graded with an F (0% - 20%) (Uys *et al.*, 2016:268; HAKSA, 2014:17). Overall, South Africa regressed from a C-grading in 2010 to a D-grading in 2014. A possible reason for this decline is, as children get older and reach adolescence, their PA levels decline (Belton *et al.*, 2014:123; Robbins *et al.,* 2014:21; Lindelof *et al.,* 2012:119; Okely *et*

al., 2004:245). Moreover, Robbins *et al.* (2014:21) indicate the decrease of PA in boys from 49% (six- to 11-year-olds) to less than 12% as they reach adolescence.

A study by Janse van Rensburg *et al*. (2013:249) shows the value of childhood activity and indicates that an active lifestyle will contribute to better health. Studies by Belton *et al*. (2014:123) and Malina (2012:23) indicate that PA holds important implications for prevention of diseases and promoting lifelong health in children, which will continue through adulthood. In addition, Warburton (2013:251) indicates that regular PA will prevent premature mortality and chronic medical conditions in the later stages of life. Moreover, children with a physically active lifestyle have an attractive appearance, increased self-confidence and a positive attitude towards PA (Amusa *et al*., 2012:996; Ghofrani & Golsanamlou, 2012:21). According to Monyeki (2014:328), sedentary behaviour is considered one of many consequences of inactivity. Further research by Tucker *et al*. (2014:1006) indicates there is a positive relationship between sedentary behaviour and health conditions such as obesity, cancer, coronary heart diseases, diabetes mellitus, and other chronic diseases (Belton *et al.*, 2014:123; Morar *et al.*, 2014:103; Janse van Rensburg *et al.*, 2013:250; Lindelof *et al.*, 2012:113; Killough *et al*., 2010:304). Furthermore, inactivity has been associated with different factors such as lack of physical education (PE) in schools (Monyeki, 2014:335).

In the past, PE played an important role in PA habits as well as in creating positive perceptions towards PA (Gao *et al.*, 2015:349; Cairney *et al*., 2012:26; McNees, 2012:9). According to the Department of Basic Education (DBE, 2011:6), PE contributes to developing an active lifestyle by focusing on the development of perceptual motor skills, sport and games, growth and development, and play. PE further plays an important role to provide opportunities for children to engage in PA and improve physical fitness (Gao *et al*., 2015:349; McNees, 2012:9; De Meij *et al*., 2011:1052; Hansen & Sanders, 2010:33). According to various researchers (Gao *et al*., 2015:349; McNees, 2012:9; Naidoo & Coopoo, 2012:83; De Meij *et al.*, 2011:1052; Fogel *et al*., 2010:592), school-based programmes will be suitable to promote PA, given that school-aged children spend most of their time in school, and they will reach the majority of children from different socio-economic classes.

Monyeki (2014:333) indicates that PE is important because it plays a role in children's confidence, self-esteem and social development. According to the South African Curriculum and Assessment Policy Statement (CAPS), the time allocated to PE for Grade 6-learners is

90 minutes per week (DBE, 2011:7). However, Morar *et al*. (2014:106) indicate that 36.3% of 10- to 13-year-old children do not participate in PE, although it has been indicated on their timetable. Additionally, Monyeki (2014:330) indicates that only 52.8% of children and adolescents aged five to 17 participate in PE. These findings support those of the HAKSA (2014:14) report card which found that PE received a D-grading because the average time children spent in PE classes was between 30 to 40 minutes per week.

Lennox and Pienaar (2013:155) suggest introducing physical activities to children from a young age. The reason for this is to motivate them to continue engaging in PA as well as to ensure good health and to reduce the health risk factors associated with low PA levels. In the last few years, there has been a growing interest in intervention-based programmes to address the problem of physical inactivity. Several researchers (Robbins *et al.,* 2014:22; Naidoo & Coopoo, 2012:78; Fogel *et al.,* 2010:598; Hansen & Sanders, 2010:33; Killough *et al.*, 2010:304; Barnett *et al*., 2008:5; Van Beurden *et al.*, 2003:493) have studied the effect of school-based intervention programmes with the focus on PE, and they have found a good relationship between their programmes and PA. Gao *et al.* (2015:350) studied the comparison between PE, recess and exergaming in 144 six- to eight-year-olds, and they concluded that children showed higher levels of PA during recess and exergaming than in PE. The reason for this was that the teachers were not passionate about PE and that the promotion of PA was not a priority for the teacher (Gao *et al.*, 2015:353).

From the literature, it seems that how to address the improvement of PA is an important issue, but it is of more concern how to motivate the children to continue with PA after intervention programmes has ended (Belton *et al*., 2014:123). De Milander (2011:20) recommended that to improve PA levels and fitness, PE programmes should be revised, as these programmes are inadequate for inactive children with regards to the duration, frequency and intensity of the classes. Some of the limitations that were reported for these studies were financial resources, cost of equipment, space, lack of time or unattractiveness to children (Tumynaitė *et al.*, 2014:64, Hansen & Sanders, 2010:40). According to a study by Eather *et al.* (2013:13) on 228 5^{th} and 6^{th} graders, results indicated that active gaming showed greater improvement in PA than normal PE classes. They suggest that if the quality and instruction of PE improves and the total of time spent on higher intensity increases, the PE classes will have more and better physical benefits. Various researchers (Morar *et al*., 2014:109; Naidoo &

Coopoo, 2012:84; Van Deventer, 2011:834) have concluded that the PE teachers are not trained and do not have the necessary equipment.

Recently, several researchers (Baert, 2014:3; Tumynaitė *et al.*, 2014:58; Gao, 2013:3; Fogel *et al.*, 2010:592) have proposed the benefits of incorporating technology with PA. Tumynaitė *et al.* (2014:58) state that children are open for new gaming inventions such as DVD, games or television. Exergaming intervention has been designed to use the effect of video games to increase PA (Adkins *et al.*, 2013:576; Best, 2013:72; Gao, 2013:3; Fogel *et al.*, 2010:592). Data of four Grade 5-learners from South Florida indicated that exergaming increased the time they were physically active (Fogel *et al.*, 2010:598). These results indicate that factors like waiting your turn, instructions and class management take up time when learners should be physically active, which is not the case with exergaming; subsequently more time is available to participate in the activity (Fogel *et al.*, 2010:598). In a study done in Nebraska, 88 participants aged seven- to 10-years, participated in a seven week exergaming intervention programme before school started. The results showed that the exergaming intervention programme made no differences in the total daily sedentary time or moderate PA time. The reason for this could be that the children compensated for the increased PA before school by being more sedentary during the rest of the day (Adkins *et al.*, 2013:584). According to Gao's (2013:3) study, 46 4th graders from United States of America (USA) who participated in a nine month exergaming intervention programme during school showed an increase in PA in comparison to the 61 5th graders who did not participate in any other structured exercise programme.

Tumynaitė *et al.* (2014:58) studied the effect of a three month HOPSports Brain Breaks® intervention programme on 113 Grade 1 to Grade 4 learners (aged seven- to 10-year-old) from Lithuania. They performed physical fitness tests before and after the intervention programme to determine the effect of the intervention programme on the children's fitness levels. The sedentary behaviour was tested with the Health Behaviour of School Children (HBSC) questionnaire. This research showed that the children's sedentary behaviour was reduced after completing/participating in this HOPSports Brain Breaks® intervention. They further concluded that this intervention was unique for it addressed all the factors associated with PA (motivation, knowledge and perceptions of PA as well as self-motivation to be physically active) (Tumynaitė *et al.*, 2014:58). West and Shores (2007:6) found that children who participated in HOPSports Brain Breaks® programmes achieved more moderate to

vigorous PA than normal PE lessons. A study conducted on 8 000 children from North Carolina investigated the effect of HOPSports Brain Breaks® programme (Stradley, 2010). The results indicated that children's sedentary behaviour was less when they participated in HOPSports Brain Breaks®. These researchers also indicated that the girls, overweight and obese children's moderate to vigorous PA was higher and that the HOPSports Brain Breaks® used time more efficiently than during PE lessons (Stradley, 2010). A study conducted by Emeljanovas *et al.* (2014:331) on 181 learners (Grade 1 to Grade 4) from Kaunas, Lithuania, determined the effect of HOPSports Brain Breaks® on children's attitudes towards and perceptions of PA. The results reported improvements of attitudes towards and perceptions of PA after a three month intervention programme in comparison to the control group who reported lower scores.

Recently, Uzunoz *et al.* (2017:2) studied 300 Grade 3 to Grade 5 learners from Turkey and investigated the effect of a four month HOPSports Brain Breaks® programme. It was expected from the experimental and the control groups to complete the Attitudes towards Physical Activity Scale (APAS) questionnaire. The results indicated that there was a significant improvement in the experimental group's perception, attitude and motivation to be physically active, as well as better academic performance when compared to the control group (Uzunoz *et al.,* 2017:2). Furthermore, HOPSports Brain Breaks® intervention programme is a cost-effective, user friendly and fun but effective way to address the above-mentioned problems.

Various questionnaires have been compiled to evaluate children's attitudes and self-perception towards PA (Mok *et al.*, 2015:380; Lindwall *et al*., 2014:553; Bryan & Solmon, 2012:271; Ghofrani & Golsanamlou, 2012:23) and how these perceptions and attitudes influence their participation in PA (Belton *et al.,* 2014:131; Ghofrani & Golsanamlou, 2012:22). Fairclough *et al*. (2012:101) and Niven *et al*. (2007:473) are of the opinion that self-perception contributes to a person's self-esteem and correlates with PA, whereas attitudes can be described as a way of thinking or feeling towards PA. It is clear from Belton *et al.* (2014:132) study that if mid- to late-adolescents does not have a positive attitude or perception towards PA; they will not choose an active lifestyle when they are given the opportunity to decide. Belton *et al.* (2014:132) and Tsang *et al.* (2013:44) found a significant difference between the attitudes of low and moderate levels of PA, and indicated that low levels of PA were associated with low perceptions of PA as well as a negative attitude towards PA.

Belton *et al.* (2014:132) and Lindelof *et al.* (2012:113) report that barriers (lack of time, distance, lack of interest and body-related factors) prevent children from being active; these barriers have an effect on children's attitudes and perceptions and will determine whether they will be physically active or not (Shirinde *et al.*, 2012:230). Finn and McInnis (2014:235) indicate that children's attitudes and perceptions towards PA are influenced by factors such as previous PA experiences as well as their motor abilities. It is important to determine what prevents and motivates children to be physically active (Belton *et al.*, 2014:123). Positive attitudes towards PA are linked with enjoyment, motivation, success and good performance (Mok *et al*., 2015:395; Bryan & Solmon, 2012:281; Cairney *et al.*, 2012:27; Ghofrani & Golsanamlou, 2012:22).

From the literature, it is clear that PA is important to improve physical fitness and the children's attitude towards these activities. Quite extensive research has been conducted on the effect of different PA and fitness interventions, but there has been limited research regarding the effect of technology-based intervention programmes like the HOPSports Brain Breaks®. No research could be found on the South African population in this regard. With this in mind, the following research questions were formulated: a) What are the effects of a three month technology-based (HOPSports Brain Breaks®) intervention programme on the attitude of Grade 6-learners towards PA?; and b) Will a three month technology-based (HOPSports Brain Breaks®) intervention programme increase the physical fitness levels of Grade 6-learners? Answers to these questions may create a stronger awareness among Kinderkineticists, Physical Educational teachers, coaches, movement scientists and other health workers of the possible effect of the HOPSports Brain Breaks® intervention programme on PA and fitness levels as well as the attitude towards PA.

1.3. OBJECTIVES

The objectives of this study were:

1.3.1 To determine whether the participation in a three month HOPSports Brain Breaks® intervention programme will improve the attitudes of Grade 6-learners towards PA and fitness; and

1.3.2 To determine whether participation in a three month HOPSports Brain Breaks® intervention programme will increase the physical fitness levels of Grade 6-learners.

1.4. HYPOTHESES

This study is based on the following hypotheses:

H^1 A three month HOPSports Brain Breaks® intervention programme will improve Grade 6-learners' attitude towards PA and fitness.

H^2 A three month HOPSports Brain Breaks® intervention programme will increase the physical fitness levels of Grade 6-learners.

1.5. PROPOSED CHAPTERS

This dissertation is presented in article format. The outline of the dissertation will be as follows:

1.5.1 Chapter 1 comprises the introduction, problem statement and objectives of the study. The new Harvard guidelines as proposed by the North-West University were used for the references and will follow directly after Chapter 1.

1.5.2 Chapter 2 comprises a literature overview on the effect of Brain Breaks on physical fitness and attitudes towards PA of Grade 6-learners. The references are according to the new Harvard guidelines as proposed by the North-West University and follow directly after Chapter 2. Subsequently, an overview discussion on the PA levels, factors influencing PA and fitness as well as the effect of attitudes towards PA will be provided. Additionally, various school- and technology-based intervention programmes will be discuss to indicate the effect it has on PA levels and physical fitness.

1.5.3 Chapter 3 is presented in article format, with the title: *The effect of a three month HOPSports Brain Breaks® intervention programme on the attitudes of Grade 6-learners towards PA and fitness*. This article will be presented for publication to the *Journal of mental health & physical activity* and is written according to the guidelines of this journal. The author guidelines of this journal are placed in Annexures E. Some amendments were made to the journal's guidelines for uniformity of the dissertation. The line spacing, headings numbering, alignment of the articles where

altered, as well as the tables were placed inside the text and not at the end of the article. These amendments help with the readability of the dissertation and correspond with the rest of the dissertation.

1.5.4 Chapter 4 is also in article format with the title: *The effect of a three month HOPSports Brain Breaks® intervention programme on the physical fitness levels of Grade 6-learners.* This article will be presented for publication to the *Journal of applied developmental psychology* and is written according to the guidelines of this journal. These author guidelines are placed in Annexure F. Some amendments were made for uniformity to correspond with the rest of the dissertation and include: alignment, line spacing, headings numbering as well the tables and figures are place in the text and not at the end as indicated by the guidelines. These amendments help with the readability and uniformity of the dissertation.

1.5.5 Chapter 5 includes the summary, conclusion and recommendations of the study.

1.5.6 The European Test of Physical Fitness (EUROFIT) and the Attitude toward Physical Activity Scale (APAS) were used for data collection. The APAS questionnaire is in Annexure C. The parents' informed consent forms are placed in Annexures A and the children's informed consent forms in Annexure B. The EUROFIT is copyright-protected and therefore not placed in the Annexures.

Subsequently Chapter 2 will provide an overview discussion of the effect of Brain Breaks on physical fitness and attitudes towards physical activities of Grade 6-learners.

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CHAPTER 2

CHAPTER 2
LITERATURE REVIEW: THE EFFECT OF HOPSPORTS BRAIN BREAKS® ON PHYSICAL FITNESS AND ATTITUDES TOWARDS PHYSICAL ACTIVITY OF GRADE 6-LEARNERS.

2.1 INTRODUCTION

Several barriers prevent children from being active, and these barriers have an effect on their attitudes and perceptions that will determine whether they will be physically active or not (Belton *et al.*, 2014:132; Lindelof *et al.*, 2012:113; Shirinde *et al*., 2012:230). Finn and McInnis (2014:235) indicate that children's attitudes and perceptions towards physical activity (PA) are influenced by factors such as previous PA experiences as well as their motor abilities.

The problem exists with regard to the decline in children's PA levels (Belton *et al*., 2014:123; Robbins *et al.*, 2014:21; Lindelof *et al.*, 2012:119; Okely *et al.*, 2004:245) which leads to the rising trends of overweight and obesity amongst children (McNees, 2012:6). Research by Tucker *et al*. (2014:1010) indicates that there is a positive relationship between sedentary behaviour and health conditions such as obesity and cardiovascular disease. Additionally, according to researchers, sedentary behaviour has a negative impact on PA and physical fitness. Truter *et al.* (2010:227) state that obesity and overweight have a negative effect on the physical development of children. Furthermore these researchers concluded that overweight or obese children's physical fitness is negatively affected, especially between the age of nine and 12 years, which in turn leads to a decline in PA (Niven *et al*., 2007:477). The HOPSports Brain Breaks® programme might address this problem to counteract the decline in PA.

HOPSports Brain Breaks® is a web based PA video programme, developed for use in classrooms, Physical Education (PE) classes, before and after school and during break (HOPSports, 2017a) with minimal interruptions and easy transition back to school work (Moving minds, 2017). This programme is an instant resource for educators and can be used to boost children's PA levels, activate students' learning as well as to increase children's test scores (Fitness-gaming, 2015). The mission of this programme is to improve the next generation into a healthier one by combining fitness, fun, learning and entertainment through movement (HOPSports, 2017b). In addition, HOPSports Brain Breaks® use technology to change inactive children to active children

by means of a digital platform which includes physical, mental and nutritional health videos (Mok *et al.,* 2015:396). In this sense, HOPSport Brain Breaks® programme focuses on all the fundamental components such as self-confidence and motivation to be physically active, knowledge about PA and health that contribute to the increase of PA levels (Uzunoz *et al*., 2017:11). Mok *et al.* (2015:396) also conclude that children not only have the opportunity to be active, they will also learn and master new motor skills. In light of the above mentioned aspects, the problem of inactivity in children needs to be addressed. The following paragraph will elucidate the aim of this study.

The purpose of this dissertation is firstly to determine whether the participation in a three month HOPSports Brain Breaks® intervention programme will improve the attitudes of Grade 6-learners towards PA and fitness; and secondly to determine whether participation in a three month HOPSports Brain Breaks® intervention programme will increase the physical fitness levels of Grade 6-learners. With these objectives in mind, it is important to reflect on the findings of the relevant literature. Firstly, the definitions of physical fitness and PA, factors influencing physical fitness and activity, recommendations for PA as well as the effect of physical fitness and PA on overweight and obese children will be discussed. Secondly, the importance of PE in PA development, as well as factors influencing PE, will be discussed. Thirdly, definitions of attitudes towards physical fitness and activity, factors influencing children's attitude as well as the relationship between attitudes and physical fitness and activity, will be discussed. Fourthly, the influence of school-based intervention programmes as well as technology-based intervention programmes on physical fitness, PA and attitude will be discussed. Lastly, this literature review will be concluded with a discussion of the possible relationship between HOPSports Brain Breaks®, physical fitness, PA and attitude.

2.2 PHYSICAL FITNESS AND PHYSICAL ACTIVITY

Physical fitness is an important measure of the performance of PA (Ortega *et al.*, 2008:1), whereas, PA plays an important role in a child's life and contributes to being healthy. The definition of physical fitness and PA will be discussed, followed by physical fitness skills, PA levels, factors influencing PA, recommendations of PA as well as the advantages of physical fitness and activity for overweight and obese children.

2.2.1 Definition of physical fitness and physical activity

Physical fitness can be defined as the ability to execute daily PA independently (Ortega *et al.*, 2008:1) and can be seen as an important dimension of PA (Corbin *et al*., 2014b:26; Tumynaitė *et al*., 2014:57; Malina, 2010:271). Furthermore, the Centre of Disease Control (CDC, 2015) describes physical fitness as the ability to carry out tasks without physical and mental strength or fatigue, as well as to have sufficient energy to perform leisure time activities. Moreover, PA can be described as a movement produced by the musculoskeletal system (World Health Organisation [WHO], 2017), or any bodily movement produced by muscle action, that results in energy expenditure (Powers & Howley, 2007:321). Additionally, the CDC (2015) defines PA as movement of the body that is produced by muscle contraction which results in energy expenditure above the basal level.

2.2.2 Physical fitness skills

Physical fitness is an important indicator for PA and health (Eather *et al.*, 2013:12; Ortega *et al.*, 2008:8), and can be divided into four health-related and six sport-related components, also known as motor- or performance-related fitness (Presidential Youth Fitness Program [PYFP], 2015:1; Pienaar, 2012:28; Gallahue & Ozmun, 2006:244). Health-related fitness involves skills which play an important role in the prevention of chronic diseases as well as functional capacity to perform daily tasks, leisure time activities (American College of Sport Medicine [ACSM], 2015; Plowman & Smith, 2014:11), and participate in sport (Corbin *et al.*, 2014b:29). In addition, health-related fitness can be divided into the following components: body composition, flexibility, muscular strength and endurance, as well as cardiovascular endurance (ACSM, 2013:2). These components will be discussed briefly.

Cardiorespiratory endurance:

Cardiorespiratory endurance is the capability of the circulatory and respiratory systems to transport oxygen to muscle cells during sustained PA (ACSM, 2015; Pienaar, 2012:28), and is an important aspect for health because better cardiovascular endurance leads to an increase in PA as well as decreased risk of death (ACSM, 2011).

Muscular strength and endurance:

Muscular strength refers to the ability of muscles to contract against a resistance, whereas, muscular endurance is the ability to resist fatigue and sustain a muscle contraction against a resistance (Pienaar, 2012:28; Auxter *et al*., 2010:256; Fahey *et al.,* 2006:33). The benefits of muscular strength include prevention of life threatening diseases, enhanced life quality (Fahey *et al.,* 2006:34), strength development, injury reduction as well as increased performance (Gallahue & Ozmun, 2006:250). Furthermore muscular endurance can be explained as the ability to perform more repetitions with a lower load (Gallahue & Ozmun, 2006:247). These components is important for daily activities, play routines and performance in sport, and includes activities such as pull-ups, sit-ups and push-ups (Fahey *et al.,* 2006:34; Gallahue & Ozmun, 2006:247).

Body composition:

Body composition is the percentage of bone, fat and muscles in the body, which is associated with health and fitness (Pate *et al.,* 2012:80). Improvement of body composition leads to decreased risk of cardiovascular diseases, improved bodily function, high blood pressure, some cancers as well as to improved body mass index (BMI) (ACSM, 2015; Pienaar, 2012:28; Auxter *et al.,* 2010:257). Furthermore, Pate *et al.* (2012:80) state that body composition is an attribute that has an effect on a person's ability to perform daily activities and the performance of numerous fitness components.

Flexibility:

Flexibility refers to the range of motion at any given joint and plays an important role in good health and well-being (CDC, 2015; Pienaar, 2012:55; Auxter *et al.,* 2010:257; Fahey *et al.,* 2006:34). Additionally, improving flexibility tends to improve performance (Pienaar, 2012:55; ACSM, 2011) in certain skills, e.g. in dancing (Gallahue & Ozmun, 2006:252). Furthermore, it is important to perform flexibility activities because it increases the ability of a joint to move through the full range of movement (CDC, 2015), is essential to prevent injuries (Gallahue & Ozmun, 2006:252) and improves overall performance, function and fitness (Pate *et al.,* 2012:201).

In comparison to health-related fitness, sport-related fitness is necessary for daily activities, and involves skills which enhance athletic or sport performance (Plowman & Smith, 2014:11; Pienaar, 2012:31; ACSM, 2011). In addition, sport-related fitness consists of the following categories: movement control factors (agility and balance), force production factors (speed, power and coordination) (Gallahue & Ozmun, 2006:256) and reaction time (PYFP, 2015:1). Movement control factors (agility and balance) are especially important during the early childhood years

when children learn to master fundamental movement skills, whereas force production factors (speed, power and coordination) are more important in later childhood years when they enter the specialized movement phase (Gallahue & Ozmun, 2006:256). Improved physical fitness contributes to maintaining health and reduces the risks of various diseases, whereas, when children don't attain adequate motor skills, it will lead to impeded motor fitness accomplishment (Gallahue & Ozmun, 2006:254). Additionally, when children don't have the necessary motor skills, it could contribute to decreased ability to perform daily activities and routines, reduce overall health and increase the risk of developing secondary conditions such as obesity (Auxter *et al.,* 2010:252). Auxter *et al.* (2010:252) is further of the opinion that children with lower motor skills and obesity tend to have negative attitudes towards PA. However, when fitness components such as coordination, agility, balance etcetera form part of daily routine, physical fitness levels continue to improve, which leads to improved health (Auxter *et al.,* 2010:252). The following categories which include speed, agility, balance, power, reaction time as well as coordination will be discussed briefly.

Speed:

Speed can be defined as the capacity to perform bodily movement as fast as possible (Auxter *et al.,* 2010:165; Fahey *et al.,* 2006:34). Speed development is an important skill children from the age of seven should master to move into the specialized movement phase where they start specializing skills to participate in sport and daily activities (Gallahue & Ozmun, 2006:55).

Agility:

Agility is the ability of the body to change direction with the necessary body control and balance (Fahey *et al.,* 2006:34) without decrease in speed and strength (Pienaar, 2012:32).

Balance:

Balance is the ability to control equilibrium in a motionless (static) state or when the body is in motion (dynamic) (ACSM, 2011; Auxter *et al.,* 2010:157; Fahey *et al.,* 2006:34) thus; improving balance reduces the risk of injury and increases participation in PA and mobility (ACSM, 2011).

Power:

Power refers to the ability of muscles to contract and coordinate for maximum performance (Auxter *et al.,* 2010:164; Fahey *et al.,* 2006:34).

CHAPTER 2

Reaction time:

Reaction time is the ability to quickly react on a stimulus (Fahey *et al.,* 2006:34) and can be used as a performance measure to evaluate how fast a child can initiate a required movement (Magill, 2011:25).

Coordination:

Coordination refers to the ability to execute motor tasks correctly by using body movements and senses (Fahey *et al.,* 2006:34). Gallahue and Ozmun (2006:254) define coordination as the ability to integrate different motor systems with sensory systems to form efficient movement patterns. Moreover, Pienaar (2012:32) describes coordination as the ability to perform bodily movements wilfully and effectively without unnecessary movements. Coordinated movements will improve children's ability to use learned motor patterns as well as to help them to learn new movement patterns (Pienaar, 2012:32). Coordination is further important for physical fitness components such as balance, speed, rhythm and agility (Gallahue & Ozmun, 2006:254) and must be synchronized to ensure that the movement patterns are smooth and efficient (Auxter *et al.,* 2010:166).

The above mentioned components are important for PA and physical fitness, therefore the recommendations for PA will be discussed briefly.

2.2.3 Recommendations for physical activity for Grade 6-learners

Research has been done to address the recommendations for PA (ACSM, 2011:198; Janse van Rensburg *et al.,* 2013:250; Janssen & LeBlanc, 2010:13). Only the recommendations that focus on Grade 6-learners will be discussed in detail because this is the target population of this study, and according to literature this is the age group when the PA levels tend to decrease significantly (Minnaar *et al.,* 2016:73; ACSM, 2011:183). Accordingly, it is important to follow these guidelines because it will improve the cardiovascular system, musculoskeletal tissues, bone health, self-concept as well as academic performance (ACSM, 2011:198). Additionally, the WHO (2017) stated that children should follow these guidelines to develop neuromuscular awareness and to maintain a healthy body weight. The following recommendations will be discussed: type, frequency, duration and intensity of exercises.

2.2.3.1 Types of exercises

Children should be exposed to different types of activities which are fun, developmental and educational (ACSM, 2011:198). Janse van Rensburg *et al.* (2013:250) and the WHO (2017) states that children, five- to 17-years, should take part in activities which improve cardiovascular function, muscle strength, bone health and flexibility. These researchers also state that it is important to add aerobic and resistance training to children's activities because it contributes to health benefits. Moreover, Corbin *et al.* (2010:69) report that children aged six- to 13-years should participate in vigorous aerobic and sport activities as well as muscular fitness and flexibility exercises for 60 minutes or more per day. Janssen and LeBlanc (2010:13) and the CDC (2015) concur with Corbin *et al.* (2010:69) and stated that aerobic activities should make up the greatest part of a child's 60 minutes per day of PA. Furthermore, moderate intensity aerobic activities are activities like running, walking, cycling, dancing and swimming are important to increase the heart rate (WHO, 2017; ACSM, 2011:198), play a role to decrease body fat and help to improve endurance performance (Wilmore *et al.*, 2008:394). However, recent research by Füssenich *et al.* (2016:7) on nine- to 11-year-old children indicates that there is no difference in cardiovascular risk score in children who participate in moderate PA and children who do not participate in any activity. These researchers further conclude that 17 minutes per day of vigorous PA seems to have a significant effect on the decrease of cardiovascular disease risks (Füssenich *et al.*, 2016:7).

Resistance training is necessary to improve muscle tone, muscular strength and endurance, motor fitness skills as well as sport performance (Janse van Rensburg *et al.*, 2013:250; ACSM, 2011:200; Auxter *et al.*, 2010:258). According to the ACSM (2011:200), resistance training also decreases the risk of injuries by strengthening the ligaments, tendons and bones, plays an important role in obesity intervention programmes and improves motor skill coordination (Wilmore *et al.*, 2008:395). Examples of resistance training activities are: jumping, climbing, gymnastics, obstacle course and strength training. Bone strengthening activities should be incorporated in activities to increase muscular fitness and to promote bone strength and growth (Katzmarzyk & Dentro, 2014:8; Janssen & LeBlanc, 2010:13).

2.2.3.2 Frequency of exercises

The normal activity pattern of children can be characterized by short burst of activity with brief resting periods in between ACSM (2011:198). The CDC (2015) concluded that children (aged six- to 17-years) should be physically active every day and recommend that aerobic, muscle strengthening, bone strengthening and vigorous intensity aerobic exercises should be included in their training programmes at least three times per week (CDC, 2015). Malina (2010:272) also recommends that the frequency of exercises should be three to five times per week, whereas muscle strength activities should be done at least two to three times per week for children aged six- to 17-years (WHO, 2017:7; ACSM, 2011:199). Moreover, Corbin *et al.* (2010:69) recommend that children aged six- to 13-years should participate in the following activities: moderate PA five times per week or more (e.g. playing games, walking); vigorous aerobic and sport activities three times per week or more (e.g. jogging, sports); muscular fitness and flexibility exercises three times per week or more (e.g. stretching, wall climbing). However, Corbin *et al.* (2014a:96) further recommend that the frequency for 13- to 18-year-old children should be as follow: children should participate in daily moderate PA (e.g. household activities); three or more days in aerobic activities (e.g. jogging, dancing); three or more days in sport and recreation activities (e.g. soccer, tennis); two to three days in muscular fitness activities (e.g. resistance training) and lastly, three or more days in flexibility exercises (e.g. stretching exercises).

2.2.3.3 Duration of exercises

According to the WHO (2017:7), Corbin *et al.* (2014:96), ACSM (2011:198) and Janssen and LeBlanc (2010:13) the children should do an average of 60 minutes or more PA daily, which includes activities such as PE, free play, sport and planned exercises. Aerobic activities should be done at least 60 minutes or more per day, whereas weight bearing and bone strengthening activities should occupy 45 to 60 minutes or more, and high impact activities should be 10 minutes (CDC, 2015; Malina, 2010:273). Corbin *et al.* (2010:69) recommend that children aged six- to 12-years should participate for 60 minutes or more in vigorous aerobic exercises, sport and recreation activities, muscular fitness as well as flexibility exercises. Füssenich *et al.* (2016:7) concur and state that 60 minutes per day for children aged nine- to 11-years is sufficient and has a positive effect on body composition and cardiovascular fitness. However, Corbin *et al.* (2010:69) recommend the following for 13- to 18-year-old children: 20 minutes or more on

aerobic exercises; 20 minutes or more on sport and recreation activities; eight to 12 repetitions (reps) of two to four sets for major muscle group training, and lastly 10 to 30 seconds of two to four reps of flexibility exercises for major muscle groups.

2.2.3.4 Intensity of exercises

As mentioned above, the recommended 60 minutes per day of PA should be moderate to vigorous intensity (ACSM, 2011:198), which contributes to healthier cardiorespiratory fitness level (Ortega *et al.*, 2008:7). Moderate intensity (4 metabolic equivalent tasks (METS) – 4 x resting metabolic rate) can be defined as different types of activities which increase your heart rate, breathing and sweating, whereas, vigorous intensity (7 METS – 7 x resting metabolic rate) significantly increases your heart rate, breathing and sweating. However, Ortega *et al.* (2008:7) observed that increased level of vigorous intensity can be related to higher cardiorespiratory fitness levels, and provide more health benefits than moderate intensity (Janssen & LeBlanc, 2010:12).

The ACSM (2011:201) stated that the recommendations for the PA guidelines are beneficial for health and following and maintaining these guidelines will have short- and long-term benefits.

2.2.4 Advantages of physical fitness and activity

PA has numerous benefits and plays an important role in health and well-being of a child (Monyeki, 2014:335; Du Toit *et al.*, 2011:23; Malina, 2010:272). Monyeki (2014:335) concludes that advantages of PA include prevention of non-communicable diseases as well as a decline in total fatness. Malina (2010:272) reports similar associations, and states that PA reduces the overall adiposity in children, improves blood pressure and improves the metabolic risk profile. Wilmore *et al.* (2008:486) further contend that, as the levels of PA and physical fitness increase, the risk for coronary artery and cardiovascular disease decreases. In addition, Ortega *et al.* (2008:6) explain that as physical fitness increases, fat mass decreases and lean mass increases. According to the ACSM (2011:192), there are a few components which benefit from PA; these include movement skills, aerobic fitness, muscular strength, body composition, cholesterol, blood pressure, blood sugar, as well as bone health.

Warburton (2013:251) indicates that regular PA results in the prevention of premature mortality and chronic medical conditions in the later stages of life. Weinberg and Gould (2014:139) agree with the above mentioned researchers, and indicate that PA and cardiorespiratory fitness are associated with a decrease of mortality and coronary heart diseases.

Other advantages of physical fitness and PA include better academic performance (Esteban-Cornejo *et al.,* 2014:307; Monyeki, 2014:335; Bass *et al.,* 2013:835; Coe *et al.,* 2013:501; Du Toit *et al.,* 2011:31; Ortega *et al.,* 2008:7). Du Toit *et al.* (2011:31) studied the correlation between physical fitness and academic performance of 212 children (aged 9- to 12-years) from Potchefstroom in South Africa and found that the relationship between academic performance and the fitness components increases as children grow older. The results indicated a significant correlation between strength tests and academic performance, especially in 12-year-old boys and girls (Du Toit *et al*., 2011:31). In accordance, a study by Coe *et al.* (2013:501) evaluating 1 701 Grade 3, Grade 6 and Grade 9 learners from the USA, reported that muscular strength and endurance showed a significant correlation with academic performance in all the grades. A recent study in Illinois on 838 learners (Grade 6 to Grade 8) were conducted to establish whether physical fitness had an effect on academic performance or not, indicated that aerobic capacity showed the strongest relationship with academic performance. It showed a relationship with muscular strength endurance as well, but with a lesser consistency (Bass *et al.,* 2013:835).

Furthermore, Esteban-Cornejo *et al.* (2014:307) studied the influence of physical fitness on academic performance within 2 038 children aged six- to 18-years from Spain. These researchers found that cardiorespiratory capacity and motor ability were related to better academic performance; however, muscular strength was not associated with better academic performance (Esteban-Cornejo *et al.,* 2014:307). According to Moving minds (2017), the short activity breaks from HOPSports Brain Breaks® programme have a positive effect on children's learning readiness, cognitive learning and time-on-task, all of which lead to improved academic performance.

Ortega *et al.* (2008:7) conducted a study to evaluate the relationship between physical fitness and mental health. These researchers found that the increase in cardiorespiratory fitness was associated with positive short- and long-term effects on anxiety, mood status and self-esteem in children (Ortega *et al.,* 2008:7). A study by Wood *et al.* (2012:316) on 25 13-year-old children from the United Kingdom (UK), found that PA had a positive effect on their self-esteem and

mood. In a more recent study, Monyeki (2014:335) concluded that physical fitness was beneficial for self-confidence and character building. In accordance, Barton *et al.* (2014:201) studied the effect of playground sport on the self-esteem of 52 eight-year-olds children from the UK. The results indicated that playground sport improved those children's self-esteem. They further concluded that playground sports also led to increased PA levels (Barton *et al.,* 2014:202). Moreover, it was found that the HOPSports Brain Breaks® programme includes activities which increase children's self-esteem as well as their behaviour (Moving minds, 2017).

2.2.5 Physical activity levels

PA is an important contributor to a healthy lifestyle for children, which leads to many benefits (Walter, 2011:780) that include reducing the risk for cardiovascular diseases and strengthening muscle and bones (CDC, 2015). It is well known that the participation in PA decreases with age. Katzmarzyk and Dentro (2014:10) studied the health status of children aged six- to 12-years living in the USA, and reported that 42% of children aged six- to 11-years met the recommendation in comparison to the 24.8% of children aged 12- to 15-years. Moreover, the declination is more prevalent in girls than boys where 19% of 13-year-old girls and 34% of boys were physically active (Katzmarzyk & Dentro, 2014:11). Malina (2012:25) further added that children's PA levels have a tendency to increase, but reach a peak at age 12- to 14-years and then start to decline.

In agreement with Malina's (2012:25) statement, Weinberg and Gould (2014:137) indicate that 50% of 12- to 21-year-olds from the USA did not participate in any PA. These researchers further reported that boys' and girls' PA levels decrease from age 12- to 21-years from 70% to 40%. Robbins *et al.* (2014:21) studied 30 Grade 6 and 7 boys from Midwestern USA and reported a decrease in PA in six- to nine-year-old boys from 49% to less than 12% as they reach adolescence. In a recent study by Gao *et al.* (2015:351) on 75 seven- to eight-year-old learners from Texas, USA, where they compared the percentage of time these learners spent on various PA related programmes (PE, exergaming and recces), it was found that during recess 49% of Grade 1-learners and 63% of Grade 2-learners were sedentary. They further indicated that 65% of Grade 1-learners and 61% of Grade 2-learners were sedentary during the PE classes. A study by Belton *et al.* (2014:132) on 256 learners (aged 12- to 14-years) from Ireland showed that only 33% of this group complied with the PA guidelines. Additionally, the British Heart Foundation indicated that England's PA levels declined from 2008 to 2012, with statistics

indicating that boys aged 11- to 12-years showed a higher decrease, from 30% to 43% in comparison to girls from 44% to 42% (Townsend *et al.*, 2015:26). The British Heart Foundation further reports that only 19% of boys and 14% of girls aged 11- to 12-years old met the recommendation for PA. In comparison, Scotland indicated that 72% of boys and 76% of girls aged 11- to 12-years met the recommendation of PA (Townsend *et al.*, 2015:30). In recent research the USA (2016) report card indicated that only 21.6% of children aged six- to 19-years met the recommendation, whereas more boys (26.0%) than girls (16.9%) were physically active. They further stated that only 5.1% of 12- to 15-year-old children met these recommendations (Katzmarzyk *et al*., 2016:S309).

Physical inactivity is not a problem only in the rest of the world, but also in South Africa where it has been indicated that South African children are not sufficiently active (Monyeki, 2014:335). The Healthy Active Kids South Africa (HAKSA) report card studied the current health status in children. In 2014 South African children were graded with a D for their overall PA levels (21% - 40%) (HAKSA, 2014:12) in comparison to 2016 where the children were graded with a C (41% - 60%) (Uys *et al.*, 2016a:267). Moreover, HAKSA (2014:12) stated that the average time spent being active was 100 to 200 minutes per week, resulting in less than 20 minutes per day.

A study by Kemp and Pienaar (2011:2) on 280 obese and overweight children aged nine- to 12-years from Potchefstroom, South Africa, indicated that obese children did not meet the recommendation of PA in comparison to overweight children who did meet these recommendations. However, these researchers (Kemp & Pienaar, 2011:2) concluded that 60 minutes per day was not enough to address the problem of overweight and obesity. Furthermore, Walter (2011:785) conducted a study in Port Elizabeth on the PA levels of 112 children aged nine- to 12-year-old and reported that the average time that these children spent on PA was only 35 minutes of the recommended 60 minutes per day. Cozett (2014:66) studied the PA levels of 348 children (aged 11- to 13-years) from Western Cape, South Africa and indicated that 74.8% of boys and 54.8% of girls were physically active. Additionally, the results indicated that 89% of 12-year-old children failed to comply with the recommendation. In accordance a study by Morar *et al.* (2014:106) on 960 children aged 10- to 13-years from three suburbs in KwaZulu-Natal, South Africa, reported the following results regarding the PA levels of learners (see Table 2.1).

Table 2.1: Percentage of PA levels of children in KwaZula-Natal.

	Exercised daily	**Exercised three times /week**	**Exercised once weekly**	**Never exercised**
Westville	42.3%	28.4%	22.1%	-
Reservoir Hills	50.7%	23.4%	20.1%	-
KwaDabeka	18.7%	7.5%	41.9%	31.9%

To conclude, it is clear that KwaDabeka had the lowest levels of PA (18.7%); this can be due to the socio-economic status (SES) of the children in this area (Morar *et al.*, 2014:108). Accordingly, the second Youth Risk Behaviour Survey (YRBS) indicated the prevalence of PA levels in South African children 13-years and younger (Reddy *et al.*, 2010:43). In this regard the results of this study indicated differences in the following provinces: Free State (53.6%) and the North West Province (51.2%) had higher prevalence of children participating in vigorous PA in comparison to the Western Cape (32.4%). It was further concluded by the YRBS that girls (46.2%) showed lower levels of PA in all age groups in comparison to boys (36.7%) (Reddy *et al.*, 2010:44). Accordingly, 28.8% of children indicated that they didn't want to participate in PA, where Limpopo had the lowest prevalence (24%) in comparison to Western Cape Province (36.2%) (Reddy *et al.*, 2010:44). These results will be summarized in Table 2.2.

Table 2.2: The prevalence of PA levels of South African children aged 13-years and younger.

	Participate in sufficient vigorous PA		**Participate in sufficient moderate PA**		**Participate in insufficient or no PA**	
	Boys	Girls	Boys	Girls	Boys	Girls
13-years and younger	54.0%	35.8%	26.6%	28.8%	33.3%	42.8%

Pienaar (2009:56) pointed out that the adolescent years are a critical period with the concerning trend of increased lower levels of PA particularly in girls. Additionally, in Limpopo, 56 girls' (aged 13- to 19-years) results indicated that these girls are only active for 1.2 hours per day and as these girls grow older, they become less active (Mokabane *et al.*, 2014:666). Furthermore, Uys *et al.* (2016a:267) indicate that 50% of children comply with the daily recommendation, and added that girls and older children are at highest risk for not meeting the daily recommendations.

More recently, De Vos *et al.* (2016:376) studied the PA level and sedentary behaviour of 230 Grade 7-learners from Potchefstroom, South Africa. The results indicated that boys spend 361.76 minute per week and girls 334.03 minutes per week being physically active in comparison to the recommended 420 minutes per week. These researchers (De Vos *et al.,* 2016:375) further state that 70.7% to 71.9% of the children did not comply with the recommendation, and conclude that boys tend to engage more in competitive activities (e.g. soccer) whereas girls enjoy non-competitive and recreational activities like swimming and dancing (De Vos *et al.,* 2016:379). Similarly, a study by Minnaar *et al.* (2016:72) on 78 children (aged five- to six-, nine- to 11- and 12- to 14-years) from an unidentified rural town in South Africa revealed that children aged nine- to 11-years are more physically active than the older group (12- to 14-years). Additionally, 12- to 14-year-old girls tend to be more aerobically active than the younger group; however, their PA levels decline at this age (Minnaar *et al.,* 2016:72). Visagie *et al.* (2017:211) concur with these researchers findings, and state that a possible reason why white girls from their study choose aerobic exercises is because they have more opportunities and available equipment to be physically active. Different factors that influence children's PA levels will be discussed in the following paragraph.

2.2.6 Factors influencing physical activity levels

Recently, several factors that have an influence on PA levels have been identified. These factors include: sedentary behaviour, lack of skill, lack of time, attitudes, self-perception and motivation towards PA and fitness, interest in and enjoyment of PA (Mok *et al.,* 2015:382; Belton *et al.,* 2014:133; Morar *et al.,* 2014:107; Shirinde *et al.,* 2012:234). Some of the major factors that are relevant in this regard will be discussed.

2.2.6.1 Sedentary behaviour

Sedentary behaviour can be defined as any behaviour characterized by energy expenditure smaller or equivalent to 1.5 METS while sitting or reclining posture (Amusa *et al*., 2012:993). In addition, Monyeki (2014:326) added that sedentary behaviour is time spent on activities such as watching television, where there is no increase in energy expenditure. According to various researchers, sedentary activities, which include screen based activities, video games and mobile phones, have increased among children and this result in less time being physically active (De Vos *et al.,* 2016:378; Martin *et al.,* 2015:47; Finn & McInnis, 2014:235; Monyeki, 2014:328; Warburton,

2013:252). Green *et al.* (2012:917) indicate that children spend more than five hours daily with technology-based activities, and add that these not only replace PA, but also affect their well-being and health. Zhu *et al.* (2011:801) conclude that overweight and obese children prefer a more sedentary lifestyle. However, when sedentary children initially start to exercise and be active, the problem arises to continue with this lifestyle. Possible reasons could be lack of motivation, or it may simply be too challenging for them (Weinberg & Gould, 2014:142). Various researchers indicate the positive relationship between sedentary behaviour and health conditions such as obesity, cancer, coronary heart disease, diabetes mellitus, and other chronic diseases (Belton *et al.,* 2014:123; Morar *et al.,* 2014:103; Tucker *et al*., 2014:1006; Janse van Rensburg *et al.,* 2013:250; Lindelof *et al.,* 2012:113; Killough *et al*., 2010:304; Whitney & Rolfes, 2008:477; Wilmore *et al*., 2008:494).

A study by Wilmore *et al.* (2008:508) reveals that PA helps the body to regulate food consumption as well as to balance energy expenditure, whereas sedentary behaviour reduces this ability, which results in weight gain. In accordance, researchers have concluded that sedentary behaviour is a contributor to childhood obesity (Katzmarzyk *et al.,* 2015:1701; Xu & Xue, 2015:16). Moreover, sedentary behaviour can lead to weight gain for two reasons: firstly the required energy is beyond the resting metabolic rates, and secondly it replaces the time children could spend being physically active (Whitney & Rolfes, 2008:287). A study by Ziyagil *et al.* (2011:592) in Turkey on 2 000 children aged 11- to 17-year agrees with this statement, and states that children, who spend most of their time watching television, are more likely to become obese. The recommendation for screen based activities is less than two hours daily (Australian Health Survey, 2013; Amusa *et al.,* 2012:995; Janssen & LeBlanc, 2010:41), although the CDC (2015) found that children between the ages of eight- and 18-years spend more than seven hours daily with technology-based activities.

Gao *et al.* (2015:349) indicate that only 42% of American children between the ages of six- and 11-years participate in moderate PA. The Australian Health survey in 2013 stated that children aged five- to 17-years of age spend more than two hours per day on screen based activities (Australian Health Survey, 2013). Additionally they found that 51% of children aged five- to 17-years had some kind of screen based equipment in their bedrooms which include: television (28%), computers (26%) and video games (25%). The Active Healthy Kids Australia (AHKA) report card indicates that 14% of children aged 12- to 17-years comply with the recommendation for screen time (less than 2 hours per day). They further state that sedentary

behaviour has not improved from 2014 and is still graded with a D- (AHKA, 2016:26). A study by Patnode *et al.* (2011:464) on 720 (Grade 6 to Grade 11) learners from Minnesota found that boys are more likely to spend their time watching television and playing video games, whereas girls rather engage in activities such as using the computer, phoning and texting. Atkin *et al.* (2008:451) studied the amount of time children aged 13- to 16-years from UK spent on technology-based activities daily and found that technology-based activities was accounted for the highest results, watching television being majority (36 min = boys and 32 min = girls). Tucker *et al.* (2014:1006) and Warburton (2013:252) indicate that 47.3% of American children spend more than two hours daily watching television in comparison with the 30.8% who spend less than two hours daily watching television.

Additionally, Leatherdale (2014:201) studied 2 331 Grade 1 to Grade 4 learners' PA levels from Waterloo, Canada, and indicated 63.3% of boys and 62.7% of girls are moderately active; however, 21.8% of boys and 18.9% of girls spend more than two hours daily being sedentary. Furthermore, the results indicated that only 4.1% of boys and 4.2% of girls prefer to play outside in comparison to the 75.3% and 78.6% (boys and girls respectively) who indicated that they prefer to play inside (Leatherdale, 2014:201). A study conducted by Beck *et al.* (2016:35) studied the sedentary behaviour patterns of 206 children aged nine- to 11-years from Denver, USA, by focusing on in-school versus out-of-school sedentary behaviour. The results indicate that children are significantly more sedentary before (60%) and after school (45%) during weekdays, whereas girls (45%) are more sedentary in comparison with boys (43%). Hence, out-of-school sedentary behaviour indicates that boys and girls (48%) are equally sedentary over weekends. Beck *et al.* (2016:36) further conclude that there is an increase in weekend sedentary behaviour (48%) in comparison to the weekday sedentary behaviour (43%), thus the PA levels decrease from 48.3% during weekdays to 44.3% during weekends.

A study conducted by De Vos *et al.* (2016:376) on 230 Grade 7-learners from Potchefstroom, South Africa, investigated the learners' PA levels and sedentary behaviour and indicated that more than 70% of children didn't comply with the daily recommendations of PA. These researchers further reported that these children were more sedentary over weekends and preferred to spend most of their time on the following activities: computer games (65%), video games (74.4%), on their cell phones (79%) and watching television (72%). According to the HAKSA (2014:17) South African children between the ages of 10- and 17-years, spend more than three hours daily watching television, which gives South Africa an F (0% - 20%) for

sedentary behaviour. However, the 2016 HAKSA report card indicates that there is no change in sedentary behaviour and is still graded with an F (0% - 20%) (Uys *et al.*, 2016a:268). In previous research the rising amount of inactivity among 951 learners aged 13- to 18-years learners from Western Cape indicated that 44% of boys and 56% of girls were inactive (Frantz, 2006:76). In a study by Mokabane *et al.* (2014:666) in Limpopo, the results indicate that 56 girls aged 13- to 15-years spend more than two hours daily being sedentary. De Vos *et al.* (2016:379) concur and conclude that boys are physically more active than girls, where girls spend more time being sedentary. Mokabane *et al.* (2014:665) further state that children currently grow up in a time where it is easier to be sedentary than physically active. A factor contributing to this statement refers to transport, causing children not to participate in walking or bicycling activities (Papoutsi *et al.*, 2013:748). More recently, a study by Phillips and Awotidebe (2015:267) on 55 girls aged 15- to 18-years from Western Cape, South Africa, indicated that inadequate safety aspects in public areas are a barrier to participate in PA.

A study by Hornby-Turner *et al.* (2014:9) on 145 (aged nine- to 11-year-old) girls from England also found that girls are more likely to use public transportation than walk to school. Papoutsi *et al.* (2013:748) add that the fear of crime and kidnapping contributes to sedentary behaviour, owing to unsafe parks, walking and bicycling routes. Hornby-Turner *et al.* (2014:9) agree with the above statement and also indicate that unsafe environments and busy streets are among the barriers to being physically active. A study by Tumynaitė *et al.* (2014:64) on 113 (Grade 1 to Grade 4) learners from Lithuania further reveals that engagement in sedentary activities leads to reduction of physical skills and PA which are necessary for normal development. The effect of insufficient motor and physical fitness skills on PA levels will now be discussed.

2.2.6.2 Insufficient motor and physical fitness skills

Motor skills help to improve the health of a child by focussing on the total development of the child (De Milander, 2011:11). Fundamental movement skills are important building blocks for children to participate in physical activities, for these skills characterise the necessary behavioural competencies for participation (Okely *et al.*, 2004:238). Stodden *et al.* (2008:291) concur that when a child does not have the necessary fundamental skills (running, hopping, catching, throwing, and balancing), opportunities to be physically active later in life will be limited. Thus, when children have better developed motor skills, they will have the ability to engage in various PA and sports (Stodden *et al.*, 2008:295). Similarly, Malina (2012:20) states

that the refinement of motor skills is related to increased PA levels and is essential for sport and the improvement of sport-related skills. Therefore, physical fitness skills, sport and motor skills are some factors which contribute to the PA levels of children (Zhang *et al.*, 2015:521; Niven *et al*., 2007:477). Humbert *et al.* (2006:472) report that children's confidence in the execution of their motor skills has a great influence on their participation in PA.

Crane *et al.* (2015:959) conducted a study in British Columbia and Canada on 116 five-year-old children. The aim of the study was to examine these children's perceptions of their physical competence and the extent to which these perceptions influence their PA. They conclude that PA enables motor skill development which enhances motor proficiency (Crane *et al.*, 2015:959). However, as children and adolescents get older they opt out of PA when they don't have the necessary skills to participate in activities (Crane *et al.*, 2015:959).

Pařízková (2014:250) did a meta-analysis of selected longitudinal studies that investigated the relationship between body fat to PA, and indicated that when children have reduced motor skills, they are more likely to get tired easily, which results in less engagement in exercises as well as active games. Okely *et al.* (2004:244) studied the relationship between fundamental motor skills and overweight and obesity in Grades 2, 4, 6, 8 and 10 learners from Australia. The results of these researchers' study indicated that if children don't have the necessary fundamental movement skills, they are more likely to become overweight, because they spend less time being physically active (Okely *et al.*, 2004:244). Recently, Belton *et al.* (2014:132) have found that 99.5% from 256 children aged 12- to 14-years from a rural Irish town hadn't mastered the key fundamental movement skills, resulting in low movement skill proficiency. Another study by Krombholz (2013:51) on 1 543 children aged three- to seven-years from Munich, Germany, examined the relationship between weight and the development of motor performance skills and found that obese children have poorer motor skills and are less engaged in physical activities.

A study by Shirinde *et al.* (2012:232) on 344 children aged 15- to 16-years from Alma-Vaalwater, South Africa, investigated barriers to participation in PA and indicated that lack of skills was one of the most common barriers to participating in PA for both boys and girls. Moreover, Van Biljon and Longhurst's (2012:986) study on 30 nine- to 12-year-old children from Zululand in South Africa reports that obesity contributes to decreased physical fitness, due to the fact that the children don't have the necessary skills to perform activities such as fundamental motor skills. De Milander (2011:12) studied the association between PA, motor

proficiency and physical fitness on 97 aged 12- to 13-year-old children from Bloemfontein, South Africa, and this researcher report that the decline in PA leads to lower motor skills as well as lower physical fitness skills, which in turn leads to health problems such as obesity. Furthermore, De Milander's (2011:18) results indicate that motor skills and some components of fitness skills (one mile run and push-up test) of 12- to 13-year-old girls showed a significant difference between the active and inactive group. Recently a study conducted by Visagie (2016:7) on 406 girls (aged nine- to 10-years) from in the North West province, South Africa, studied the relationship between object control and physical fitness. The results concur with those of De Milander (2011:18) and state that children who are more physically active and have better cardiovascular endurance performed better in their object control skills in comparison to overweight/obese children. This researcher further concludes that poor object control skills lead to inactivity for the reason that most sports involve object control skills. Pienaar (2009:53) states that it is essential for children to develop motor skills from an early age to help them to be physically active later in life. Lack of time is another factor indicated to have an influence on PA levels (Weinberg & Gould, 2014:142; Humbert *et al.*, 2006:473). This factor will be discussed briefly.

2.2.6.3 Lack of time

Lack of time is an intrapersonal factor which is one of the reasons why children are not physically active (Weinberg & Gould, 2014:142; Humbert *et al.*, 2006:473). Belton *et al.* (2014:132) agree that the main barrier to engaging in PA is lack of time. Woods *et al.* (2010:102) conducted a study on 1 275 10- to 12-year-olds children from Ireland, and reported that 15% of girls and 20% of boys stated that the reason why they didn't participate in sport was because they didn't have enough time. Furthermore, research by Humbert *et al.* (2006:469) on 160 children (aged 12- to 18-years) from Canada, studied the different factors that influence PA participation within high and low SES. The results indicated that both high and low SES children stated that lack of time was a barrier. Some of the reasons they gave were too much homework, extracurricular activities and family obligations (Humbert *et al.*, 2006:474). Another study on 1 062 children aged 14- to 18-years from Albania, Balkan Peninsula, was done by Pano and Markola (2012:62) to investigate children's attitudes and perception towards PA. They found that 58.8% of boys and 59.6% of girls indicated they didn't have time to participate in PA.

Shirinde *et al.* (2012:234) study on 344 15- to 16-year-old children from Alma-Vaalwater, South Africa, stated that the lack of time was one of the most common barriers to prevent both boys and girls from engaging in PA. More recently, Morar *et al.* (2014:105) studied the health and fitness attitudes of 960 children aged 10- to 13-years from KwaZulu-Natal, South Africa, and indicated that 14.38% of the sample size did not participate in sport because they had too much homework. In accordance, Phillips and Awotidebe (2015:267) concur that lack of time is a barrier to participation in PA, owing to extramural activities and family responsibilities.

2.2.7 Attitudes towards physical activity and physical fitness

Literature has indicated that attitude can also play a role in PA and physical fitness. Attitude is a measure of behavioural change and has the ability to either encourage or discourage children (Mok *et al.,* 2015:396). Pienaar (2009:54) reports the importance of establishing positive attitudes towards PA during childhood and adolescent years, because children who have positive attitudes towards their motor skills will most likely be active when they are older. Accordingly Mok *et al.* (2015:395) concur that children's attitude towards PA is a contributor to PA participation; if children have a positive attitude towards PA; they are likely to engage in PA. Attitudes towards PA and physical fitness are discussed as follows: definition of attitudes towards PA and physical fitness, factors influencing attitudes as well as the relationship between attitudes and PA.

The Oxford dictionary (2016a) defines attitude as "*a settled way of thinking or feeling about something*". Merriam-Webster (2015a) adds "*a feeling or way of thinking that affects a person's behaviour*". Perception can further be defined as "*the way that you notice or understand something using one of your senses*" (Merriam-Webster, 2015b), whereas, the Oxford dictionary (2016b) define perception as "*the way in which something is regarded, understood or interpreted*. Fairclough *et al.* (2012a:101) and Niven *et al*. (2007:473) are of opinion that self-perception contributes to a person's self-esteem and correlates with PA, whereas attitudes can be described as a way of thinking or feeling towards PA. Meyer and Twenge (2015:110) further define attitudes as *"a favourable or unfavourable evaluative reaction toward something or someone exhibited in one's beliefs, feelings, or intended behaviour"*.

2.2.7.1 Factors influencing attitudes

Finn and McInnis (2014:235) examined the perceptions towards classroom-based PA of 74 Grade 5 and Grade 6 girls from Massachusetts in USA, and state that children's attitudes are linked to the enjoyment of PA, whether or not it interests them. According to Humbert *et al.* (2006:472), some of the factors that have an effect on children's attitudes towards PA are: being made fun of, not being included or being picked last, as well as PA being fun. Barnett *et al.* (2013:274) found similar results in 276 children aged 16- to 18-years from Australia, and indicate that children's attitude towards and motivation to be physically active are affected by what their peers will think, and if they are competent or not to perform the activities. A study on 568 girls aged 12- to 14-years from England examined the relationship between girls' motivational tendencies towards PE and PA, and indicated that children's perceptions are influenced by teachers' feedback (Fairclough *et al.,* 2012b:154). Accordingly, Seabra *et al.* (2013:323) in Maia, Portugal, examined the effect of gender, weight and SES on the attitudes of 683 children aged eight- to 10-years towards PA. They found that obese and overweight children have lower perceptions of PA. Seabra *et al.* (2013:322) further concluded that boys and children with a high SES enjoy PA more than girls, overweight children and children with a low SES. Hence, various researchers state that positive attitudes towards PA are linked with enjoyment, motivation, success and good performance (Mok *et al.,* 2015:395; Bryan & Solmon, 2012:281; Cairney *et al*., 2012:27; Ghofrani & Golsanamlou, 2012:22) and are affected by factors such as previous PA experiences, non-supportive or threatening by peers, and feelings of incompetence (Belton *et al*., 2014:123; Stodden *et al.,* 2008:292; Humbert *et al.,* 2006:473). Another factor that has been indicated is that parents can have an impact on children's attitudes toward PA (Barnett *et al.,* 2013:277; Seabra *et al.,* 2013:324; Kimiecik & Horn, 2012:16;).

The relationship between family and children's PA beliefs was studied by Kimiecik and Horn (2012:16) in 173 children aged nine- to 12-years from a large school district in the eastern region of USA. They found that parenting styles also have an impact on children's attitudes towards PA and motivation for short- and long-term PA participation. Barnett *et al.* (2013:277) concur and state that encouraging parents and family members are important for children to participate in PA, and the lack of encouragement acts as a barrier to such participation. The results of a study by Seabra *et al.* (2013:324) indicate that high SES parents tend to have more positive attitudes towards PA, and they transfer these attitudes to their children. Furthermore, children from a high

SES perceive their parents' influence as an important indicator of their being physically active, which contributes to their enjoyment and encouragement for PA (Seabra *et al.,* 2013:324).

Moreover, Van Biljon and Longhurst (2010:13) indicate that parents or significant others have an impact on children's attitudes towards PA and whether they will be physically active or not. A study by Kemp and Pienaar (2010:111) on 38 children aged nine- to 12-years from Potchefstroom, South Africa, analysed children's self-perception and whether PA will improve their self-perception. The results of this study indicated that the children had low athletic and physical self-perception, and this could be due to the fact that these children felt that they had inadequate motor and sporting skills.

Subsequently it can be concluded from the above-mentioned that the following factors have an influence on the decision children will make about being physically active or not: 1) their enjoyment of PA, 2) their competence to perform the activities, 3) previous PA experiences, and 4) the attitudes of parents and significant others towards PA (Finn & McInnis, 2014:235; Bryan & Solmon, 2012:268).

2.2.7.2 The relationship between children's attitudes and motivation towards PA and engagement in physical activity.

Behavioural change is affected by attitude and can either be motivational or preventative of nature (Mok *et al.,* 2015:396). Additionally, positive attitudes are considered able to change motivational behaviour, and therefore could possibly have an effect on PA participation (Bryan & Solmon, 2012:268). In more recent research by Finn and McInnis (2014:235) on 74 Grade 5 and Grade 6 girls from Massachusetts, USA, they state that negative perceptions toward PA are one of the reasons for the decline in PA levels.

A study by Bryan and Solmon (2012:279) on 114 Grade 6 to Grade 8 learners from Louisiana, USA, examined the role perception and attitude play in children's motivation towards engagement in PE and PA, and indicated that children's attitude showed a noticeable decline from Grade 6 to Grade 8. This was associated with the decrease in the number of steps the children took during the PE class. In accordance, Inchley *et al.* (2011:246) state that negative perceptions may intensify during this period, because children are more vulnerable at ages 11- to 15-years. Belton *et al.* (2014:132) add that, if mid- to late-adolescents do not have a positive

attitude or perception towards PA; they will not choose an active lifestyle when they are given the opportunity to decide. In addition, Finn and McInnis' (2014:245) study on 47 girls from Massachusetts, USA, found that, if children develop a positive attitude, it is likely that they will be motivated to be physically active outside the school setting. Bryan and Solmon (2012:281) add that if children enjoy PE, they will be more likely to continue being physically active.

Belton *et al.* (2014:132) studied 256 (12- to 14-year-old) children from a rural Irish town, while Tsang *et al.* (2013:44) studied 20 (11- to 18-year-old) children from Sydney, Australia. These researchers found a significant difference between the attitudes of low and moderate levels of PA; they indicated that low levels of PA were associated with low perceptions of PA as well as negative attitudes towards PA. In addition, Fairclough *et al*. (2012a:108) found that overweight/obese children aged 10- to 11-years are more likely to have a negative perception towards PA in comparison to children of normal weight. These researchers further opine that overweight girls have a lower self-perception than overweight boys (Fairclough *et al*., 2012a:108). The reason for this is that boys' perceptions are related to PA competence, whereas girls' perceptions are related to aesthetic appearance (Fairclough *et al*., 2012a:108). Previous research by Kamtsios (2010:11) studied gender differences on the attitudes towards exercise of 775 11- to 12-year-old children from West-Northwest Greece, and found that boys' attitudes towards PA is more positive than girls', and boys have a higher perceived athletic competence and body attractiveness. Inchley *et al.* (2011:246) concur with this finding and indicate that in their study of 641 Scottish children aged 11- to 15-years, the boys showed a higher perception towards being active in comparison to girls.

A study in Potchefstroom, South Africa, by Kemp and Pienaar (2010:112) on 38 overweight and obese children indicated that there were differences between boys' and girls' perceptions, whereas boys once again had higher athletic perceptions whereas girls had a higher academic and behaviour perceptions. These results can be ascribed to boys being more likely to play sports and games, whereas girls will rather focus on academic activities. Kemp and Pienaar (2010:113) further conclude that overweight and obese children have lower self-perception that their normal weight peers. In this regard, Toriola's (2010:104) study of 405 children aged six- to 15-years, from Swaziland, also indicated that 19% of boys and 8% of girls had a negative perception towards PE and school sports, and that 44.2% of girls and 26% of boys had low self-perceptions of competence. Van Biljon and Longhurst (2010:15) state that there is a relationship between

children's perception and PA participation: children with high perception are more eager to participate in PA whereas children with low perception will choose not to be physically active.

In a recent study by Chen and Hypnar (2015:192) on 1 131 Grade 3 to Grade 5 learners from the USA, the relationship between attitudes and motivation toward PA was determined. The results of the study indicated that factors such as being intrinsically motivated, and if the learners' psychological needs are met during PE classes, have an impact on their positive attitudes towards PA (Chen & Hypnar, 2015:205). Previous research by Van Biljon and Longhurst (2010:15) revealed that when children perceive more benefits than barriers, they will have a positive attitude towards PA and will be more physically active. In addition, Morar *et al.* (2014:108) studied 960 children from three suburbs in KwaZulu-Natal, South Africa, and stated that only 45% of their sampled children (aged 10- to 13-years) indicated that sport activities were fun. These researchers also found that the children who indicated that sport activities were fun had a positive attitude toward their PE teachers (Morar *et al.*, 2014:108).

Research by Lazarević *et al.* (2015:90) on 531 (Grade 6 to Grade 7) learners from Serbia determined the attitudes of children towards PE, and found that boys have a more positive attitude than girls, and this positive attitude tend to decline with age. It furthermore concluded that if children have a positive attitude towards PE, they are more likely to engage in PA after school (Lazarević *et al.*, 2015:90). For this reason, teachers should develop high expectations in children during PE which will have a positive effect on their attitudes towards PE and PA (Toriola, 2010:97).

To conclude, the importance of PE and factors influencing PE will be discussed in detail.

2.3. PHYSICAL EDUCATION

Physical Education (PE) not only contributes to develop an active lifestyle by focusing on development of perceptual motor skills, sport and games, growth, development and play, but also contributes towards developing a positive attitude which will lead to being physically fit (Department of Basic Education, DBE, 2011:6). In the following paragraph the importance of PE in PA development will be discussed as well as factors which have an influence on PE.

2.3.1. Importance of Physical Education in physical activity development

PE has one goal and that is to promote PA (Bryan & Solmon, 2012:270). PE in schools plays an important role to develop a foundation for health-promoting behaviour in children (Chen & Hypnar, 2015:192), given that children spend most of their time in school and it reaches the majority of children from different socio-economic statuses (Gao *et al*., 2015:349; McNees, 2012:9; Naidoo & Coopoo, 2012:83; De Meij *et al.*, 2011:1052; Fogel *et al*., 2010:592). PE can be seen as one opportunity for children to engage in PA and improve physical fitness (Gao *et al*., 2015:349; McNees, 2012:9; De Meij *et al*., 2011:1052; Hansen & Sanders, 2010:33), which in turn leads to the development of skills as well as competencies and contributes to increased PA levels (Chen *et al.*, 2014:475). Cairney *et al.* (2012:26) state the important fact that PE can promote positive perceptions towards PA, and contribute to improvements in health (Erfle & Gamble, 2015:33), since they found that the weight status of overweight and obese children improves with daily PE in comparison to children who do not participate in regular PE (Cairney *et al.*, 2012:26). PE in schools plays a significant role in improving PA, children's attitudes towards PA and their choice to be physically active (Kamtsios, 2010:15). Additionally, the South African Curriculum and Assessment Policy Statement (CAPS) purposes that participation in PE provides children the opportunity to learn the health benefits of PA, to improve fundamental and social skills as well as to contribute to the development of positive attitudes (DBE, 2011:7). With this, CAPS outlines the following skills that are compulsory for Grade 6-learners: firstly advanced sequence activities (changing shape, speed and direction); secondly striking, catching and fetching; thirdly rhythmic patterns, coordination and control of movements, and lastly basic athletics activities (DBE, 2011:8). From the above it is clear that PE has a profound effect on physical, emotional, social and cognitive development as well as the lifestyles of children (Bailey, 2006:397). Possible factors that influence PE will now be discussed.

2.3.2. Factors influencing Physical Education

According to CAPS, the time allocation for PE for Grade 6-learners is 90 minutes per week (DBE, 2011:7). Reddy *et al.* (2010:44) report that the second Youth Risk Behaviour Survey (YRBS) found only 68.9% of South African children, aged 13-years and younger have PE on their timetables, whereas some schools (34%) do not offer PE at all. Additionally, Cozett (2014:68) found that 56.6% of children had no PE sessions in comparison to 43.3% who had one

or two PE sessions. This could be ascribed to more than one teacher being responsible for PE and also dissimilarities in teachers' priority level of PE. Some teachers go outside for PE while other teachers who stay in class and continue with the school curriculum. Recently a study conducted by Visagie *et al.* (2017:205) on 406 girls aged nine- to 10-years from North West Province of South Africa, investigated the percentage of girls participating in moderate and high intensity PA, and found that only 68.14% indicated that they are participating in PE compared to 31.37% who don't participate in PE. Morar *et al*. (2014:106) further indicate that 36.3% of 10- to 13-year-old children from KwaZulu-Natal, South Africa do not participate in PE, although it has been indicated on their timetable. This was supported by the results of the HAKSA report card which indicates that PE has not improved from 2014 to 2016 and remains on a D-grading because the average time children spend in PE classes is between 30 to 40 minutes per week (Uys *et al.*, 2016a:267; HAKSA, 2014:14;). A study by Van Deventer (2011:834) concludes that PE teachers are uninformed regarding the time needed for PE due to the fact that the teachers are not qualified for PE. De Vos *et al.* (2016:378) concur with Van Deventer (2011:834) and state that one reason for low levels of PA and higher levels of sedentary behaviour can be associated with the problems South African schools experience with presenting PE. However, Gråstén (2016:8) reports that children with low PA levels are likely not to enjoy PE or perceive it as unimportant.

During PE periods at school, the majority of children spend their time waiting their turn and listening to instructions, which leads to less time being active (Brain Breaks, 2017; Foo *et al.*, 2014:75; Fogel *et al*., 2010:598). In this regard Van Biljon and Longhurst (2010:15) state that the lack of PE in schools precludes children from developing fundamental skills. Additionally, Kamtsios (2010:15) purports that when children don't experience a feeling of fun and success during PA, or when the activities do not meet their abilities, their attitudes and perceptions towards PA will be affected. Pano and Markola (2012:62) concur and state that children aren't given the necessary opportunities to be successful in motor performance during PE and therefore can't develop confidence in their own abilities. A study by Belton *et al.* (2014:132) also found that PE-related factors such as the competitive nature of PE, and lack of choice in PE activities, constituted another barrier for the children not to participate. According to Brain Breaks (2017), PE focuses on team sports rather than on fitness skills, which leads to fewer children participating in moderate PA and more children feeling incompetent in activities. Lazarević *et al.* (2015:94) and Gråstén (2016:8) agree that the contents of PE lessons have an effect on children's attitudes towards PE. They found that the contents relate more to boys' interests and therefore

boys tend to be more positive towards PE than girls. Other factors such as usefulness, competency in PE activities and enjoyment of PE may have a negative effect on children's attitudes towards PE, which leads to a decline in PA. Moreover, Gråstén (2016:7) reports that PE is perceived differently by boys and girls, and PE classes are more important to boys than girls.

Hence there is no doubt that PE teachers play an important role in offering attractive activities as well as a choice in different activities (Bryan & Solmon, 2012:279; Ghofrani & Golsanamlou, 2012:28; Toriola, 2010:97). A study done by Gao *et al.* (2015:353) found that one reason for lower levels of PE participation was that teachers were not passionate about PE and that the promotion of PA was not a priority for them. Various researchers (Morar *et al*., 2014:109; Naidoo & Coopoo, 2012:84; Van Deventer, 2011:834) conclude that PE teachers are not trained and do not have the necessary equipment to teach good PE lessons. Furthermore, Van Deventer's (2011:828) study in 150 primary schools in Eastern Cape, Free State and the North-West Provinces in South Africa indicates that, owing to unqualified PE teachers, children are not exposed to the benefits of PE. Eather *et al.* (2014:84) also report that the instruction and support of the teachers during the PE might have an impact on children to participate. A study conducted by Jacobs (2011:216) on 62 learners in Grade 7 to Grade 12 from the North-West Province in South Africa, examined the practice of PE and how children perceived it. The results of this study indicated that children felt it was not worthwhile and neither teachers nor children took PE seriously, since they saw it as a free period. In accordance, Ghofrani and Golsanamlou (2012:28) state that PE do not meet the needs of the children and should be reviewed urgently. This is supported a study conducted by Foo *et al.* (2014:79) on 18 10-year-old children from Malaysia. These researchers' results indicated that there was no improvement in these children, and concluded that PE doesn't have satisfactory duration and frequency. Other factors such as lack of resources and facilities as well as lack of time in school curriculum have a negative influence on PE (Cozett, 2014:82).

Kriemler *et al.* (2011:925) conducted a systematic review regarding the improvement of PA and fitness in children. These researchers reported that if the quality of PE and instruction improved, as well as the amount of time spent on higher intensity activities, the PE lessons would have more physical benefits. Furthermore, Pano and Markola (2012:64) and Kamtsios (2010:15) conclude that PE programmes should be developed to address both genders' interests and needs in order to ensure that children have enough opportunities to develop motor skills and performance. Fairclough *et al.* (2012b:155) conclude that to promote PA through PE, teachers

should focus on improving children's perceptions by improving their ability to perform the activity, their self-efficacy and enjoyment. Furthermore, including a variety of based on choice as well as specific, positive and motivational feedback during PE lessons will contribute to the increase of PA participation in PE. Lazarević *et al.* (2015:96) concur, stating that PE instructions/teaching can assist in the development of an active lifestyle.

It is clear from the above mentioned factors there is a need for intervention programmes to address the problem of inactivity and to enhance PE programmes; subsequently different intervention programmes will be discussed in detail.

2.4. INTERVENTION PROGRAMMES

In the last few years, there has been a growing interest in intervention-based programmes to address the problem of obesity and physical inactivity. In the following section school-based intervention programmes as well as technology-based intervention programmes will be discussed in detail.

2.4.1 School-based intervention programmes

The school setting has been identified as the ideal place for intervention programmes to address PA, given that children spend most of their time in school and it reaches the majority of children from different SES (Gao *et al.*, 2015:349; McNees, 2012:9; Naidoo & Coopoo, 2012:83; De Meij *et al.*, 2011:1052; Fogel *et al.*, 2010:592). Several researchers have studied the effect of school-based intervention programmes on PA levels and physical fitness abroad and in South Africa (Dallolio *et al.*, 2016:1026; Uys *et al.*, 2016b:55; Eather *et al.*, 2014:83; Ling *et al.*, 2014:247; Tian *et al.*, 2014:1707; Walter, 2014:360; Sacchetti *et al.*, 2013:639; Naidoo & Coopoo, 2012:78; Walter, 2011:787; Draper *et al.*, 2010:14; Killough *et al.*, 2010:304).

In this regard, a study conducted by Killough *et al.* (2010:304) on 32 Grade 5 and 6 learners from Ontario, Canada, studied the effect of a 12-week school-based obesity prevention programme (pause-to-play) which was conducted three times per week. These researchers found that the perceptions of the different teachers during this programme were positive, and the teachers indicated that this was a much needed and successful programme with numerous

benefits such as: promoting a healthy lifestyle, a variety of different physical activities, and the children were more engaged, energetic and confident in their school work. Children's perceptions of the "pause-to-play" programme included that it was fun, they wanted to continue with the programme and they wanted to be physically active rather than to sit and watch television. Furthermore, it was found that this programme improved the children's fitness levels and body composition. However, it was indicated that teachers did not have enough time for the programme, which might have had an effect on the children's enjoyment of the programme and their attitudes towards sedentary behaviour (Killough *et al.*, 2010:309).

A study conducted by Dallolio *et al.* (2016:1026) investigated the effect of a one year PE intervention on the motor skills, physical fitness and anthropometric variables of 241 children aged eight- to 10-years from Emilia Romagna, Italy. The experimental group participated in moderate to vigorous PA four times per week for one hour. The control group continued with their standard PE lessons twice weekly for 50 minutes. The results indicated that physical fitness skills (speed, agility, etc.) showed great improvements, but only in boys, and suggested that PE programmes should be adjusted to suit all participants (Dallolio *et al.*, 2016:1026). In another study on 356 Grade 6-learners from Klaipeda, Lithuania, the effect of non-formal PE (e.g. dance, sports, etc.) on the physical fitness during or after school has been studied (Šarkauskienė *et al*., 2016:45). It was expected from the experimental group to participate in non-formal PE at least once a week for one to two hours, while the control group went on as usual and didn't participate in the non-formal PE lessons. The results indicated that there was a significant improvement in boys' cardiovascular fitness, upper body and abdominal strength, and endurance as well as explosive leg power when compared to the control group, whereas the girls' abdominal strength and endurance also improved significantly.

The effectiveness of a two year school-based intervention programme in improving physical abilities and behaviour on 521 children aged eight- to nine-years (and after a two year follow-up 10- to 11-years) in Italy was studied by Sacchetti *et al.* (2013:639). The aim of this study was to increase PA of primary school learners by using integrating educational strategies that included schools, public figures and sport associations. It was expected from the control group to continue with their PE lessons twice weekly, whereas the experimental group had to participate in daily moderate to vigorous exercises for 30 minutes as well as PE lessons twice per week. These researchers found that the control group's daily PA did not improve in comparison to the intervention group who demonstrated a significant difference in PA habits. It was also indicated

that both groups' motor performances improved; however the intervention group's improvements were higher in comparison to the control group. A study by Eather *et al.* (2014:83) on 48 children aged 10- to 12-years from Australia, studied the efficacy of an eight-week "fit-4-fun" school-based physical fitness intervention programme on the health-related fitness of these children. The intervention programme included three components: 1) curriculum programme where the children participated in health and PE lessons one day per week for 60 minutes (to improve children's knowledge and skills with regards to health-related fitness), 2) family partnerships where the children had to participate in activities at home with their families four times a week for 20 minutes (children select from a variety of activities which improve muscular and cardiorespiratory fitness and flexibility), and lastly the school environment (children participate in optional fun activities, fitness challenges and games during lunch or recess). Moreover, it was expected from the control group to participate in their normal health and PE lessons one day per week for 60 minutes. The results of the study indicated increased levels of the health-related fitness skills, especially muscular fitness and flexibility, whereas children's attitudes towards physical fitness did not change over time, due to the short period of the programme. However, the programme did have a positive effect on the children's self-efficacy and motivation to engage in PA in the future. In addition, Ling *et al.* (2014:247) studied the effect of a healthy lifestyle school-based intervention programme which was conducted over a five month period, four times per week, on 1 508 learners (Grade K to Grade 5) in four rural elementary schools from Kentucky, USA, and they found that this intervention programme increased the percentage of children meeting the PA recommendations, and also increased PA levels over time. Moreover, it was also indicated that this intervention programme can easily be integrated in the daily routine of schools. However, more research will be necessary to study the long-term effect of this programme (Ling *et al.*, 2014:247).

In South Africa several intervention programmes were developed to address the problem with regard to inactivity (Uys *et al.*, 2016b:55; Naidoo & Coopoo, 2012:75; Walter, 2011:787). Naidoo and Coopoo (2012:75) studied the impact of an 18 month school-based intervention programme on 798 children aged 10- to 15-years from 11 schools in KwaZulu-Natal, South Africa. The intervention programme was designed to introduce various methods of PA that were integrated in the schools' curriculum where trained teachers lead the intervention activities daily. The results indicated that there was an overall increase in PA participation and that teachers presented effective PA lessons when they had the necessary training. A more recent study by Uys *et al.* (2016b:55) studied the effect of the Health kick school-based intervention programme

on 3 126 learners from Grade 4 to Grade 6 over a three year period in Western Cape Province, South Africa. The aim of the study was to determine the effect of a daily health promotion programme which targeted healthy eating, PA and attitudes of primary school children. They reported that the low intensity intervention programme had no effect on the children's fitness levels or attitudes; however, it increased short-term PA participation as well as core strength.

Previous research by Draper *et al.* (2010:14) on 39 teachers and 508 learners (Grade 4 to Grade 6) from 5 different schools in Alexandra, South Africa aimed to evaluate the Healthnutz PA programme in schools. The programme included non-competitive and fun activities as well as health education during their PE lessons once a week. It was expected from the teachers to complete a questionnaire, take part in focus group discussions and to receive Healthnutz training prior to the intervention to lead the programme at the different schools. The training covered the following topics: 1) growth and motor development of children, 2) benefits of PA, 3) medical conditions and 4) PA lesson plans. The children completed a questionnaire to determine their attitudes toward PA as well as their physical fitness, using the EUROFIT test protocol. The results from this focus group discussions reported that the programme had a positive impact on the children and they enjoyed the activities. The programme further raised awareness about the importance of PA, but it was difficult to fit the programme into their timetables. Other obstacles were teachers who did not implement the programme, teachers who were not motivated, and teachers having difficulty in controlling big groups, insufficient equipment and insufficient space. The children's PA intervention results indicated that the four month participation in this programme made a significant difference on their self-efficacy pertaining to PA, their fitness levels, knowledge regarding PA, and improved their attitudes towards PA. Unfortunately the programme was also no longer implemented at these schools. If it had, it would have changed the culture of PA. Moreover, further research is necessary to investigate the sustainability of the programme (Draper *et al.*, 2010:14).

In another study, the effect of a low-cost in-school intervention programme, designed to encourage free play during daily lunch breaks for six-weeks, was studied (Walter, 2014:360). The study focused on 79 children aged eight- to 12-years from three disadvantaged schools in Port Elizabeth, South Africa, where PE was neglected. The results indicated that there had been a significant decrease in sedentary behaviour in Grade 3 boys, whereas no significant difference manifested regarding the decrease in sedentary behaviour for the Grade 4, 5 and 6 learners. Walter (2014:360) further indicated that the boys (47 minutes) of all grades engaged in more

moderate vigorous PA than the girls (38 minutes) after the completion of the intervention programme. In addition, teachers' feedback of the intervention programme included comments that the intervention had a positive effect in the classroom and children engaged in more PA before, during and after school. However, some limitations of this study were that the sample size was too small and that intervention period of six-weeks was too short. A study conducted by Tian *et al.* (2014:1707) studied the effect of a 12-week PE intervention programme on physical and motor fitness on 110 Grade 7-learners aged 12- to 13-years from two primary schools in Potchefstroom, South Africa. The children from the experimental group participated in an enhanced PE programme for 60 minutes once a week that was presented by specialized PE teachers, whereas the control group continued with their usual PE lessons once a week for 60 minutes that was presented by teachers who had governmental training. The results of this study indicated that the enhanced PE programme had a significant effect on the children's physical and motor fitness, whereas the children from the control group indicated no significant differences. However, different results were noted for the four experimental groups, which could be ascribed to the different teaching styles of the four teachers, as well as the period of the intervention programme that might have influenced the results of this study.

More recently the research focus has changed from PA school-based programmes to technology-based intervention programmes. Different intervention programmes will be discussed.

2.4.2. Technology-based intervention programmes

Over the past few years several researchers have studied the effect of technology-based intervention programmes on PA levels (Baert, 2014:3; Tumynaitė *et al.*, 2014:57; Gao, 2013:3; Fogel *et al*., 2010:598), as well as the benefits of incorporating technology with PA. Active video gaming intervention has been designed to use the effect of video games to increase PA, where the child's movement of his/her body replaces the buttons of normal video games (Adkins *et al*., 2013:576; Best, 2013:72; Gao, 2013:3; Fogel *et al.*, 2010:592).

Exergaming is technology that allows participants to use motor movements to imitate the PA on the screen. A study conducted by Fogel *et al.* (2010:592) studied the effect of exergaming on PA among inactive children to determine whether inactive children will spend more time participating in PA in exergaming or in normal PE lessons. It was expected from children to rotate between 11 stations with different exergaming equipment (WII^{TM} Dance Dance Revolution

[DDR®], cycling game, tennis, boxing, WII™ basketball and iTech fitness) during PE lessons twice a week for 30 minutes. Four participants aged nine-years were selected from a primary school in Florida, USA, where the teacher conducted both the PE and exergaming classes. The results of this study indicated that PA levels was higher for all four participants when comparing to normal PE lessons, however, it could be due to the fact that the activities was new.

Gao (2013:3) studied the effect of a nine month DDR® programme on 107 learner's (Grade 4 and 5) PA levels and academic performance from the Mountain West region, USA. The experimental group (Grade 4) had to participate in the DDR® programme three times per week during recess for 30 minutes, whereas the control group (Grade 5) did not participate in any structured exercise programme. The DDR® programme combines physical dancing and fast-foot movements on the dance pad, where the participant should imitate the patterns on the screen. These researchers reported that the experimental group's daily PA levels increased in comparison to the control groups who had a decline in their PA levels. However, it was not possible to study the effect that age had on the results. In another study, Adkins *et al.* (2013:578) examined the influence of a seven-week (twice a week for 30 minutes) before-school dance exergaming programme (WII™ DDR® and WII™ Just Dance®) to improve PA levels of 232 children aged seven- to 10-years from Nebraska, USA. The children were divided into four different groups; 88 children participated in a running club, 53 children participated in Just Dance® programme (imitate the dance routine by holding the WII™ console), 46 in DDR® programme and 45 children participated in no intervention programmes. No significant difference between the different groups' total daily moderate to vigorous PA levels as well as the total daily sedentary time could be found. Although, Adkins *et al.* (2013:584) are of the opinion that these children's PA did increase during the course of the intervention, their PA declined during the remainder of the day.

A study by Hansen and Sanders (2010:34) explored what children experience when participating in an eight-week active gaming programme twice a week. The programme consisted of the follow gaming stations: 1) DDR®, 2) Virtual Bicycles (imitate on-screen bikes which includes steering, speed turn etc. by using game controllers), 3) Gamercize, 4) XrBoards (consist of a balance board as a controller where participant imitates different outdoor activities such as snowboarding), 5) WII™ and Xavix Sports (by using the controllers the participant can play different sports such as bowling and boxing) and lastly 6) Martial arts simulators (participant can punch, kick or tap various towers in the game) during their normal PE lessons. The study

focused on six Grade 5-learners from southeast USA and reported that the learners in the experimental group indicated they enjoyed active gaming, the social interaction, and the fact that they could choose which activities they wanted to play and how long they wanted to play it. These researchers further reported that the children had a continuous interest in participating in active gaming and it made PE lessons more enjoyable for them.

However, more recently a study conducted by Azevedo *et al.* (2014:953) on 497 children aged 11- to 13-years from England, UK, aimed to determine the effect of dance mat systems on PA over a 12 month-period, and found that there was a decrease in light PA (10%) and an increase in sedentary time in the intervention group, whereas the control group indicated an increase in PA (3%). This result could be ascribed to limited data on PA at the follow-up session with the accelerometers, and it could be that children lost interest as well as because of the long period between measurements. However, there were improvements in weight, BMI and some components of health-related quality of life (psychological well-being, independence and parent relations) in the experimental group. No changes were noted in physical fitness, physical well-being and peer and social support. Ma and Qu (2016:100) studied the effect of a three month exergaming intervention programme for three times per week for 30 minutes per session on the hand-eye-coordination of 18 children (aged 11-years) from Hong Kong, China, where it was expected from the children to choose three different exergames (Sport Rival, Boom Ball, Shape Up and Just Dance®) to participate in. The results of this study indicated that exergaming can contribute to hand-eye-coordination development. However, no control group was included, and so it was unknown whether other factors could have had an effect on hand-eye-coordination development.

Similarly, the effect of exergaming on 30 overweight and obese children (nine- to 12-years) from Zululand, South Africa, was studied by Van Biljon and Longhurst (2012:986) to determine whether a six-week exergaming intervention can help obese children to function more effectively in their daily activities. The programme included Nintendo WII™ games such as aerobics, boxing and hula hoop games, where it was expected from the participants to play 15 minutes at each station, three times per week for 30 minutes. The results indicated that after a six-week exergaming programme, children in the experimental group's fitness had improved in comparison to the control group; however, no changes in speed, agility and balance were noted. In addition, Dickinson and Place (2014:2) studied the effect of Nintendo WII™ on physical fitness skills of 100 Autism children aged five- to 15-years from England, UK. The experimental

group played Nintendo WII™ three times per week for 15 minutes, as well as their normal PE lessons twice weekly for 45 minutes, whereas the control group only participated in their PE lessons. The result of this study for the experimental group demonstrated a significant improvement for shuttle run, cardiovascular fitness and bleep test, broad jump as well as sit-up; however flexibility only indicated a slight increase. In contradictory, the control group only indicated improvement in flexibility (Dickinson & Place, 2014:2).

A study conducted by Stradley (2010) on 8 000 children from North Carolina, evaluated the HOPSport Brain Breaks® programme. The results showed that boys are more active than girls during normal PE lessons, but when the HOPSport Brain Breaks® programme was used, girls, overweight and obese children increased their moderate to vigorous activity more than boys. The results of this study further indicated that during normal PE lessons 38% of healthy, 34% overweight and 29% of obese children participated in moderate PA in comparison to the HOPSport Brain Breaks® programme where, 50% of healthy, 48% of overweight and 45% of obese children participated in moderate PA. Furthermore, these children participated in more vigorous PA when the HOPSport Brain Breaks® were used than during normal PE lessons where healthy children improved their participation from 6% to 13%, overweight children 3% to 9% and obese children 2% to 6%. Stradley (2010) concluded that when children don't participate in HOPSport Brain Breaks® programme, sedentary behaviour is higher (35% of healthy children and 36% of overweight and obese children) in comparison to when children participate in HOPSport Brain Breaks® (21% of healthy, 22% of overweight and 23% of obese children were sedentary). It was further concluded that HOPSport Brain Breaks® use time more efficiently than normal PE lessons (Stradley, 2010).

More recently, research done by Tumynaitė *et al.* (2014:57) at a primary school in Kaunas, Lithuania, where the effect of a three month HOPSport Brain Breaks® intervention programme on 113 learners' (Grade 1 to Grade 4) physical fitness and sedentary behaviour was determined. The children of this intervention were expected to watch videos based on PA and then performed the exercises that were demonstrated on the video. The results indicated that physical fitness did not improve after the intervention; however, all forms of sedentary behaviour reduced. Additionally, 387 learners (Grade 4 to Grade 8) from North Carolina, USA, were selected to participate in the study to determine whether children were more physically active in PE lessons where they used the HOPSport® programme (West & Shores, 2014:21). The results indicated that children participating in the HOPSport® programme spent more time in moderate to

vigorous PA, in comparison to when they participated in normal PE lessons. Furthermore, it was noted that both boys and girls indicated an increase in PA levels, where the girls had a greater increase than boys. Learners in the lower grades (Grade 4 and Grade 5) were considerably less active than the learners in the older grades (Grade 6 to Grade 8). Grade 6, 7 and 8 learners improved their moderate PA from 36%, 29% and 28% to 47%, 45% and 47% respectively. Furthermore their vigorous PA improved from 4%, 3% and 3% to 12%, 9% and 8% respectively. Limitations included aspects such as teachers' experience with different activities as well as whether children's interest would fade, which might have an effect on sustainability. Further research was done to determine the effect of HOPSport Brain Breaks® on primary school children's perception of and attitudes towards PA (Emeljanovas *et al.,* 2014:331). The study was conducted on 181 learners in Grade 1 to Grade 4 from Kaunas, Lithuania, where it was expected from the experimental group to participate in HOPSport Brain Breaks® programme daily for five to nine minutes over a period of three months. The results indicated that the experimental group's perception of and attitudes towards PA improved over the three month period in comparison to the control group who reported lower scores (Emeljanovas *et al.,* 2014:331). In accordance, Uzunoz *et al.* (2017:2) also conducted a study in Turkey, to determine the effect of HOPSport Brain Breaks® programme on 300 learners' (Grade 3 to Grade 5) attitudes towards and beliefs about PA over a four month period. Both the control and the experimental group completed the APAS questionnaire before and after the intervention. The experimental group participated daily in HOPSport Brain Breaks® online programme for three to five minutes in their classrooms whereas the control group did not. The results indicated that participation in the HOPSport Brain Breaks® online programme significantly improved the experimental group's perceptions, attitudes and motivation to be physically active as well as their academic performance, whereas the improvements within the control group were not significant (Uzunoz *et al.,* 2017:2).

The effects of exergaming on attitudes toward PA were studied by Lwin and Malik (2012:757) on children aged 10-years and pre-adolescents aged 12-years from Singapore. The six-week intervention programme was conducted once a week during PE lessons and lasted 45 to 60 minutes. The participants from each age group were assigned to PE lessons with exergaming or PE without exergaming. The results reported that the PE lessons with exergaming improved the participant's attitudes toward PA and their intention to exercise; however the 12-year-old children's attitudes improved to a lesser extent when compared to the younger group (Lwin & Malik, 2012:757). More recently a study was conducted by Lwin *et al.* (2016:972) in Singapore

to investigate the effect of exergaming and health education messages on the attitudes towards PA of children and adolescents aged eight- to 17-years. The programme took place over a seven-week period and consisted of 12 sessions where each session was one hour long. The participants were divided in three different groups: 1) the competitive group were expected to play Xbox Kinect and compete with other children; 2) the non-competitive group could play Xbox Kinect and progress on their own terms, and lastly 3) the control group participated in PE without exergames. Additionally, the intervention programme incorporated intrinsic (the internal factors that motivate one to be physically active) and extrinsic (the external factors that represent the benefits to be active) messages by means of brochures containing characters doing sports. The results from this study indicated that the elementary school children's attitudes towards PA were more positive in comparison to the control group, whereas the competitive group reported more positive attitudes when they were exposed to intrinsic messages and the non-competitive group indicated positive attitudes when they were exposed to extrinsic messages. Furthermore, the adolescents from junior high school indicated no improvement in attitudes in either the competitive or non-competitive group; however, adolescents in the control group who received no health education messages reported improved attitudes toward PA. This can be ascribed that adolescents believe they can determine their own behaviour and what they do in their free time (Lwin *et al.,* 2016:975).

In conclusion, it is clear from the above intervention programmes, that exergaming had a positive influence on children's participation rate during the sessions; furthermore higher levels of PA were seen during recess and exergaming than in the normal PE lessons. In accordance, school-based intervention programmes also proved to have a positive effect on PA levels; however, more research is needed to study the long-term effect of this intervention (Ling *et al.,* 2014:247) as well as its sustainability. HOPSports Brain Breaks® programme can also contribute to the get children to be physically active again by increasing their heart rate and improving important motor skills (Moving minds, 2017). Additionally HOPSports Brain Breaks® focuses on to teach children from all ages and fitness abilities the correct techniques (Moving minds, 2017). The above intervention programmes leave no doubt that more research is necessary to determine the effect of technology-based intervention programmes on South African children's PA levels, as well as the effect of technology-based intervention programmes on their attitudes towards PA.

2.5 SUMMARY

The decline of PA is a worldwide concern which leads to the prevalence of overweight and obesity. There are various factors influencing children not to be physically active, and these are especially prevalent in children between nine- and 12-years. Some of these factors include sedentary behaviour, attitudes towards PA and insufficient physical fitness skills.

Physical fitness and activity is a great contributor to a healthy lifestyle and are associated with many health benefits such as decrease in mortality and coronary heart diseases. The recommendation for children is at least 60 minutes or more of PA three to five times per week. However, PA levels decrease with age and don't comply with the daily recommendation. South African children spend less than 20 minutes per day being active, where boys tend to be more physically active than girls and overweight and obese children. Factors which have an influence on PA levels are sedentary behaviour and children's attitudes towards PA. Children tend to be more sedentary before and after school as well as during weekends, and girls have the tendency to engage in more sedentary activities than boys. Overall, children prefer to play inside and screen based activities, which leads to insufficient development of motor skills and fitness. Other factors that contribute to sedentary behaviour are lack of time, children feel unsafe and children's attitudes towards PA. Children's attitude toward PA plays an important role whether children will choose to be physically active or not, and can be ascribed to what motivates children to be active, whether they have the necessary skills to perform the activities, their parents' influence and SES. Boys are more likely to have a positive attitude towards PA than girls, and this could be because activities are more related to boys' interest than girls'.

PE can contribute to address the concern of overweight and obesity, physical fitness skills as well as PA levels in children, because it reaches the majority of children. However, PE programmes are not effective and do not meet the needs of children. Moreover, the enjoyment, usefulness and competency to participate in PE activities have an impact on children's attitude towards PA.

School- and technology-based intervention programmes showed positive effects on PA levels and physical fitness skills. However, the sustainability and long-term effects of the different intervention programmes need more research on how to improve these. A combination between

these methods could have more long-term and positive effects on both PA levels as well as children's perception towards being physically active.

In conclusion, obesity and inactivity have shown a dramatic increase over the past few years, where South Africa has been identified as one of the countries which has the highest childhood obesity rates. With technology that forms part of everyday life, it could contribute towards addressing this problem. However, little research has been done in South Africa to study the effect of technology-based intervention programme on PA on children.

Subsequently Chapters 3, 4 and 5 will further scrutinize these problems and provide statistics that could contribute to compile more effective intervention programmes for overweight/obese children as well as children who is inadequately active.

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CHAPTER 3

The effect of a three month HOPSports Brain Breaks® intervention programme on the attitudes of Grade 6-learners towards physical activity and fitness.

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Running Head: Effect of Brain Breaks on attitudes towards physical activity

The effect of a three month HOPSports Brain Breaks® intervention programme on the attitudes of Grade 6-learners towards physical activity and fitness.

Abstract

Negative attitudes towards physical activity (PA) have been reported to have an influence on the PA levels of children and the choices they make to be physically active or not. Research also indicated that children's PA levels are more prevalent to decline between the ages of 12- to 15-years. This study investigated the effect of a three month HOPSports Brain Break® intervention programme on children's attitudes towards PA and fitness. Attitudes towards PA were assessed by means of the Attitudes towards Physical Activity Scale (APAS) questionnaire in children between the ages of 11- to 12-years. The experimental group consisted of 75 children (44 boys and 31 girls) with a mean age 11.4 years (±0.54) and 39 children (12 boys and 27 girls) for the control group with a mean age of 11.71 years (± 0.49). The results indicated that there were no significant differences between the two group's attitudes towards PA and fitness with the pre-test. However after the intervention programme there was a significant difference with a large effect size ($d \geq 0.8$) which includes the attitudes towards the benefits of PA ($\alpha = .70$; $d = 1.13$), importance of PA ($\alpha = .65$; $d = 0.63$), self-perception of physical fitness ($\alpha = .86$; $d = 0.77$) and their attitudes towards support in the environment and their interest for PA ($\alpha = .83$; $d = 1.25$). Recommendations from this study are that more focus should be on 12-year old children because the decline in PA levels is more prevalent and their attitudes are more influential as well as to create opportunities where children can be equally active.

Keywords: Children, physical activity levels, barriers to physical activity, fitness, Brain Break

CHAPTER 3
THE EFFECT OF A THREE MONTH HOPSPORTS BRAIN BREAKS® INTERVENTION PROGRAMME ON THE ATTITUDES OF GRADE 6-LEARNERS TOWARDS PHYSICAL ACTIVITY AND FITNESS.

3.1 Introduction

The problem of physical inactivity does indeed exist; not only in the rest of the world (Belton, O'Brien, Meegan, Woods & Issartel, 2014; Robbins, Pfeiffer, Wesolek & Lo, 2014; Lindelof, Nielsen & Pedersen, 2012; Okely, Booth & Chey, 2004), but also in South Africa where it has been indicated that South African children are not sufficiently active (Monyeki, 2014). Although the Healthy Active Kids South Africa (HAKSA) report card studied the health status in children and reported that South African children's overall physical activity (PA) levels had improved from a D grade in 2014 to a C grade in 2016 (Uys et al., 2016a; HAKSA, 2014), it was reported that more than half of the indicators had not improve from 2014 (Uys et al., 2016a). Furthermore, Uys et al. (2016a) graded physical fitness and motor proficiency separately, and graded each with a D. Physical fitness and PA play important roles in a child's life, and can be ascribe that physical fitness is an important measure of the performance of PA (Ortega, Ruiz, Castillo & Sjöström, 2008) whereas PA is an important contributor to a healthy lifestyle and leads to many benefits such as a decrease of morality and coronary heart diseases (Center of Disease Control [CDC], 2015; Monyeki, 2014; Malina, 2012; Du Toit, Pienaar & Truter 2011; Walter, 2011).

Various researchers concur that children's PA levels tend to reach a peak at age 12- to 14-years, and then start to decline (Cozett, 2014; Dentro et al., 2014; Malina, 2012). Participation in PA decreases with age, where 42% of six- to 11-year-old children meet the daily recommendation in comparison to only 24.8% of children aged 12- to 15-years. This decline is more prevalent in 13-year-old girls (19%) than boys (34%) (Cozett, 2014; Dentro et al., 2014; American College of Sport Medicine [ACSM], 2011). Several factors have been identified which influence PA levels, such as: a sedentary lifestyle, not enough time, weather, lack of equipment, insufficient skills, lack of interest and safety (Martin, Ameluxen-Coleman & Heinrichs, 2015; Zhang, Thomas & Weiller, 2015; Finn & McInnis, 2014; Hornby-Turner, Hampshire & Pollard, 2014; Monyeki, 2014; Shirinde, Monyeki, Pienaar & Toriola, 2012). Accordingly, sedentary activities, which include screen-based activities and video games, have increased among children, which results in less time to be physically active (Martin et al., 2015; Finn & McInnis, 2014; Monyeki, 2014; Warburton, 2013). Moreover, Hornby-Turner et al. (2014) add

that fear of playing outside because of the unsafe environment and busy streets were another barrier to be physically active. In addition, these researchers conclude that physical fitness, sport and motor skills contribute to children's participation in PA (Zhang et al., 2015; Niven, Fawkner, Knowles & Stephenson, 2007) and also have an effect on children's confidence in their skills (Humbert et al., 2006). Woods, Tannehill, Quinlan, Moyna and Walsh (2010) found that 10- to 12-year-old girls (15%) and boys (20%) indicated that they didn't participate in sport because they didn't have enough time. Additionally, being made fun of, not being included or being picked last as well as PA being fun, influence children to be physically active (Humbert et al., 2006). Other barriers such as previous PA experiences as well as their motor abilities have been reported to have an effect on children's attitudes and perceptions, and according to various researchers this could determine whether they will be physically active or not (Belton et al., 2014; Lindelof et al., 2012; Shirinde et al., 2012).

Research by Mok et al. (2015) defines attitude as a measure of behavioural change which has the ability to either encourage or discourage children. Accordingly, Merriam-Webster (Attitude, 2015) defines attitude as a way someone feels or thinks, that has the ability to affect their behaviour. Perception on the other hand can be defined as how you learn to understand or notice things by using your senses (Perception, 2015), or according to Oxford dictionary (Perception, 2016) how things are interpreted. Previous research indicates that PA is related to self-perception which contributes to a person's self-esteem, while attitude is how someone feels or thinks about PA (Fairclough, Boddy, Ridgers & Stratton, 2012; Niven et al., 2007). Mok et al. (2015) concur, and state that the way children feel about PA will have an effect on whether or not they will be physically active. Additionally, a study by Finn and McInnis (2014) on Grade 5 and Grade 6 learners indicated that one of the reasons why PA levels decline is because children have negative perceptions toward PA.

Belton et al. (2014) and Tsang, Kohn, Chow & Singh (2013) indicated that low PA levels are associated with low perceptions of and negative attitudes towards PA. A study by Bryan and Solmon (2012) scrutinized the effect perception and attitudes have on children's motivation to participate in Physical Education (PE) and PA. They found that there was a noticeable decline from Grade 6 to Grade 8 learners, and this was determined by the amount of steps the children took during PE lessons. Previous research indicated that children aged 11- to 15-years are more vulnerable and are more likely to have negative perceptions (Inchley, Kirby & Currie, 2011). Lazarević, Orlić, Lazarević and Janić (2015) studied Grade 6 and Grade 7 learners' attitudes towards PE, and concluded that boys tend to have a more positive attitude than girls and that these positive attitudes have the tendency to decline as children get older. Seabra et al. (2013)

and Fairclough et al. (2012) furthermore studied the effect gender, weight and socio-economic status (SES) have on attitudes towards PA, and concluded that overweight and obese children tend to have lower perceptions of PA and also that boys and high SES children enjoy being physically active in comparison to girls, overweight and low SES children. Moreover, Kemp and Pienaar (2010) indicate that boys have higher athletic perceptions whereas girls have higher academic and behaviour perceptions, as well as that overweight and obese children's perceptions of athletics are lower when compared to their normal weight peers.

The following studies have been published regarding the effect of attitudes towards PA, but little research has been done to study the effect of intervention programmes on attitudes towards PA in 12-year-old children. Lwin and Malik (2012) studied the effect of exergaming (technology that allows participants to use motor movements to imitate the PA on the screen) on the attitude toward PA of 10-year-old children and pre-adolescents aged 12-years, and concluded that children's attitudes towards PA as well as their intention to exercise improved when they were exposed to exergaming. However, the 12-year-old children's attitudes improved to a lesser extent. Recently, Lwin et al. (2016) studied the effect exergaming and health education messages have on attitudes towards PA of children and adolescents aged eight- to 17-years, and indicated that the younger children were more positive when they participated in exergaming in comparison to the group who continued with normal PE lessons. The adolescents from junior high school showed no improvement in attitudes in either the competitive or non-competitive group (Lwin et al., 2016). In South Africa, Uys et al. (2016b) investigated what effect the Health Kick (health promotion programme which targeted healthy eating, PA and attitudes of primary school children) school-based intervention programme has on Grade 4 to Grade 6 learners, and found that the intervention programmes had no effect on children's fitness levels or attitudes; however, core strength and short-term PA participation increased.

Although limited research has been done on the effect of HOPSports Brain Breaks® on attitudes towards PA, this web-based physical activity video programme can be used as an instant resource before and after school, during break, PE lessons as well as in classrooms. This programme focuses not only on improving the PA levels but also on other key components, such as assisting children to learn and master new skills, motivation, knowledge and self-confidence (Fitness-gaming; 2015; Mok et al., 2015; Uzunoz, Chin, Mok, Edginton & Podnar, 2017). A recent study by Mok (2016) investigated the effect of HOPSports Brain Breaks® on attitudes towards PA and found that children's attitudes towards PA improved. Accordingly, Uzunoz et al. (2017) studied the effect of HOPSports Brain Breaks® on 300 Grade 3 to Grade 5 learners'

attitudes towards PA and found that it had a positive effect on the experimental group's perception, attitude, motivation and academic performance.

The literature indicates that limited research has been done especially in South Africa, on the attitudes of Grade 6-learners towards PA and fitness, as well as on intervention programmes to address negative attitudes. Therefore the purpose of this study was to determine whether a HOPSports Brain Breaks® intervention programme will improve the attitudes towards physical fitness and PA of Grade 6-learners.

3.2 Methods

3.2.1. Study design

This study comprises a convenient sample with a once off cross-sectional design, and a pre- and post-test.

3.2.2. Ethical consideration

Ethical approval was obtained for this study which forms part of the Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU-00003-14-A1). Permission was also obtained from the Department of Education as well as respective schools. Informed consent was obtained from the parents/legal guardians of the Grade 6-learners before participating in the study. A discussion was held to discuss the purpose of this study, as well as to explain what was expected from each learner whose parent(s) gave consent to participate in this study. Each learner also had to give assent before he/she could take part in this study.

3.2.3. Procedure

A formal meeting was arranged with the respective school principals, where the aim of this protocol and study was explained to obtain consent. Letters explaining the aim and protocol of this study were sent to all the Grade 6-learners' parents or legal guardians to obtain informed consent from the parents. All learners whose parents/legal guardians had responded favourably to the consent forms also had to provide assent before taking part in any measurements. Their participation was entirely voluntary, and they could withdraw from the study at any given point. Children whose parents gave consent were expected to complete a questionnaire before and after the intervention programme to determine their attitudes towards

PA, and these were done during school time in their classrooms. The questionnaire consisted of 50 questions. The pre-test was done in March and the post-test in June.

3.2.4. Participants

For the focus of this study, namely the effect of HOPSports Brain Breaks® intervention programme, 114 Grade 6-learners (boys n=56; girls n=58), aged 11- to 12-years were the target population. A convenient sample of three primary schools was identified from similar socio-economic backgrounds. The one school functioned as the experimental group (44 boys and 31 girls), while the second and third schools functioned as the control group (12 boys and 27 girls).

Table 3.1

Total participants in the control and experimental groups

Participants	**Control group**	**Experimental group**
Boys	12	44
Girls	27	31
Total	**39**	**75**

3.2.5. Questionnaire: Attitude towards Physical Activity Scale (APAS)

This self-report questionnaire was developed by Mok et al. (2015) based on Welk's (1999) Youth Physical Activity Promotion (YPAP) model, which is a valid and reliable questionnaire to measure primary school children's attitudes towards, perceptions of and beliefs about various aspects of engagement of PA, with the focus on PA using video games. This questionnaire consists of seven scales. The first section comprises 10 questions, which require the participants to indicate their attitudes towards the benefits of PA. The second section comprises five questions which require the participants to indicate their attitudes towards the importance of PA. Section 3 comprises 11 questions, where the participants have to indicate the contributions of video exercise towards learning in school subjects and about health, whereas Section 4 comprises four questions, where the participants have to indicate their self-efficacy in using video exercises for PA. Section 5 comprises 14 questions, where the participants have to indicate their attitudes towards support in the environment and interest for PA. Section 6 comprises eight questions, which require participants to indicate their self-perception of physical fitness. Lastly, Section 7 comprises

five questions, which require the participants to indicate their personal best goal orientation in PA. The participants have to indicate by choosing only one answer for each question from a four-point Likert scale as follows: 1 = strongly disagree, 2 = disagree, 3 = agree and 4 = strongly agree. This questionnaire indicates a good validity and reliability, according to the Rasch model, ranging from 0.90 to 0.98 and Cronbach's alpha ranging from 0.629 to 0.837 (Mok et al., 2015).

3.2.6. Intervention

A three month HOPSports Brain Breaks® intervention programme was done once a day for three consecutive months. The researchers worked closely with the teachers to choose the videos. The teachers received training on how to choose different videos and to present the programme. The HOPSports Brain Breaks® intervention programme was presented within the framework for PE provided in the CAPS (DBE, 2011). The programme focused, amongst others, on strength, speed, hand-eye and foot-eye coordination, agility and spatial awareness (Brain Breaks, 2017). For this intervention programme the experimental school had access to the Internet to view the online videos. The participants engaged in PA using the online video programmes which should help to improve physical fitness and reduce inactivity. The HOPSports Brain Breaks® video programme was presented every day during school time in their classrooms for five to 10 minutes during the intervention programme. The online video programme has more than 250 videos from which they could choose. The content of the videos includes knowledge about health and training, nutrition, education of social skills, environmental education, dance and fitness (Brain Breaks, 2017; Tumynaitė et al., 2014). The experimental school received login details and a password to use for the online video programme to present the intervention. The control groups didn't have access to any of the videos. Both groups also participated in their normal PE lessons once a week during school hours.

3.2.7. Statistical analysis

In order to process the data, SPSS for Windows (2016) was used. Descriptive statistics including minimum and maximum values, means (m) and standard deviation (SD) of each test variable were calculated (SPSS, 2016). Secondly, to estimate the reliability for the different sections of the APAS questionnaire, the internal consistency was determined by means of Cronbach's Alpha as well as the Inter-Item Correlation between the individualized items in each section. The analysis of the Inter-Item Correlation is provided in Table 3.3 as determined by the

Inter-Item Correlation range discussed by Clark and Watson (1995) and should be between 0.15 and 0.55. Lastly independent t-testing and effect sizes were used to determine the objective of this study, whether participation in a three month HOPSports Brain Breaks® intervention programme will increase the physical activity levels of Grade 6-learners. The critical level of statistical significance was set at $p \leq 0.05$, and to determine practical significance these guidelines were used: $d \geq 0.2$ (small effect), $d \geq 0.5$ (medium effect) and $d \geq 0.8$ (large effect) (Cohen, 1988).

3.3. Results

The descriptive characteristics of the variables between the different groups that were used in this study are displayed in Table 3.2. Table 3.2 indicates that 46 participants (61.3%) of the experimental group were 11-years-old and 27 participants (36.0%) were 12-years. In the control group 10 participants (25.6%) indicated they were 11-years and 29 participants (74.4%) were 12-years. Overall, the experimental group had a mean age of 11.4 years (±0.54) and the control group a mean age of 11.71 years (± 0.49).

Table 3.2

Descriptive statistics of study variables

Variables	**Experimental group**				**Total**	**Control group**				**Total**
Age	**10**	**11**	**12**	**13**		**10**	**11**	**12**	**13**	
N	1	46	27	1	**75**	0	10	29	0	**39**
% within group	1.3%	61.3 %	36.0%	1.3%	**100%**	0%	25.6%	74.4%	0%	**100%**
Mean and SD	**11.4 ± 0.54**					**11.71 ± 0.49**				

Note: N = number, % = percentage, SD = Standard deviation

Table 3.3 indicates that the following sections of the APAS questionnaire had an acceptable internal consistency ($\alpha \geq 0.70$): attitudes towards the benefits of PA; contributions of video exercise to learning in school subjects and about health; self-efficacy in using video exercises for PA; attitudes towards support in the environment and interest in PA; self-perception of physical fitness; personal best goal orientation in PA. However, section two (attitudes towards the importance of PA) indicates $\alpha \leq 0.70$ which could be due to the low number of questions in this section. Furthermore the Inter-Item Correlation for the following

sections falls between 0.15 and 0.55, a range which indicates an average correlation: attitudes towards the benefits of PA; attitudes towards the importance of PA; attitudes towards support in the environment and interest for PA, self-perception of physical fitness; personal best goal orientation in PA, whereas section three (contributions of video exercise to learning in school subjects and about health) and section four (self-efficacy in using video exercises for PA) indicated a large Inter-Item Correlation (Clark & Watson, 1995).

Table 3.3

Inter-Item Correlation between the variables of the APAS questionnaire.

Sections of the Questionnaire	N of items	Mean Inter-Item Correlation	Cronbach's Alpha
1. Attitudes towards the benefits of PA	10	.18**	.70#
2. Attitudes towards the importance of PA	5	.29**	.65
3. Contributions of video exercise to learning in school subjects and about health	11	.60*	.94#
4. Self-efficacy in using video exercises for PA	4	.69*	.90#
5. Attitudes towards support in the environment and interest for PA	14	.27**	.83#
6. Self-perception of physical fitness	8	.43**	.86#
7. Personal best goal orientation in PA	5	.43**	.79#

Note: # = acceptable internal consistency ($\alpha \geq 0.70$) ** = medium Inter-Item Correlation, * = large Inter-Item Correlation

To determine the differences between both groups during the pre- and post-test an independent-sample t-test was conducted and respectively indicated in the different sections of the questionnaire (see Table 3.4). With regard to attitudes towards PA and the different sections of the questionnaire no statistical ($p \geq 0.05$) and practical ($d \leq 0.2$) significant difference was found between both groups before the intervention, except for section two (attitudes towards the importance of PA) which indicated a significant difference ($d=0.40$). However, the results from the post-test indicated a statistical ($p \leq 0.001$) and practical ($d \geq 0.2$) significant difference between the attitudes of the groups, which emphasizes that the experimental group's attitudes towards PA improved practically significantly in comparison to the control group.

As demonstrated in Table 3.4, the different sections of the questionnaire indicate the following statistical ($p \leq 0.05$) and practical ($d \geq 0.5$) differences: section 1 (attitudes towards the benefits of PA; $p \leq 0.001$ and $d=1.13$), section 2 (attitudes towards the importance of PA; $p \leq 0.001$ and $d=0.63$), section 4 (self-efficacy in using video exercises for PA; $p \leq 0.001$ and $d=0.81$), section 5 (attitudes towards support in the environment and interest for PA; $p \leq 0.001$ and $d=1.25$), section 6 (self-perception of physical fitness; $p \leq 0.001$ and $d=0.77$) and section 7 (personal best goal orientation in PA; $p \leq 0.001$ and $d=0.67$). Section 3 (contributions of video exercise to learning in school subjects and about health $p \leq 0.001$ and $d=0.30$) is the only section with medium effect size ($d \geq 0.3$) which indicates there is a significant difference.

3.4 Discussion

This study aimed to determine whether a HOPSports Brain Breaks® intervention programme would improve Grade 6-learners' attitudes towards physical fitness and PA.

The findings of this study indicated that prior to the intervention programme there was no difference in the attitudes of the control group and experimental groups towards PA and fitness, with the exception of section 2 where there were small differences between the two groups' attitudes towards the importance of PA. After completion of the HOPSports Brain Breaks® intervention programme, the experimental group's results generally indicated a statistical and practical significant difference in their attitudes towards PA and fitness in three particular sections, namely attitudes towards the benefits of PA (section 1), self-efficacy in using video exercises for PA (section 4) and attitudes towards environmental support and interest in PA (section 5), which shows a great improvement in their attitudes. A moderate improvement between the two groups after the intervention programme was reported for attitudes towards the importance of PA (section 2), self-perception of physical fitness (section 6) and personal best goal orientation in PA (section 7). Although no similar research could be found on Grade 6-learners the results are in accordance with a study done by Mok (2016) on 2 751 learners from Grade 3 to Grade 5 that represented seven different countries which include: Turkey, Serbia, Croatia, Romania, Poland, Lithuania and South Africa. Additionally the sections with the strongest effect size were section 4 (self-efficacy in using video exercises for PA) followed by section 1 (attitudes towards the benefits of PA) and section 2 (attitudes towards the importance of PA). A study by Uzunoz et al. (2017) found similar results from 300 Grade 3 to Grade 5 learners from Turkey which indicated significant improvements in self-efficacy in using

videos (section 4), personal best (section 7), importance of PA (section 2), self-confidence on physical fitness as well as motivation and enjoyment of PA.

Table 3.4

Significant differences between the experimental and control group with regards to their attitudes towards PA before and after the intervention

		Pre-test					**Post-test**				
Sections	**Group**	**N**	**Mean**	**Std. Deviation**	**p-value**	**Effect sizes(*d*)**	**N**	**Mean**	**Std. Deviation**	**p-value**	**Effect sizes(*d*)**
Attitudes towards the benefits of PA	Experimental	68	3.19	.42	.715	0.07	75	3.72	.29	**≤.001***	**1.13**$^{\#}$
	Control	39	3.16	.42			39	3.19	.47		
Attitudes towards the importance of PA	Experimental	68	3.34	.44	**.051***	**0.40**$^{\#\#}$	75	3.53	.40	**≤.001***	**0.63**$^{\#}$
	Control	39	3.51	.43			39	3.07	.73		
Contributions of video exercise to learning in school subjects and about health	Experimental	68	2.32	.95	.503	0.10	75	2.58	.68	.140	**0.30**$^{\#\#}$
	Control	39	2.42	.55			39	2.38	.70		
Self-efficacy in using video exercises for PA	Experimental	68	2.63	1.11	.610	0.08	75	3.42	.46	**≤.001***	**0.81**$^{\#}$
	Control	39	2.72	.70			39	2.86	.70		
Attitudes towards support in the environment and interest for PA	Experimental	68	3.26	.46	.506	0.13	75	3.60	.37	**≤.001***	**1.25**$^{\#}$
	Control	39	3.19	.48			39	3.07	.43		
Self-perception of physical fitness	Experimental	68	3.23	.57	.284	**0.21**$^{\#\#\#}$	75	3.61	.40	**≤.001***	**0.77**$^{\#}$
	Control	39	3.35	.52			39	3.11	.65		
Personal best goal orientation in PA	Experimental	68	3.39	.58	.197	**0.24**$^{\#\#\#}$	68	3.50	.47	**≤.001***	**0.67**$^{\#}$
	Control	39	3.53	.51			39	3.12	.58		

N = indicates the number of children, $p \leq 0.05$* = significant difference, # = large effect size ($d \geq 0.8$), ## = medium effect ($d \geq 0.5$) and ### = small effect ($d \geq 0.2$)

Pertaining to section 3 (contributions of video exercise to learning in school subjects and about health) of this study, only a small effect size was reported, which could be ascribed to the fact that the control group did not watch the HOPSports Brain Breaks® videos, and for that reason their attitudes did not improve in this section. Moreover the control group indicated no statistical significant differences in the post-test. These results correlate with a study by Eather (2014) who found similar results on 48 children (aged 10- to 12-years) from Australia. These researchers studied the efficacy of an eight-week "fit-4-fun" school-based physical fitness intervention programme on the health-related fitness of these children. The intervention programme comprised three components: 1) curriculum programme where the children participated in health and PE lessons one day per week for 60 minutes (to improve children's knowledge and skills with regard to health-related fitness), 2) family partnerships where the children had to participate in activities at home with their families four times a week for 20 minutes (children select from a variety of activities which improve muscular and cardiorespiratory fitness and flexibility), and lastly the school environment (children participate in optional fun activities, fitness challenges and games during lunch or recess), whereas the control group was expected to participate in their normal health and PE lessons one day per week for 60 minutes. The results of the study reported increased levels of the health-related fitness skills, whereas children's attitudes towards physical fitness did not change over time, due to the short period of the programme. However, the programme did have a positive effect on the children's self-efficacy and their motivation to engage in PA in the future (Eather, 2014). More recent research by Uys et al. (2016b) on 3 126 children (Grade 4 to Grade 6) from Western Cape, South Africa, aimed to determine the effect of a daily health promotion programme which targeted healthy eating, PA and attitudes of primary school children. The results concur with research by Eather (2014) and indicated that the Health Kick school-based intervention programme reported no difference in attitude towards PA over a three year period due to the low intensity of the programme. However, it indicated that there was an increase in short-term PA participation as well as core strength.

In agreement with our study, Christodoulos, Douda, Polykratis and Tokmakidis (2006) studied 79 Grade 6-learners from Greece who were subjected to a health education intervention programme which included PA and health components during normal Physical Education classes twice a week for 45 minutes. The results indicated that these children's attitudes and intention to be physically active improved significantly after the intervention programme. Concurrent with our study's result, similar results were found by a study done by Emeljanovas et al. (2014) on 181 children in Grade 1 to 4 from Kaunas, Linthuania where it was expected from the

experimental group to participate in HOPSports Brain Breaks® programme daily for five to nine minutes over a period of three months. The results indicated that the experimental group's perception of and attitudes towards PA improved over the three month period in comparison to the control group who reported lower scores. Uzunoz et al. (2017) further indicated that after the four month HOPSports Brain Breaks® programme, the experimental group's attitudes towards, perceptions of and motivation to be physically active improved significantly. Herewith, a study conducted by Van Biljon and Longhurst (2010) found similar results on 30 participants (aged nine- to 12-years) from Zululand, South Africa who were divided in three different groups. The experimental group participated in a six week exergaming programme (participants had access to play Nintendo WII™ Fit and WII™ sports), control group A participated in normal television games and control group B continued with normal daily activities. The results of their study indicated that the exergaming programme had a positive effect on the experimental group's attitudes towards PA, whereas the two control groups indicated no effect.

In this current study, a possible explanation for the improvement in the experimental group's attitudes could be that after these children had watched the videos, they made the connection between the importance and the benefits of PA and how it could help them. Another possible reason could be that while children participated in the video exercises, their motor skills improved, and this led to achieve more success in other PA and sport and therefore improved their attitudes towards PA and fitness. Furthermore, the scale that indicated the highest improvement (attitudes towards support in the environment and interest for PA) could be ascribable that the HOPSports Brain Breaks® videos expose children to a variety of different experiences, exercises; health-related themes and sports, which could have stimulated their interest in PA. In addition, the fun element that is incorporated in the HOPSports Brain Breaks® videos could contribute to motivate children to be more physically active and facilitate the children to improve their lifestyle, which in turn could lead to improved attitudes towards PA and fitness.

3.5. Recommendations and limitations

Our study provides valuable results with regards to the effect that HOPSports Brain Breaks® has on children's attitudes towards PA and fitness; however, this study did have some limitations. The limitations that might have had an effect on the results of this study could be that some teachers placed a higher priority on the intervention programme than others, as well as that the sample size was too small.

Further studies are recommended to conduct similar research to prove the positive effect of HOPSports Brain Breaks® on children's attitudes and how it could improve PA and fitness levels. Moreover, more studies should focus on Grade 6 and Grade 7 learners' PA and intervention programmes to address inactivity and improve their attitudes towards PA and physical fitness, as it has been indicated that PA levels decrease from this age and their attitudes are more likely to be negative when compared with younger children. Another recommendation for further research is to study the effects of alternative methods such as, playground equipment, action song videos or music in cases where there is no Internet.

3.6. Conclusion

In conclusion, no other studies could be found that studied the effect of HOPSports Brain Breaks® intervention programme on the attitude towards PA in Grade 6-learners in the South African context. However this study indicated that children's attitudes towards PA and fitness improved significantly which might have an effect on their PA levels. Furthermore, these children learn more about the benefits and importance of PA, how to improve their own goals and personal best, and how their peers feel about being physically active. HOPSports Brain Breaks® is a cost-effective, safe and fun programme where every child has the opportunity to be active no matter which level of motor skills, and where they don't have to wait their turn to participate.

Research on HOPSports Brain Breaks® should not be seen as another intervention programme to address the problem with regard to PA levels, but rather as a new way to incorporate technology to improve children's attitudes towards PA and fitness and increase PA levels. Opportunities should be created where every child can be physically active and enjoy being active, especially Grade 6-learners where the decline is more prevalent.

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CHAPTER 4

The effect of a three month HOPSports Brain Breaks® intervention programme on the physical fitness levels of Grade 6-learners.

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Running Head: Effect of Brain Breaks on physical fitness levels

The effect of a three month HOPSports Brain Breaks® intervention programme on the physical fitness levels of Grade 6-learners.

Abstract

This study determined the effect of a three month HOPSports Brain Breaks® intervention programme on the physical fitness levels of Grade 6-learners. Physical fitness was measured with the EUROFIT test battery. The experimental group consisted of 73 (26 boys and 47 girls) and the control group 49 children (16 boys and 33 girls). Mean age for the total group was 11.92 (±0.36) years. The results indicated that there was a statistically ($p \leq 0.05$) and practically ($d \geq 0.20$) significant difference between the experimental and control group for percentage body fat; stork balance; plate tapping; sit-and-reach; standing jump; sit-ups; 10 x 5m shuttle run and 20m shuttle run between the pre- and post-test. It is recommended that future studies determine the effect of HOPSports Brain Breaks® between genders as well as what effect it will have on academic performance.

Keywords: Physical activity, EUROFIT, children, physical fitness, intervention programmes

CHAPTER 4
THE EFFECT OF A THREE MONTH HOPSPORTS BRAIN BREAKS® INTERVENTION PROGRAMME ON THE PHYSICAL FITNESS LEVELS OF GRADE 6-LEARNERS.

4.1. Introduction

Notwithstanding the numerous health benefits of physical activity (PA) and the role PA plays in a child's life (Monyeki, 2014; Malina, 2012; Du Toit, Pienaar & Truter, 2011), it is still evident that South African children are not adequately active (Monyeki, 2014). Accordingly, the American College of Sport Medicine (ACSM; 2011) states that movement skills, aerobic fitness, muscular strength, body composition, cholesterol, blood pressure, blood sugar and bone health benefit from PA.

Furthermore, research has indicated that PA and physical fitness are beneficial for self-esteem, mood, character building and have a positive effect on anxiety (Monyeki 2014; Wood, Angus, Pretty, Sandercick & Barton, 2012; Ortega, Riuz, Castillo & Sjöström, 2008). Various research studies have been conducted which indicate that children's PA levels increase but reach a peak at the age of 12-years, after which they start to decline (Robbins, Pfeiffer, Wesolek & Lo, 2014; Weinberg & Gould, 2014; Malina, 2012). In this context, research has indicated that there is a positive relationship between inactivity and obesity which negatively impacts the development of children's physical skills (Tucker et al., 2014; Tumynaitė et al., 2014; Truter, Pienaar & Du Toit, 2010). In accordance, De Milander (2011) studied the relationship between PA, motor proficiency and physical fitness on 12- to 13-year-old children and reports that lower motor and physical fitness skills is a result of the decline in PA levels. Also, Stodden et al. (2008) report that without fundamental skills, children will have limited opportunities to be physically active. Another study by Krombholz (2013) indicates that overweight and obese children are to a lesser extent physically active and have inferior motor skills. Van Biljon and Longhurst (2012) concur and state that decreased physical fitness in obese children could be ascribable to the fact that children don't have the motor skills to perform the activities. In addition, Crane, Naylor, Cook and Temple (2015) stated, as children get older they are more likely to opt-out of PA participation when they don't have the skills to execute the activities. However, children's confidence and perception of their own motor skills could also influence their PA participation (Humbert et al., 2006). Other factors include lack of resources and facilities, waiting their turn, listening to instructions; insufficient time in the school curriculum has an influence on PA as well (Brain Breaks, 2017; Cozett, 2014; Foo, Krasilshchikov, Shaw &

Shaw, 2014; Fogel, Miltenberger, Graves & Koehler, 2010).

A study by De Milander (2011) states that, to improve the wellbeing of a child, motor skills development is important because it focuses on the total development of the child. Furthermore, an additional building block that is important for children to be physically active is fundamental movement skills which characterize children's behavioural proficiencies to participate in PA (Okely, Booth & Chey, 2004). Powers and Howley (2007); Center of Disease Control (CDC; 2015) as well as the World Health Organisation (WHO, 2017) define PA as the ability of the musculoskeletal system to execute a movement; which contributes to energy expenditure. In this sense, to have the competence to perform daily PA, tasks and leisure–time activities without exhaustion; outlines the definition of physical fitness (CDC, 2015; Ortega et al., 2008). Moreover, physical fitness is categorized into health-related fitness which is essential in order to be physically active and preclude chronic diseases (ACSM, 2015; Plowman & Smith, 2014), and sport-related fitness which includes skills that contribute to the improvement of athletic and sport performance (Plowman & Smith, 2014; Pienaar, 2012; ACSM, 2011). Health-related fitness is divided into body composition, flexibility, muscular strength and endurance as well as cardiovascular endurance components, whereas sport-related fitness entails speed, agility, balance, power, reaction time and coordination (Gallahue & Ozmun, 2006). Several researchers have studied the effect of intervention programmes on health-related fitness and indicated that intervention programmes can improve physical fitness.

Much research has been done abroad and in South Africa to determine what the impact of school-based intervention programmes is on PA levels and physical fitness of children (Dallolio, Ceciliani, Sanna, Garulli & Leoni, 2016; Uys et al., 2016; Eather, 2014; Ling, King, Speck, Kim & Wu, 2014; Tian, Du toit & Toriola, 2014; Walter, 2014; Sacchetti et al., 2013; Naidoo & Coopoo, 2012; Draper et al., 2010; Killough et al., 2010). In this regard, a study on 32 Grade 5 and Grade 6 learners investigated the effect of a school-based obesity prevention programme, and results indicated that these children's physical fitness levels and body composition improved. However, limited time was devoted to the programme which had an impact on children's enjoyment and attitude towards being sedentary (Killough et al., 2010). Moreover, Dallolio et al. (2016) studied the impact of a Physical Education (PE) intervention programme on the motor skills, physical fitness and anthropometric variables of 241 children (aged eight- to 10-years). The outcome of this study indicated that only the boys' physical fitness skills improved, and recommended that the programme should be adapted to meet all the participants' abilities (Dallolio et al., 2016). In accordance, Šarkauskienė, Derkintienė and Paplauskas (2016) studied 356 Grade 6-learners to investigate the impact of non-formal PE (e.g. dance, sports etc.) on their

physical fitness skills. The results indicated that boys' cardiovascular fitness, upper body and abdominal strength and endurance as well as explosive leg power improved profoundly, whereas the girls only indicated improvement in abdominal strength and endurance.

Eather (2014) investigated the effect of a "fit-for-fun" physical fitness intervention programme on 48 children's (aged 10- to 12-years) health-related fitness. It was found that the health-related fitness skills of these children improved; the results of the study also indicated increased levels of the health-related fitness skills, in particular muscular fitness and flexibility. Conversely, Sacchetti et al. (2013) studied the efficacy of a school-based intervention programme to improve 521 children's (aged eight- to nine-years and after a two year follow-up, 10- to 11-years) physical skills and performance. The results of this study showed that the experimental group's PA behaviour improved significantly, in comparison to the control group who did not improve. It was further indicated that the motor performance improved in both groups, whereas the experimental group's improvements was greater. Moreover, since children spend most of their time with technology, more recently researchers have initiated the investigation of technology-based intervention programmes on physical fitness and PA (Ma & Qu, 2016; Azevedo, Watson, Haighton & Adams, 2014; Dickinson & Place, 2014; Tumynaitė et al., 2014; Gao, 2013; Van Biljon & Longhurst, 2012).

Gao (2013) investigated the effect of a nine month Dance Dance Revolution (DDR®) programme on 107 Grade 4 and 5 learners' PA levels. The results indicated that the experimental group's (Grade 4) daily PA levels increased when compared to the control group (Grade 5) whose PA levels declined. In accordance, Tumynaitė et al. (2014) studied a three month HOPSports Brain Breaks® intervention programme and the influence it had on 113 learners' (Grade 1 to Grade 4) physical fitness and sedentary behaviour. It was found that physical fitness did not show any improvement because of to the short duration (three months) of the programme, whereas overall sedentary behaviour decreased.

Conversely, a three month exergaming intervention programme was studied by Ma and Qu (2016) to determine the effect of hand-eye-coordination on 18 children aged 11-years. It was found that hand-eye-coordination development can improve with exergaming. In another study, an exergaming intervention programme was commenced on 30 overweight and obese children (aged nine- to 12-years) to improve obese children's functionality in daily activities. Physical fitness improved in the experimental group; however, speed, agility and balance did not improve (Van Biljon & Longhurst, 2012). More recently, a study by Dickinson and Place (2014) on 100 children with autism (aged five- to 15-years) determined the efficacy of Nintendo WII™ on physical fitness skill. The experimental group's shuttle run, cardiovascular fitness, bleep test,

broad jump as well as sit-up improved significantly, whereas flexibility increased slightly in comparison to the control group who indicated only improvement in flexibility. Notwithstanding, the HOPSports Brain Breaks® programme could contribute to preclude lower PA levels and physical skills.

In this sense, the literature indicates that more research is necessary to study the effect of HOPSports Brain Breaks® on Grade 6-learners PA levels and physical fitness. This online intervention programme can be conducted during class, during break, as well as before and after school to improve PA levels, active learning and test grades (Fitness-gaming, 2015). Additionally, this technology-based intervention programme incorporates physical, mental and health videos which could contribute to increase PA levels as well as to accomplish new motor skills (Mok et al., 2015).

4.1.1. Purpose of research

Above literature indicates that the effect of PA and fitness has been studied in detail; however limited research in South Africa has been done regarding the effect of technology-based intervention programmes such as HOPSports Brain Breaks®. No research could be found on the South African population in this regard. Keeping this in mind, the aim of this research is to study the effect of a three month HOPSports Brain Breaks® intervention programme on physical fitness levels of Grade 6-learners.

4.2. Methods

4.2.1. Research design

This study is a convenience sample with a once-off cross-sectional design, and a pre- and post-test. This design was chosen to answer the research question: will a HOPSports Brain Breaks® intervention programme affect the physical fitness levels in Grade 6-learners in an experimental and control group?

4.2.2. Participants

For the aim of this study, namely the effect of HOPSports Brain Breaks® intervention programme, the target populations was 114 Grade 6-learners (boys n=56; girls n=58), aged 11- to 12-years. Three schools from similar socio-economic backgrounds in the Tlokwe Municipality district were selected, where one school functioned as the experimental group (26 boys and 47 girls), and the second and third schools functioned as the control group (16 boys and

33 girls).

Table 4.1

Total participants in the control and experimental groups

Participants	**Control group**	**Experimental group**
Boys	16	26
Girls	33	47
Total	**49**	**73**

4.3. Measuring

4.3.1. The European test of physical fitness (EUROFIT)

The EUROFIT test was used to determine the physical fitness of the participants. This test is designed for children aged six- to 18-years, and evaluates various fitness components. These components include cardiovascular endurance; running speed and agility; speed of limb movement; balance; flexibility; explosive leg strength, and abdominal strength, and these were evaluated with the following tests (Skowroński, Horvat, Nocera, Roswal & Croce, 2009):

4.3.1.1. 20 metre (m) shuttle run test. This test evaluated cardiovascular endurance and expected the participant to run back and forth between two marks for as long as possible. The test ended when the participant could not finish the lap in a specific time. The number of laps completed was recorded.

4.3.1.2. 10 x 5m shuttle test. Running speed and agility were evaluated with this test where the participant had to start behind a line and run a distance of 5m as fast as possible. The participant had to repeat this 10 times, and the fastest time was recorded.

4.3.1.3. Plate tapping test. The plate tapping test evaluated the speed of limb movement. It was expected from the participant to tap two plates with the preferred hand as fast as possible until s/he had performed 25 cycles. The fastest time was recorded.

4.3.1.4. Stork balance test. The participant's balance was evaluated with the stork balance test. S/he was expected to stand on one leg for one minute, while the non-supporting foot was placed against the medial side of the supported leg's knee. The participant's total

time was recorded.

4.3.1.5. Sit-and-reach test. The sit-and-reach tested hamstring flexibility and required the participant to sit down with bare foot against a sit-and-reach box and keep the knee fully extended. The participant was then asked to reach as far as possible forward. The better of two attempts was recorded to the nearest half centimetre (cm).

4.3.1.6. Standing long jump test. This test assessed the participant's explosive leg strength. The participant was required to stand behind a line and jump as far as possible with both feet together. The longest attempt was recorded.

4.3.1.7. Sit-up test. The sit-up test was used to determine abdominal strength. The participant had to lie down on his/her back; knees bent at 90^0, with the feet flat and execute as many sit-ups as s/he could in 30 seconds.

4.3.2. Anthropometry

The measurements were taken by a qualified Level 2 ISAK accredited anthropometrist according to the standard protocol proposed by ISAK. The following measurements were taken of the participants: body mass (kg), stature (m) and skinfolds (triceps, subscapular and calf). The participants were weighed and measured in light clothing and without shoes, using calibrated scales and a stadiometer. The BMI was calculated as weight (kg)/height (m^2) and the percentage body fat was measured by calculating the skinfold measurement, using the equation of Slaughter et al. (1988).

4.3.3. Intervention

The participants were assessed before and after the intervention with the EUROFIT test, to determine their physical fitness levels. The HOPSports Brain Breaks® intervention programme was conducted once a day for three consequent months. The researcher and the teachers worked closely to select from the list of various two to five minute videos which included arts (dance and music); fitness skills (cardio and functional fitness); sports (skillastics, cycling, rowing); education (health issues, nutrition and hygiene), and classroom activities (fun fitness, dynamic Physical Education) (Brain-Breaks, 2017). Each video contains a real or animated instructor to demonstrate the different exercises which would contribute to the improvement of children's motor and physical skills (HOPSports, 2017a; Tumynaitė et al., 2014; McNees, 2012). The teacher was trained how to choose different videos and to present the

programme. HOPSports Brain Breaks® intervention programme was presented within the framework for PE provided in the CAPS (DBE, 2011). The programme focused on strength, speed, hand-eye and foot-eye coordination, agility, spatial awareness amongst others (Brain Breaks, 2017). For this intervention programme the experimental school had access to the Internet to view the online videos. The participants followed the online video programmes that helped to improve physical fitness and reduce inactivity. The intervention video programme was presented every day during school time in their classrooms during the intervention. The online video programme has more than 250 videos from which they can choose. The content of the videos includes knowledge about health and training, nutrition, education of social skills, environmental education, dance and fitness (Brain Breaks, 2017; Tumynaitė et al., 2014). The experimental school received login details and a password to use for the online video programme to present the intervention.

4.3.4. Research procedure

Ethical approval was obtained for this study from the Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU-00003-14-A1). Permission was also obtained from the North West Department of Education as well as respective schools. Informed consent was obtained from the parents/legal guardians of the Grade 6-learners before participating in the study. A discussion was held to discuss the purpose of this study, as well as what was expected from each participant whose parent(s) gave consent to participate in this study.

A formal meeting was arranged with the respective school principals, where the aim of this protocol and study was explained to obtain consent. Letters explaining the aim and protocol of this study were sent to all the Grade 6-learners' parents to obtain informed consent from the parents as well as from the Grade 6-learners. Their participation was entirely voluntary, and they could withdraw from the study at any given point. Learners whose parents had given consent were tested to determine their physical fitness, and thereafter they followed a HOPSports Brain Breaks® intervention programme. The intervention programme was done during school time in their classrooms.

4.3.5. Statistical analysis

Data processing was done using the SPSS for Windows Version 24 (2016) and calculated the following descriptive statistics for each test variables: minimum and maximum values, means (m), and standard deviation (SD). Secondly, an independent-samples t-test between the

experimental and control groups' effect sizes was conducted to determine the objective of this study: whether a three month HOPSports Brain Breaks® intervention programme will improve the physical fitness levels of Grade 6-learners. Thirdly, paired-samples t-tests were used, to determine the difference in each group's pre- and post-test. The critical level of statistical significance was set at $p \leq 0.05$, and to determine the practical significance the guidelines of Cohen (1988) were used, namely: d=0.2 (small effect), d=0.5 (medium effect) and d=0.8 (large effect). A two way frequency table was conducted to compare the classifications for the EUROFIT. The statistical significance of Pearson Chi-square was set at $p \leq 0.05$, where phi-coefficient represents the strength of the correlation where Cramer's V of $w \approx 0.1$ indicates a small effect, $w \approx 0.3$ a medium effect and $w \geq 0.5$ a large effect (Stodden et al., 2008).

4.4. Results

Table 4.2 indicates the composition of the sample population of this study. The experimental group was 73 (26 boys, 47 girls) with a mean age of 11.85 (±0.38) and the control group was 49 (16 boys, 33 girls) with a mean age of 12.02 (±0.31). The total group was 122 participants, where 42 were boys and 80 were girls. The mean age for the group was 11.92 years (SD=0.36).

Table 4.2

Descriptive statistics of study variables

Subjects	**N**	**Min**	**Max**	**Mean**	**SD**
Experimental group	73	10.50	13.02	11.85	0.38
Control group	49	11.42	12.70	12.02	0.31
Total group	122	10.50	13.02	11.92	0.36

N=number, Min=Minimum; Max=Maximum; SD=Standard Deviation

To determine the significance of EUROFIT differences between the groups' pre- and post-tests, an independent t-test was conducted. Table 4.3 reports the differences between the groups regarding the different anthropometry and fitness measurements during the pre- and post-test. Regarding the anthropometry measurements in the pre-test it can be seen that the experimental group was statistically ($p \leq 0.05$) younger and shorter than the control group in comparison to the post-test where height only indicated a practical significance. During the physical fitness tests in the pre-test, the experimental group performed statistically ($p \leq 0.05$) and

practically ($d \geq 0.5$) worse than the control group regarding standing long jump (M=137.29 vs. M=148.71), sit-ups (M=15.36 vs. 20.59) and the 20m shuttle run (M=19.22 vs. M=28.53), but better during the sit-and-reach test (M=27.92 vs. M=22.79). To rectify the differences between the experimental and the control group during the pre-test, a post hoc adjustment was done using the Bonferroni method. Table 4.3 further indicate that after the experimental group participated in the intervention programme, the experimental group performed statistically ($p \leq 0.05$) and practically ($d \geq 0.5$) better than the control group during the stork balance ($p \leq 0.05$, $d \geq 1.30$), plate tapping ($p \leq 0.05$, $d \geq 1.63$), sit-and-reach ($p \leq 0.05$, $d \geq 0.73$), and 10 x 5m shuttle run ($p \leq 0.05$, $d \geq 1.13$).

To evaluate if any differences occurred within the different groups during the pre- and post-tests, use was made of a paired sample t-test (see Table 4.4). Table 4.4 indicates that during the anthropometric measurements, statistically ($p \leq 0.05$) and practically ($d \geq 0.2$) significant differences were observed for the increase in height and body fat percentage. The same tendencies were found for all the physical fitness measurements where the experimental group performed statistically ($p \leq 0.05$) and practically ($d \geq 0.2$) better during the post-test after the intervention was received. Regarding the control group, statistically and practically significant differences were also reported regarding the increase in height, weight and body fat percentage. However, the control group declined statistically and practically significantly in the post-test during three of the seven physical fitness tests (plate tapping, standing jump and 10 x 5m shuttle run).

Table 4.3

Differences between the experimental and control group during the pre- and post-test regarding their physical fitness levels.

	Experimental Group (n=73)	**Control Group (n=49)**	**Significance of difference**			
Variables	**Mean±SD**	**Mean±SD**	**t**	**df**	**p**	**d**
Pre Test (PrT)						
Anthropometry						
Age	11.85±0.38	12.02±0.31	-2.786	114.305	**<0.006***	**0.47**$^{\#}$
Height	149.33±6.95	153.28±8.29	-2.745	90.528	**<0.007***	**0.48**$^{\#}$
Weight	46.35±16.10	46.89±11.91	-0.212	118.809	0.832	0.03
BMI	20.80±6.33	19.74±3.78	1.152	118.631	0.252	0.17
% Body fat	23.02±8.30	25.26±7.20	-1.580	112.244	0.117	**0.27**$^{\#}$
Physical Fitness						
Stork balance	30.62±14.96	30.33±16.82	0.099	94.700	0.921	0.02
Plate tapping	14.42±2.06	14.88±1.44	-1.466	119.790	0.145	**0.23**$^{\#}$
Sit-and-reach	27.92±7.32	22.79±8.00	3.594	96.769	**<0.001***	**0.64**$^{\#\#}$
Standing Jump	137.29±21.40	148.71±19.65	-3.037	108.860	**<0.003***	**0.53**$^{\#\#}$
Sit-up	15.36±4.24	20.59±3.14	-7.824	118.768	**<0.001***	**1.23#**
10 x 5m Shuttle run	21.63±2.69	21.37±1.48	0.699	116.307	0.486	0.10
20m Shuttle run	19.22±11.34	25.53±12.69	-2.810	95.052	**<0.006***	**0.50**$^{\#\#}$
Post-Test (PoT)						
Anthropometry						
Height	150.72±7.01	154.30±8.44	-2.456	89.859	0.016	**0.42**$^{\#}$
Weight	47.22±16.44	48.38±12.86	-0.438	117.134	0.662	0.07
BMI	20.63±6.08	20.06±4.17	0.613	119.926	0.541	0.09
% Body fat	27.12±9.42	26.98±7.99	0.087	113.482	0.931	0.01
Physical Fitness						
Stork balance	57.08±6.45	33.83±17.83	8.749	56.528	**<0.001***	**1.30**$^{\#\#\#}$
Plate tapping	12.89±1.69	15.64±1.59	-9.141	107.365	**<0.001***	**1.63**$^{\#\#\#}$
Sit-and-reach	29.43±7.14	23.47±8.20	4.140	93.204	**<0.001***	**0.73**$^{\#\#}$
Standing Jump	141.52±19.69	144.98±19.71	-0.951	103.013	0.344	0.18
Sit-up	18.86±4.61	19.67±8.69	-0.598	66.280	0.552	0.09
10 x 5m Shuttle run	19.82±2.11	22.20±1.88	-6.512	110.775	**<0.001***	**1.13**$^{\#\#\#}$
20m Shuttle run	28.85±15.93	24.82±12.93	1.537	115.605	0.127	**0.25**$^{\#}$

SD=Standard Deviation; df=degrees of freedom; t=t-value; *Statistical significance p≤0.05; $^{\#}$Practical significance small effect *d=≥0.2;* $^{\#\#}$Practical significance medium effect *d=≥0.5;* $^{\#\#\#}$Practical significance large effect, *d*=≥0.8.

Table 4.4

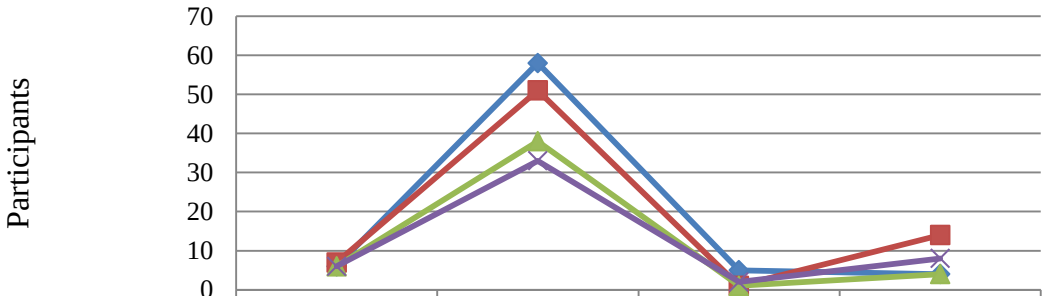
Differences within the experimental and control group's physical fitness levels during pre- and post-test.

	Pre-Test (PrT)	**Post-Test (PoT)**	**Significance of difference**			
Variables	**Mean±SD**	**Mean±SD**	**t**	**df**	**p**	**d**
Experimental group anthropometry						
Height	149.33±6.95	150.72±7.01	-6.939	72	**<0.000***	**0.20**$^{\#}$
Weight	46.35±16.10	47.22±16.44	-2.229	72	0.029	0.05
BMI	20.80±6.33	20.63±6.08	0.597	72	0.552	0.03
% Body fat	23.02±8.30	27.12±9.42	-6.622	72	**<0.001***	**0.49**$^{\#}$
Physical Fitness						
Stork balance	30.62±14.96	57.08±6.45	-14.818	72	**<0.001***	**1.77**$^{\#\#}$
Plate tapping	14.42±2.06	12.89±1.69	8.757	72	**<0.001***	**0.74**$^{\#\#}$
Sit-and-reach	27.92±7.32	29.43±7.14	-2.970	72	**<0.004***	**0.21**$^{\#}$
Standing Jump	137.29±21.40	141.52±19.69	-4.867	72	**<0.001***	**0.20**$^{\#}$
Sit-up	15.36±4.24	18.86±4.61	-12.343	72	**<0.001***	**0.83**$^{\#\#\#}$
10 x 5m Shuttle run	21.63±2.69	19.82±2.11	8.175	72	**<0.001***	**0.68**$^{\#\#}$
20m Shuttle run	19.22±11.34	28.85±15.93	-10.500	72	**<0.001***	**0.85**$^{\#\#\#}$
Control group anthropometry						
Height	153.28±8.29	154.30±8.44	-6.229	48	**<0.001***	0.12
Weight	46.89±11.91	48.38±12.86	-5.828	48	**<0.001***	0.13
BMI	19.74±3.78	20.06±4.17	-2.658	48	0.011	0.08
% Body fat	25.26±7.20	26.98±7.99	-3.483	48	**<0.001***	**0.24**$^{\#}$
Physical Fitness						
Stork balance	30.33±16.82	33.83±17.83	2.425	48	0.010	**0.21**$^{\#}$
Plate tapping	14.88±1.44	15.64±1.59	-2.665	48	**<0.001***	**0.52**$^{\#\#}$
Sit-and-reach	22.79±8.00	23.47±8.20	-4.798	48	0.566	0.08
Standing Jump	148.71±19.65	144.98±19.71	-0.577	48	**<0.002***	0.19
Sit-up	15.36±4.24	19.67±8.69	3.327	48	0.439	**0.29**$^{\#}$
10 x 5m Shuttle run	21.37±1.48	22.20±1.88	0.781	48	**<0.002***	**0.56**$^{\#\#}$
20m Shuttle run	25.53±12.69	24.82±12.93	-3.290	48	0.019	0.06

SD=Standard Deviation; df=degrees of freedom; t=t-value; *p≤0.05; $^{\#}$Practical significance small effect *d*=≥*0.2;* $^{\#\#}$Practical significance medium effect *d*=≥*0.5;* $^{\#\#\#}$Practical significance large effect, *d*=≥0.8.

To indicate the EUROFIT variables according to their skill classification a two-way frequency table was used. Figure 4.1 to Figure 4.8 reports the skills that were evaluated in the experimental and control group in the pre- and post-test and the classifications of each skill.

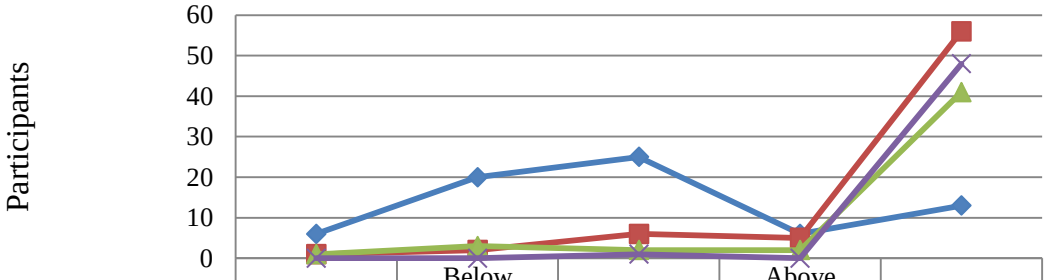
Figure 4.1 reports the percentage body fat between the two groups' pre- and post-tests, where percentage body fat was the only variable with the majority of the learners sorted in the average classification for the experimental group (n=51, 69.9%) and the control group (n=33, 67.3%). The experimental group indicated a statistically and practically ($p \leq 0.001$; $w=0.489$) significant difference between the pre- and post-test where 10 learners for the experimental and four from the control group moved to the high score classification.



	Below Average	Average	Above Average	High Score
Pre-test (EG)	6	58	5	4
Post-test (EG)	7	51	1	14
Pre-test (CG)	6	38	1	4
Post-test (CG)	6	33	2	8

Figure 4.1: **EUROFIT reference scales for percentage body fat between the experimental (EG) and control groups' (CG) pre- and post-test**

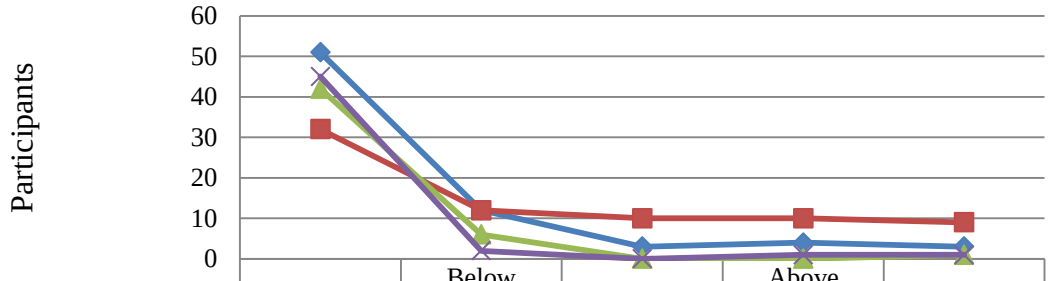
Stork balance is represented in Figure 4.2 and indicated that the experimental (n=56, 78.8%) and control group (n=48, 97.9%) sorted in the high score group. The experimental group's learners (n=43) improved from low score, below average, average to high score. The control group's learners also indicated an improvement (n=7).



	Low Score	Below average	Average	Above averag	High score
Pre-test (EG)	6	20	25	6	13
Post-test (EG)	1	2	6	5	56
Pre-test (CG)	1	3	2	2	41
Post-test (CG)	0	0	1	0	48

Figure 4.2: **EUROFIT reference scales for stork balance between the experimental and control groups' pre- and post-test.**

The experimental group indicated a statistically and practically ($p \leq 0.001$; $w=0.391$) significant difference in plate tapping after the intervention programme. Figure 4.3 reported that both the experimental (n=32, 43.8%) and control (n=45, 98.8%) group majority learners sorted in the low score classification for plate tapping; however the experimental group indicated fewer learners in the low score classification and more learners in the average, above average and high score group in contrast to the control group.

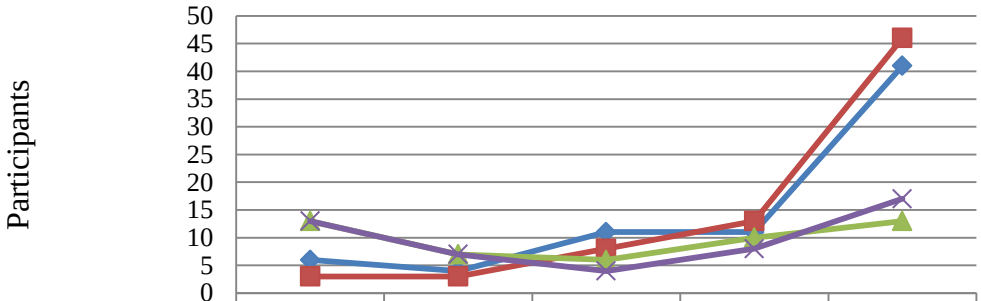


	Low Score	Below Average	Average	Above Average	High Score
Pre-test (EG)	51	12	3	4	3
Post-test (EG)	32	12	10	10	9
Pre-test (CG)	42	6	0	0	1
Post-test (CG)	45	2	0	1	1

Figure 4.3: **EUROFIT reference scales for plate tapping between the experimental and control groups' pre- and post-test.**

The results between the pre- and post-tests for the sit-and-reach test of the experimental group also indicated a statistically and practically ($p \leq 0.001$; $w=0.575$) significant difference. Figure 4.4 reports that the experimental (n=46, 63.0%) and control (n=17, 34.7%) groups sorted

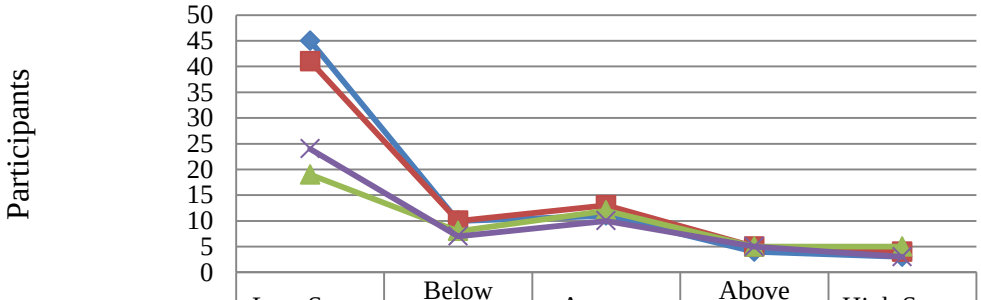
in the high score classification, whereas more learners moved to the above average (n=2) and high score (n=5) classification for the experimental group in comparison to the control group where only four learners moved to the high score group.



	Low Score	Below Average	Average	Above Average	High Score
Pre-test (EG)	6	4	11	11	41
Post-test (EG)	3	3	8	13	46
Pre-test (CG)	13	7	6	10	13
Post-test (CG)	13	7	4	8	17

Figure 4.4: **EUROFIT reference scale for sit-and-reach between the experimental and control groups' pre- and post-test**

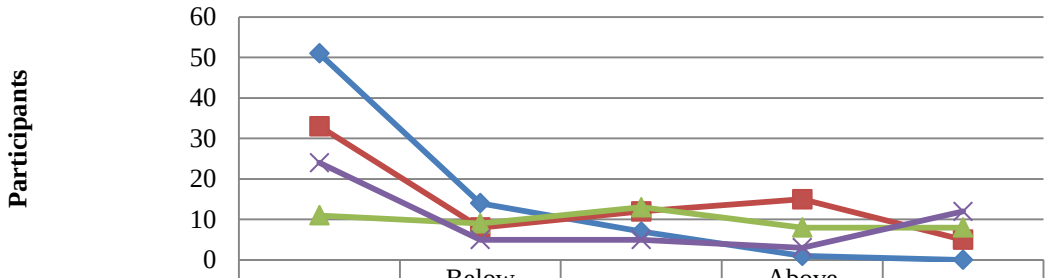
Figure 4.5 represents the results for standing jump, where the experimental (n=41, 56.2%) and the control group (n=24, 49.0%) sorted in the low score classification. The experimental group indicated a statistically and practically ($p \leq 0.001$; $w=0.695$) significant difference, where more learners improved to the average (n=2), above average (n=1) and high score classification (n=1), in contrast to the control group where more learners worsened to the low score (n=5) classification.



	Low Score	Below Average	Average	Above Average	High Score
Pre-test (EG)	45	10	11	4	3
Post-test (EG)	41	10	13	5	4
Pre-test (CG)	19	8	12	5	5
Post-test (CG)	24	7	10	5	3

Figure 4.5: **EUROFIT reference scale for standing jump between the experimental and control groups' pre- and post-tests.**

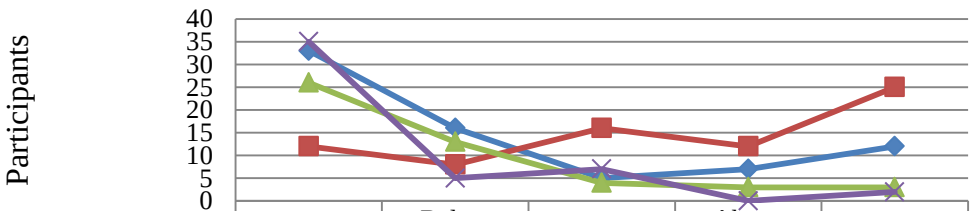
Figure 4.6 represents the sit-up test and indicates it was also sorted in the low score group for the experimental (n=33, 45.2%) and the control (n=24, 49.0%) groups. The experimental group reported statistical and practical ($p \leq 0.001$; $w=0.450$) significance, learners improved from fewer learners in the low score classification and more learners in the average (n=5), above average (n=14) and high score (n=5). The control group worsened after the post-test where more learners moved to the low score class (n=13).



	Low Score	Below Average	Average	Above Average	High Score
Pre-test (EG)	51	14	7	1	0
Post-test (EG)	33	8	12	15	5
Pre-test (CG)	11	9	13	8	8
Post-test (CG)	24	5	5	3	12

Figure 4.6: **EUROFIT reference scale for sit-ups between the experimental and control groups' pre- and post-test.**

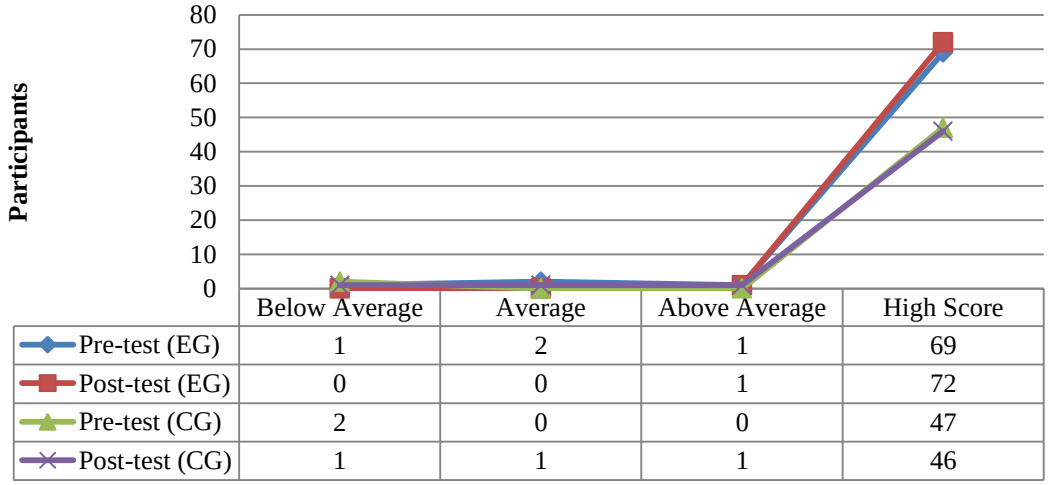
In Figure 4.7 the experimental group indicated a statistically and practically ($p \leq 0.001$; $w=0.461$) significant difference for the 10 x 5m shuttle test, where the majority of the learners sorted in the high score class (n=25, 34.2%). In the control group more learners worsened to the low score class.



	Low Score	Below Average	Average	Above Average	High Score
Pre-test (EG)	33	16	5	7	12
Post-test (EG)	12	8	16	12	25
Pre-test (CG)	26	13	4	3	3
Post-test (CG)	35	5	7	0	2

Figure 4.7: **EUROFIT reference scale for 10 x 5m shuttle test between the experimental and control groups' pre- and post-test**

Lastly, in Figure 4.8 the 20m shuttle run test sorted in the high score class for the experimental (n=72, 98.6%) and the control (n=46, 93.9%) group. The experimental group's learners improved to the high score class (n=3), in comparison to the control group who worsened.



	Below Average	Average	Above Average	High Score
Pre-test (EG)	1	2	1	69
Post-test (EG)	0	0	1	72
Pre-test (CG)	2	0	0	47
Post-test (CG)	1	1	1	46

Figure 4.8: **EUROFIT reference scale for 20m shuttle run test between the experimental and control groups' pre- and post-tests**

In contrast, the control group indicated statistically and practically significant differences regarding: percentage body fat ($p \leq 0.001$; $d=0.492$); plate tapping ($p \leq 0.001$; $d=0.856$); sit-and-reach ($p \leq 0.001$; $d=0.536$); standing jump ($p \leq 0.001$; $d=0.628$) and sit ups ($p=0.005$; $d=0.418$). However, more of the control groups' participants sorted into lower score and below average classification with the exception of percentage body fat, sit-and-reach and sit-ups which also indicated more participants in the high score classification.

4.5. Discussion

The aim of this study was to determine whether a three month HOPSports Brain Breaks® intervention programme will increase the physical fitness and PA levels of Grade 6-learners.

From the results where the two groups were compared with each other, it appears that there were statistically and practically significant differences in the pre- and post-test results. The experimental group reported lower scores for standing jump (leg strength), sit-ups (abdominal strength) and 20m shuttle run test (cardiovascular endurance) when compared to the control group during the pre-test; however, the experimental group's sit-and-reach (flexibility) test indicated higher scores than the control group. Accordingly the results from the post-test

indicated that the experimental group performed better in the stork balance (balance), plate tapping (speed), sit-and-reach (flexibility), 10 x 5m shuttle run (speed and agility) as well as 20m shuttle run tests (cardiovascular endurance) in comparison to the control group. These results are similar to the results of a study conducted by Tian et al. (2014) on 110 children 12- to 13-years old, who participated in an enhanced quality PE programme, although these researchers didn't make use of technology-based intervention. The experimental group reported significant differences for; sit-and-reach, standing jump, sit-ups, 20m shuttle run, plate tapping as well as 10 x 5m shuttle run.

Subsequently, the results of our study within each group's pre- and post-test noted the following differences: The experimental group reported practically and statistically significant improved differences between the pre- and post-test, in all the physical fitness components: cardiovascular endurance, abdominal strength, explosive leg power, flexibility, balance, speed and agility. Various research studies have been done to study the effect of intervention programmes on physical fitness; however, only some of the physical fitness components results correlate with the results of this study. In this regard, a study on 113 Grade 1 to Grade 4 learners by Tumynaitė et al. (2014) was done where it was expected from the experimental group to participate in a three month HOPSports Brain Breaks® intervention programme. The results indicated that boys' upper body and leg strength improved ($p \leq 0.05$) whereas agility did not indicate any improvement. Furthermore these results indicated that overall physical fitness did not improve; however, PA levels did improve. In another study by Van Biljon and Longhurst (2012) on 30 children aged nine- to 12-years, the results indicated that the experimental group who participated in a six week exergaming intervention programme improved their speed, agility and balance in contrast to the control group who indicated regression in these components. More recent research by Šarkauskienė et al. (2016) studied the effect of non-formal PE on 356 Grade 6-learners physical fitness. The results reported that boys who participated in the non-formal PE intervention improved their cardiovascular endurance, abdominal strength, and leg strength when compared to the group who did not participate in non-formal PE; moreover, no differences in flexibility were indicated. The girls who participated in the non-formal PE only indicated a significant difference in abdominal strength when compared to the group who did not participate in non-formal PE.

In this study, the control group's results indicated practical significance for stork balance and sit-ups which had improved after the post-test, whereas plate tapping and 10 x 5m shuttle run reported both statistical and practical significance, but indicated lower scores in comparison to the experimental group. Standing jump indicated only statistical significance, but with lower

scores. A possible explanation for the improvement for abdominal strength (sit-up test) can be ascribed to the fact that both boys and girls improve their abdominal strength from the age of 10-years, whereas, children from the age of nine-years indicated a drastic increase in their balance abilities (Gallahue & Ozmun, 2006).

The results further indicated that the EUROFIT variables classifications reported improvements between the pre- and post-test for the experimental group where three variables reported to be in the low skill class (plate tapping, standing jump and sit-ups), whereas sit-and-reach, 10 x 5m shuttle and 20m shuttle run sorted in the high score class. The control group reported that four variables sorted in the low score class (plate tapping, standing jump, sit-ups and 10 x 5m shuttle run). However, sit-and-reach and 20m shuttle run indicated to be in the high score category. The results further indicated that the experimental group's learners improved from low score and below average to average, above average and high score in all the EUROFIT variables. These results are similar to a study done by Stadler (2007) on the effect of a physical fitness intervention programme on 319 girls aged nine- to 13-years. The experimental group indicated an improvement for the 10 x 5m shuttle run, sit-and-reach, bleep test, standing jump as well as sit-ups. Furthermore our control group improved their sit-and-reach scores in comparison to the control group of Stadler (2007). A possible explanation for the improvement in the experimental group is that HOPSports Brain Breaks® programme contributes to increase PA levels; children learn and master new skills as well as this programme focuses on children from all ages and motor abilities (Moving Minds, 2017). In contrast, the control group continued with normal PE classes and might have had limited time to be physically active during PE period (Brain Breaks, 2017; Foo et al., 2014; Fogel et al., 2010) which prevents children to learn and master fundamental skills (Van Biljon & Longhusrt, 2010).

Therefore, in the light of the above mentioned results, the HOPSports Brain Breaks® intervention programme can indeed contribute to the improvement of PA levels, physical fitness and motor skills of children with different motor abilities.

4.5.1. Implication and future reference

The study demonstrated some limitations and should be prevented and acknowledged in future research. However, the study reported valuable outcomes regarding the improvements of physical fitness skills in Grade 6-learners.

In the light of the findings of the study, possible recommendations for future research is to determine the effect of this programme between boys and girls, the effect of a longer intervention period as well as the effect of this programme on academic performance and how it correlates

with PA and fitness.

4.6. Conclusion

Although extensive research has been done to study the effect of various technology-based intervention programmes, the findings of the studies vary with little to no improvements. The current study's results reported that HOPSports Brain Breaks® intervention programme improved all the physical fitness components of the EUROFIT test battery which could contribute to an increase in PA levels.

Therefore HOPSports Brain Breaks® is an effective programme that teachers can incorporate in their PE periods or during class time to address the concern of inactivity as well as to improve physical fitness skills.

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CHAPTER 5

CHAPTER 5
SUMMARY, CONCLUSIONS, LIMITATIONS AND RECOMMENDATIONS.

5.1 Summary

The aim of this study was firstly to determine whether Grade 6-learners' attitudes towards physical fitness and activity will improve when they participate in a three month HOPSports Brain Breaks® intervention programme. Secondly, the aim was to determine whether their physical fitness skills had improved after the HOPSports Brain Breaks® intervention programme.

In order to achieve the objectives and hypotheses of this study, a literature review was done in Chapter 2. The focus of the literature review was on current PA levels, factors influencing PA (sedentary behaviour, lack of time, attitudes towards PA and fitness, and insufficient motor and physical fitness skills), PE as well as school- and technology-based intervention programmes. It was indicated in the review that children do not meet the recommended PA guidelines and that their sedentary behaviour increases, and this increase could be ascribed to the above mentioned factors. Moreover, if children do not have a positive attitude towards PA they will not choose to participate in PA. The literature also stated that PE could contribute to address the problem with regard to PA, obesity and physical fitness skills; however, the current state of PE is insufficient to address the needs of children, and do not focus on the different motor abilities of children. Various intervention programmes have been discussed in the literature, and these indicated that previous school- and technology-based intervention programmes did improve PA levels, attitudes and fitness skills; however it was not sustainable and more research was necessary. An article format was used in Chapter 3. The article which demonstrated the results of the effect of HOPSports Brain Breaks® on the attitudes towards PA and physical fitness skills of Grade 6-learners will be presented to the ***"Journal of mental health and physical activity"***. The participants were a total of 75 (boys=44, girls=31) learners in the experimental group with a mean age of 11.4 years (± 0.54) and 39 (boys=12, girls=27) in the control group with a mean age of 11.71 years (± 0.49). The learners' attitudes towards physical activity and fitness was evaluated with the "Attitude towards Physical Activity Scale" (APAS). The differences between the two groups' attitudes were indicated by using an independent t-test. It was clear from the results that there were no statistically or practically significant differences between the experimental and the control group during the pre-test; however, after the intervention programme, the experimental group's attitudes towards PA and fitness improved statistically ($p \leq 0.001$) and practically ($d \geq 0.2$)

significantly in comparison to the control group. The improvements in attitudes towards PA were especially profound in the children's attitudes toward the benefits of PA, the importance of PA, self-efficacy in using the HOPSports Brain Breaks® videos, attitudes towards support in the environment and interest for PA, self-perception of physical fitness as well as personal best goal orientation in PA. A possible elucidation for the improvement in the experimental group can be that children made the connection between the importance and benefits of PA. Additionally, as their motor skills improved, more success was achieved in PA which motivated them to be more physically active and led to improved attitudes towards PA and fitness.

Chapter 4 was also written in article format that will be presented to the ***"Journal of applied developmental psychology",*** and reported on the results of the effect of HOPSports Brain Breaks® on children's physical fitness skills. A total of 122 learners (42 boys and 80 girls) with a mean age of 11.92 (±0.36) years participated in this study. The experimental group consisted of 73 learners (26 boys and 47 girls) with a mean age of 11.85 (±0.38) years whereas the control group consisted of 49 learners (16 boys and 33 girls) with a mean age of 12.02 (±0.31) years. To measure the physical fitness skills of these learners; the European test of physical fitness (EUROFIT) was used. An independent-sample t-test was done to determine the differences between the effect sizes of experimental and control groups. To determine the difference between each group's pre- and post-test, a paired-sample t-test was conducted. Lastly, a two way frequency table was used to compare the different classifications of the EUROFIT between the experimental and control groups' pre- and post-test. The results indicated that the experimental group's physical fitness skills were statistically ($p \leq 0.05$) and practically ($d \geq 0.5$) better than the control group after the intervention programme. The experimental group also indicated improvements for the different classifications of the EUROFIT, with more learners sorted in the average, above average and high score class when compared to the control group.

5.2. CONCLUSIONS

The conclusions of the study were formulated based on the results.

5.2.1. Conclusion 1

Hypothesis 1 states that Grade 6-learners' attitudes towards PA and fitness will improve after they participated in a three month HOPSports Brain Breaks® intervention programme. The

results indicated that the experimental group's attitudes reported statistically ($p \leq 0.001$) and practically ($d \geq 0.2$) significant differences when compared to the control group, which confirms that the attitudes towards PA and fitness of the experimental group improved statistically and practically significantly. The hypothesis is **accepted** based on these results.

5.2.2. Conclusion 2

Hypothesis 2 states that Grade 6-learners' physical fitness skills will improve after a three month HOPSports Brain Breaks® intervention programme. The results reported that the experimental group's physical fitness skills improved statistically ($p \leq 0.05$) and practically ($d \geq 0.2$) significantly when compared to the control group. The results futher indicated that the experimental group improved their classification of the EUROFIT. In comparison to this, the control group's physical fitness skills did not improve and worsened in the classification of the EUROFIT. This hypothesis is **accepted,** based on the results of the study.

5.3. RECOMMENDATIONS AND LIMITATIONS

From the results it is clear that HOPSports Brain Breaks® programme can contribute to address the decline in PA and fitness skills as well as to improve children's attitudes towards PA. It was further indicated that children who did not participate in HOPSports Brain Breaks® programme were still not efficiently active, their motor skill and physical fitness skills did not improve, and neither did they have a positive attitude towards PA. It is herewith recommended to incorporate technology-based programmes, such as HOPSports Brain Breaks®, during class times and PE lessons to motivate children to be physically active and to improve their attitudes towards PA and fitness. It is recommended to, with the help of Kinderkineticists, physical educational teachers, coaches, movement scientists and other health workers, to implement this programme at all schools so that children from different ages, racial groups and different socio-economic status can benefit from this programme. However, alternative methods should also be reasearched in cases where there is no internet at schools. These recommendations are particularly appropriate to address the problem of inactivity from a young age, as well as to change children's attitudes towards and perceptions of PA and fitness to continue with an active lifestyle.

During the study it was attempted to improve the validity and reliablity of the results; however, some limitations did occur. These limitations can be address to improve the outcomes of the study as well as other studies. It includes the following limitations and recommendations for future research:

5.3.1. This study expected the teachers to cooperate; however, to emphasize the importance of the intervention and PA, more focus should be on teachers to inform and motivate them to see PA as a priority.

5.3.2. It is recommended to include a bigger sample size to address the limitation of a small sample size and learners being absent on the day of testing.

5.3.3. This study only focusses on the differences between the experimental and control group; however, future research should study the effect of this programme between different genders, socio-economic status as well as age groups.

5.3.4. More reseach should be conducted on Grade 6 and Grade 7 learners to address the problem of inactivity and to improve their attittudes towards PA and fitness, because the decline is more prevalent from this age.

5.3.6. More research should be conducted to study the effect of a longer intervention period to determine the sustainablitiy.

5.3.7. Lastly, future research should study the effect of this programme on the academic performance and how it correlates with PA and fitness.

ANNEXURES A

PARENT INFORMED CONSENT FORMS FOR THE RESEARCH PROJECT

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT:

The effect of Brain Breaks on the attitudes toward health and physical activities of children and adolescents

REFERENCE NUMBER: NWU-00003-14-A1

PRINCIPAL INVESTIGATORS:
Dr. Dané Coetzee and Prof. Andries Monyeki

ADDRESS:
North-West University (Potchefstroom Campus)
Faculty of Health Science
Building K3, Office G10
Potchefstroom
2531

CONTACT NUMBERS:
Dr. Dané Coetzee: **018 299 1792**
Prof. Andries Monyeki: **018 299 1790**

You child is hereby being invited to take part in a research project that investigates the effects of your child's attitudes toward health and physical activities of an online video programme on health and physical activities. Please take some time to read the information presented here, which will explain the details of this project. Please ask the researcher any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how your child could be

involved. Also, your child's participation is entirely voluntary and he/she are free to decline to participate. If you say no, this will not affect your child negatively in any way whatsoever. You are also free to withdraw your child from the study at any point, even if you did agree that your child may take part in this project.

This study has been approved by the **Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU-00003-14-A1)** and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records.

What is this research study all about?

- *This study will be conducted once a day under the supervision of your child's teacher and the researcher, and your child will be following an online video programme for 3 – 5 minutes during school time in his/her classroom for three months.*
- *The objectives of this research are: to investigate the effect of your child's attitude towards health and physical activities of an online video programme that focus on health and physical activities.*

Why have your child been invited to participate?

- *Your child has been invited to participate because we want to investigate children's attitude toward health and physical activities between Grade 3 – 6 and your child is in one of these Grades.*
- *Your child has also complied with the following inclusion criteria: He/she is a healthy child with no medical problems; has no physical impairments to participate in this study.*

What will your child's responsibilities be?

- *We will expect your child to complete a questionnaire on his/her attitudes toward health and physical activities both before and after the intervention. The questionnaire will take about 15 minutes to complete under the supervision of teachers, and consists of 50 questions; Take part in the EUROFIT test battery; and lastly doing physical activities under the supervision of teachers and following an online video programme for 3 - 5 minutes during school time, in the classroom, once a day for three consecutive months;*

Will your child benefit from taking part in this research?

- Yes, The direct benefits for your child as a participant will be that he/she will become fitter and will enjoy the physical activity;
- The indirect benefit will be that it will help us to gain better understanding of the use of online video's and its benefit towards helping other children to enjoy physical activity more.

Are there risks involved in your child taking part in this research?

- The risks in this study are minimal, but it is possible that your child might get tired during the 5 minutes of exercise in your classroom, as well as during the EUROFIT test battery; everything will be done to make sure that your child feels no discomfort and that he/she knows that they can withdraw from the study at any time.
- The benefits of this research project outweighs the risk

What will happen in the unlikely event of some form of discomfort occurring as a direct result of your child taking part in this research study?

- *Should you or your child have the need for further discussions during/after the participation in this project; an opportunity will be arranged for you and/or your child to speak directly with the researcher so that we can help you.*

Who will have access to the data?

- *Anonymity will be only partial because your child will be doing the intervention with his/her classmates. We as researchers will do everything to make sure that the answers your child give on the questionnaire will be kept secret and we will not disclose your child's name to anyone. Reporting of findings will be anonymous by means of only using the research number that will be given to your child during the data collecting phase and we will not disclose your name to anyone. Only the researchers will know which data belongs to your child. Data will be kept safe and secure by locking hard copies in locked cupboards in the researcher's office and for electronic data it will be password protected. Data will be stored for 5 years.*

If there is anything else that you would like to know or do?

- You can contact Dr. Dané Coetzee (018 299 1792) or Prof. Andries Monyeki (018 299 1790) if you have any further queries or encounter any problems.

- You can contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 018 299 2094; carolien.vanzyl@nwu.ac.za if you have any concerns or complaints that have not been adequately addressed by the researcher.
- You will receive a copy of this information and consent form for your own records.

How will you know about the findings?

- The findings of the research will be shared with you by giving you a summary of your results.

Declaration by parent/legal guardant of the participant

By signing below, I ……..……. parent/legal guardant of

……agree that he/she may to take part in a research study entitled: The effect of Brain Breaks on the attitudes toward health and physical activities of children and adolescents

I declare that:

- I have read this information and consent form and it is written in a language with which I am fluent and comfortable.
- I have had a chance to ask questions to both the person obtaining consent, as well as the researcher and all my questions have been adequately answered.
- I understand that taking part in this study is **voluntary** and I have not been pressurized to allow my child to take part.
- I understand that my child may choose to leave the study at any time and will not be penalized or prejudiced in any way.
- I understand that my child may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

..... **.....**

Signature of parent/legal guardant Signature of witness

Declaration by a person obtaining consent

I *(name)* ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

..... **.....**

Signature of person obtaining consent Signature of witness

Declaration by a researcher

I *(name)* ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

..... **.....**

Signature of researcher **Signature of witness**

DEELNEMER INLIGTINGSTUK EN TOESTEMMINGSVORM

TITEL VAN DIE NAVORSINGSPROJEK:

Die effek van Brain Breaks op die houding teenoor gesondheid en fisiese aktiwiteit van kinders en adolessente

VERWYSINGSNOMMER: NWU-00003-14-A1

HOOFNAVORSERS:
Dr. Dané Coetzee en Prof. Andries Monyeki

ADRES:
Noordwes Universiteit (Potchefstroom Kampus)
Fakulteit Gesondheidswetenskappe
Gebou K3, Kantoor G10
Potchefstroom
2531

KONTAK NOMMERS:
Dr. Dané Coetzee: **018 299 1792**
Prof. Andries Monyeki: **018 299 1790**

Jou kind word uitgenooi om deel te neem in ’n navorsingsprojek om die effek van jou kind se gesindhede teenoor gesondheid en fisiese aktiwiteite te bepaal deur middel van ’n aanlyn video program oor gesondheid en fisiese aktiwiteite. Lees die onderstaande inligting deur rakende die projek. Indien daar onduidelikhede is oor enige deel van die projek, vra die navorser om dit te verduidelik. Dit is van uiterste belang dat jy in alle opsigte tevrede is dat jy verstaan wat die

navorsing behels, wat van jou kind verwag word en hoe hy/sy betrokke kan wees. Jou kind se deelname is **heeltemal vrywilliglik**, en is welkom om dit van die hand te wys. Indien jy nee sê, sal dit jou kind op geen manier negatief beïnvloed nie. Jy mag ook op enige stadium jou kind onttrek uit die studie, selfs al het jy ingestem om deel te neem.

Die studie is goedgekeur deur die **Gesondheid Navorsingsetiekkomitee van die Fakulteit Gesondheidwetenskappe van die Noordwes Universiteit (NWU-00003-14-A1)** en word saamgestel volgens die etiese riglyne en maatreëls van die internasionale Deklarasie van Helsinki en die etiese riglyne van die Nasionale Gesondheid Navorsingsetiek Raad. **Die navorsingsetiekkomitee lede of relevante bestuur kan die navorsing rekords inspekteur.**

Wat behels die navorsing studie?

- Die studie gaan een keer per dag onder toesig van jou kind se onderwyser en die navorser aangebied word en hy/sy gaan ’n aanlyn video program van 3-5 minute volg in skooltyd in jou kind se klaskamer vir 3 maande.
- *Die doelwitte van die navorsing is: om te bepaal wat die effek van jou kind se houding/gesindheid is teenoor gesondheid en fisiese aktiwiteite deur middel van ’n aanlyn video program wat fokus op gesondheid en fisiese aktiwiteite.*

Hoekom is jou kind uitgenooi om deel te neem?

- Jou kind is uitgenooi om deel te neem omrede ons wil bepaal wat kinders se houding is teenoor gesondheid en fisiese aktiwiteite tussen Graad 3 – 6 en jou kind is in een van die Grade.
- *Jou kind is ook genader met die volgende insluitingskriteria: Hy/sy is ’n gesonde kind met geen mediese probleme nie; het geen fisiese afwykings om deel te neem in die studie.*

Wat gaan jou kind se verantwoordelikhede wees?

- *Daar gaan van jou kind verwag word om ’n vraelys te voltooi oor sy/haar gesindheid teenoor gesondheid en fisiese aktiwiteite voor en na die intervensie. Die vraelys gaan ongeveer 15 minute vat om te voltooi onder die toesig van jou kind se onderwyser, dit bestaan uit 50 vrae; Deel te neem in die EUROFIT toets battery; en laastens om fisiese aktiwiteite te doen onder toesig van onderwysers en om die aanlyn video program te volg vir 3-5 minute tydens skooltyd, in die klaskamer, een keer per dag vir 3 opeenvolgende maande;*

Hoe gaan jou kind baat vind om deel te neem in die navorsing?

- Die direkte voordele vir jou kind as ʼn deelnemer is dat hy/sy fikser gaan word en die fisiese aktiwiteit geniet
- Die indirekte voordeel is dat dit ons gaan help om beter begrip te hê oor die gebruik van aanlyn video's en dit is voordelig teenoor kinders om hulle te help om fisiese aktiwiteit meer te geniet.

Is daar enige risiko's betrokke vir jou kind wat deelneem in die navorsing?

- Die risiko's in die studie is minimaal, maar daar is ʼn moontlikheid dat jou kind moeg gaan raak tydens die 5 minute oefening in die klaskamer, asook tydens die EUROFIT toets battery; alles sal gedoen word om te verhoed dat jou kind enige ongemak ervaar en dat hy/sy weet dat hulle enige tyd kan onttrek uit die studie.
- Die voordele van die navorsingsprojek is meer as die risiko's

Wat sal gebeur indien daar ʼn geval van ongemak voorkom a.g.v. ʼn direkte oorsaak van jou kind se deelname in die navorsing studie?

- Indien jy of jou kind ʼn behoefte het vir verdere bespreking tydens/na die deelname in die projek; kan daar ʼn geleentheid gereël word sodat jy en/of jou kind direk met die navorser kan praat om jou te help.

Wie het toegang tot die inligting?

- Daar is slegs ʼn gedeeltelike anonimiteit weens die feit dat jou kind die intervensie saam met sy/haar klasmaats gaan doen. Ons as navorsers sal alles doen om te verseker dat die antwoorde op jou kind se vraelys privaat gehou word en sal nie jou kind se naam bekend maak nie. Verslaggewing van die bevindings sal anoniem bly,
- deur sleg jou kind se navorsing nommer gebruik wat aan hom/haar gegee gaan word tydens die insameling van inligting fase en ons sal nie jou kind se naam bekend maak nie. Slegs die navorsers gaan weet watter inligting aan jou kind behoort. Die inligting sal veilig bewaar word deur die harde kopie toe te sluit in die navorsingskantore en die elektroniese inligting word beskerm deur ʼn wagwoord. Die inligting word vir 5 jaar gestoor.

Is daar enige iets anders wat jy wil weet of doen?

- Jy kan Dr. Dané Coetzee kontak (018 299 1792) of Prof. Andries Monyeki (018 299

1790) indien jy enige navrae of probleme het.

- Jy kan die Gesondheid Navorsing Etiese Komitee kontak via Mev. Carolien van Zyl (018 299 2094); carolien.vanzyl@nwu.ac.za indien jy enige besware of klagtes het wat die navorser nie toepaslik aangespreek het nie.
- Jy sal ʼn afskrif van hierdie inligting en toestemmingsvorm ontvang vir jou eie rekord.

Hoe gaan jy uitvind oor die bevindings?

- Die bevindings van die navorsing sal met jou gedeel word deur vir jou ʼn opsomming van jou kind se resultate te gee.

Verklaring van ouer/voog van die deelnemer

Deur my handtekening hieronder stem ek …….. ouer/voog van …….. in dat hy/sy mag deel neem in die navorsing studie genaamd: Die effek van Brain Breaks op die houding teenoor gesondheid en fisiese aktiwiteit van kinders en adolessente

Ek verklaar hiermee dat:

- Ek die inligting en toestemmingsvorm gelees het en dat dit geskryf is in ’n taal wat ek verstaan en waarmee ek gemaklik voel
- Ek die kans gehad het om vrae te vra vir beide die persone wat die toestemming bekom asook die navorser en al my vra is voldoende beantwoord.
- Ek verstaan dat my kind se deelname in die studie **vrywilliglik** is en dat ek nie geforseer is om toe te laat dat my kind moet deelneem in die studie nie. Ek verstaan dat my kind mag besluit om die studie op enige tyd te staak en sal nie gepenaliseer of veroordeel word op enige manier nie.
- Ek verstaan dat my kind mag gevra word om die studie te verlaat voor dit afgehandel is, indien die navorser voel dit is in sy/haar se beste belange, of indien hy/sy nie die studie plan volg soos ooreengekom het nie.

Geteken te (plek) .....….....…….. op (datum) ……...…….. 20....

..... **.....**

Handtekening van ouer/voog Handtekening van getuie

Verklaring deur die persoon wat die toestemmingvorm hanteer

Ek (naam) …… verklaar hiermee dat

- Ek die inligting in die dokument verduidelik het met ……..
- Ek hom/haar aangemoedig het om vrae te vra en het die nodige tyd gevat om die

- vrae voldoende en toepaslik te beantwoord.
- Ek tevrede is dat hy/sy al die aspekte van die navorsing soos hierbo bespreek het, tenvolle verstaan
- Ek nie ’n tolk gebruik het nie.

Geteken te (*plek*) .....….....……op (*datum*) ……...…….. 20....

..... **.....**

Handtekening van persoon wat

die toestemmingvorm hanteer

Handtekening van getuie

Verklaring deur die navorser

Ek *(naam*) ……..…… verklaar hiermee dat

- Ek die inligting in die dokument verduidelik het met ……..
- Ek hom/haar aangemoedig het om vrae te vra en het die nodige tyd gevat om die vrae voldoende en toepaslik te beantwoord.
- Ek tevrede is dat hy/sy al die aspekte van die navorsing soos hierbo bespreek het, tenvolle verstaan
- Ek nie ’n tolk gebruik het nie.

Geteken te (*plek*) .....….....…… op (*datum*) ……...…….. 20....

..... **.....**

Handtekening van navorser

Handtekening van getuie

ANNEXURES B

CHILDREN INFORMED CONSENT FORMS FOR THE RESEARCH PROJECT

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

TITLE OF THE RESEARCH PROJECT:

The effect of Brain Breaks on the attitudes toward health and physical activities of children and adolescents

REFERENCE NUMBER: NWU-00003-14-A1

PRINCIPAL INVESTIGATORS:
Dr. Dané Coetzee and Prof. Andries Monyeki

ADDRESS:
North-West University (Potchefstroom Campus)
Faculty of Health Sciences
Building K3, Office G10
Potchefstroom
2531

CONTACT NUMBERS:
Dr. Dané Coetzee: **018 299 1792**
Prof. Andries Monyeki: **018 299 1790**

You are being invited to take part in a research project that investigates the effects on your attitudes toward health and physical activities of an online video programme on health and physical activities. Please take some time to read the information presented here, which will explain the details of this project. Please ask the researcher any questions about any part of this

project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is **entirely voluntary** and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee of the Faculty of Health Sciences of the North-West University (NWU-00003-14-A1) **and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki and the ethical guidelines of the National Health Research Ethics Council. It might be necessary for the research ethics committee members or relevant authorities to inspect the research records.**

What is this research study all about?

- *This study will be conducted once a day under the supervision of your teacher and the researcher, and you will be following an online video programme for 3 – 5 minutes during school time in your classroom for three months.*
- *The objectives of this research are: to investigate the effect of your attitude/feeling towards health and physical activities of an online video programme that focus on health and physical activities.*

Why have you been invited to participate?

- *You have been invited to participate because we want to investigate children's attitude toward health and physical activities between Grade 3 – 6 and you are the right age.*
- *You have also complied with the following inclusion criteria: A healthy child with no medical problems.*

What will your responsibilities be?

- *You will be expected to complete a questionnaire on your attitudes toward health and physical activities both before and after the intervention. The questionnaire will take about 15 minutes to complete under the supervision of teachers, and consists of 50 questions; Take part in the EUROFIT test battery; and lastly doing physical activities under the supervision of teachers and following an online video programme for 3 - 5*

minutes during school time, in the classroom, once a day for three consecutive months;

Will you benefit from taking part in this research?

- The direct benefits for you as a participant will be that you will become fitter and will enjoy the physical activity;
- The indirect benefit will be that it will help us to gain better understanding of the use of online video's and its benefit towards helping children to enjoy physical activity more.

Are there risks involved in your taking part in this research?

- The risks in this study are minimal, but it is possible that you might get tired during the 5 minutes of exercise in your classroom;
- The benefits outweighs the risk

What will happen in the unlikely event of some form of discomfort occurring as a direct result of your taking part in this research study?

- *Should you have the need for further discussions during/after the participation in this project; an opportunity will be arranged for you to speak directly with the researcher so that we can help you.*

Who will have access to the data?

- *Anonymity will be only partial because you will be doing the intervention with your classmates. We as researchers will do everything to make sure that the answers you gave on the questionnaire will be kept secret and we will not disclose your name to anyone. Reporting of findings will be anonymous by means of only using your research number that will be given to you and we will not disclose your name to anyone. Only the researchers will know which data belongs to you. Data will be kept safe and secure by locking hard copies in locked cupboards in the researcher's office and for electronic data it will be password protected. Data will be stored for 5 years.*

If there is anything else that you would like to know or do?

- You can contact Dr. Dané Coetzee (018 299 1792) or Prof. Andries Monyeki (018 299 1790) if you have any further queries or encounter any problems.
- You can contact the Health Research Ethics Committee via Mrs Carolien van Zyl at 018 299 2094; carolien.vanzyl@nwu.ac.za if you have any concerns or complaints that have

not been adequately addressed by the researcher.

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

How will you know about the findings?

- The findings of the research will be shared with you by giving you a summary of your results.

Declaration by the participant

By signing below, I ……..……. agree to take part in a research study entitled: The effect of Brain Breaks on the attitudes toward health and physical activities of children and adolescents

I declare that:

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

Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

..... **.....**

Signature of participant Signature of witness

Declaration by a person obtaining consent

I *(name)* ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

..... **.....**

Signature of person obtaining consent Signature of witness

Declaration by a researcher

I *(name)* ……..…… declare that:

- I explained the information in this document to ……..
- I encouraged him/her to ask questions and took adequate time to answer them.
- I am satisfied that he/she adequately understands all aspects of the research, as discussed above
- I did/did not use an interpreter.

Signed at (*place*) .....….....…….. on (*date*) ……...…….. 20....

..... **.....**

Signature of researcher **Signature of witness**

DEELNEMER INLIGTINGSTUK EN TOESTEMMINGSVORM

TITEL VAN DIE NAVORSINGSPROJEK:

Die effek van Brain Breaks op die houding teenoor gesondheid en fisiese aktiwiteit van kinders en adolessente

VERWYSINGSNOMMER: NWU-00003-14-A1

HOOFNAVORSERS:
Dr. Dané Coetzee en Prof. Andries Monyeki

ADRES:
Noordwes Universiteit (Potchefstroom Kampus)
Fakulteit Gesondheidswetenskappe
Gebou K3, Kantoor G10
Potchefstroom
2531

KONTAK NOMMERS:
Dr. Dané Coetzee: **018 299 1792**
Prof. Andries Monyeki: **018 299 1790**

Jy word uitgenooi om deel te neem in ’n navorsingsprojek om die effek van jou gesindhede teenoor gesondheid en fisiese aktiwiteite te bepaal deur middel van ’n aanlyn video program oor gesondheid en fisiese aktiwiteite. Lees die onderstaande inligting deur rakende die projek. Indien daar onduidelikhede is oor enige deel van die projek, vra die navorser om dit te verduidelik. Dit

is van uiterste belang dat jy in alle opsigte tevrede is dat jy verstaan wat die navorsing behels, wat van jou verwag word en hoe jy betrokke kan wees. Jou deelname is **heeltemal vrywilliglik**, en jy is welkom om dit van die hand te wys. Indien jy nee sê, sal dit jou op geen manier negatief beïnvloed nie. Jy mag ook op enige stadium onttrek uit die studie, selfs al het jy ingestem om deel te neem.

Die studie is goedgekeur deur die **Gesondheid Navorsingsetiekkomitee van die Fakulteit Gesondheidwetenskappe van die Noordwes Universiteit (NWU-00003-14-A1)** en word saamgestel volgens die etiese riglyne en maatreëls van die internasionale Deklarasie van Helsinki en die etiese riglyne van die Nasionale Gesondheid Navorsingsetiek Raad. **Die navorsingsetiekkomitee lede of relevante bestuur kan die navorsing rekords inspekteur.**

Wat behels die navorsing studie?

- Die studie gaan een keer per dag onder toesig van jou onderwyser en die navorser aangebied word en jy gaan ’n aanlyn video program van 3-5 minute volg in skooltyd in jou klaskamer vir 3 maande.
- *Die doelwitte van die navorsing is: om te bepaal wat die effek van jou houding/gesindheid is teenoor gesondheid en fisiese aktiwiteite deur middel van ’n aanlyn video program wat fokus op gesondheid en fisiese aktiwiteite.*

Hoekom is jy uitgenooi om deel te neem?

- Jy is uitgenooi om deel te neem omrede ons wil bepaal wat kinders se houding is teenoor gesondheid en fisiese aktiwiteite tussen die grade 3 – 6 en jy is die geskikte ouderdom.
- *Jy is ook genader met die volgende insluitingskriteria: ’n Gesonde kind met geen mediese probleme nie.*

Wat gaan jou verantwoordelikhede wees?

- *Daar gaan van jou verwag word om ’n vraelys te voltooi oor jou gesindheid teenoor gesondheid en fisiese aktiwiteite voor en na die intervensie. Die vraelys gaan ongeveer 15 minute vat om te voltooi onder die toesig van jou onderwyser, dit bestaan uit 50 vrae; Deel te neem in die EUROFIT toets battery; en laastens om fisiese aktiwiteite te doen onder toesig van onderwysers en om die aanlyn video program te volg, in die klaskamer, een keer per dag vir 3 opeenvolgende maande;*

Hoe gaan jy baat vind om deel te neem in die navorsing?

- Die direkte voordele vir jou as deelnemer is dat jy fikser gaan word en die fisiese aktiwiteit geniet;
- Die indirekte voordeel is dat jy beter begrip gaan hê oor die gebruik van aanlyn video's en dit is voordelig om kinders te help om fisiese aktiwiteit meer te geniet.

Is daar enige risiko's betrokke vir jou wat deelneem in die navorsing?

- Die risiko's in die studie is minimaal, maar daar is 'n moontlikheid dat jy moeg gaan raak tydens die 5 minute oefening in die klaskamer;
- Daar is meer voordele as risiko's

Wat sal gebeur indien daar 'n geval van ongemak voorkom a.g.v. 'n direkte oorsaak van jou deelname in die navorsing studie?

- Indien jy 'n behoefte het vir verdere bespreking tydens/na die deelname in die projek; kan daar 'n geleentheid gereël word sodat jy direk met die navorser kan praat om jou te help.

Wie het toegang tot die inligting?

- Daar is slegs 'n gedeeltelike anonimiteit weens die feit dat jy die intervensie saam met jou klasmaats gaan doen. Ons as navorsers sal alles doen om te verseker dat die antwoorde op jou vraelys privaat gehou word en sal nie jou naam bekend maak nie. Verslaggewing van die bevindings sal anoniem bly, deur sleg jou navorsing nommer gebruik wat aan jou gegee gaan word, jou naam sal nie bekend gemaak word nie. Slegs die navorsers gaan weet watter inligting aan jou behoort. Die inligting sal veilig bewaar word deur die harde kopie toe te sluit in die navorsingskantore en die elektroniese inligting word beskerm deur 'n wagwoord. Die inligting word vir 5 jaar gestoor.

Is daar enige iets anders wat jy wil weet of doen?

- Jy kan Dr. Dané Coetzee kontak (018 299 1792) of Prof. Andries Monyeki (018 299 1790) indien jy enige navrae of probleme het.
- Jy kan die Gesondheid Navorsingsetiekkomitee kontak via Mev. Carolien van Zyl (018 299 2094); carolien.vanzyl@nwu.ac.za indien jy enige besware of klagtes het wat die navorser nie toepaslik aangespreek het nie.
- Jy sal 'n afskrif van hierdie inligting en toestemmingsvorm ontvang vir jou eie rekord.

Hoe gaan jy uitvind oor die bevindings?

- Die bevindings van die navorsing sal met jou gedeel word deur vir jou ŉ opsomming van jou resultate te gee.

Verklaring deur die deelnemer

Deur my handtekening hieronder stem ek, ……. in om deel te neem aan die navorsing studie genaamd: Die effek van Brain Breaks op die houding teenoor gesondheid en fisiese aktiwiteit van kinders en adolessente

Ek verklaar hiermee dat:

- Ek die inligting en toestemmingsvorm gelees het en dat dit geskryf is in ‘n taal wat ek verstaan en waarmee ek gemaklik voel.
- Ek geleentheid gehad het om vrae te vra vir beide die persone wat die toestemming bekom asook die navorser en al my vra is voldoende beantwoord.
- Ek verstaan dat deelname in die studie **vrywilliglik is** en dat ek nie geforseer is om deel te neem nie.
- Ek mag besluit om die studie op enige tyd te staak en sal nie gepenaliseer of veroordeel word op enige manier nie.
- Ek gevra mag word om die studie te verlaat voor dit afgehandel is, indien die navorser voel dit is in my beste belang, of indien ek nie die studie plan volg soos ooreengekom nie.

Geteken te (plek) .....…..…… op (datum) …… 20…

..... **.....**

Handtekening van deelnemer Handtekening van getuie

Verklaring deur die persoon wat die toestemmingvorm bekom

Ek (naam) ……..…… verklaar hiermee dat

- Ek die inligting in die dokument verduidelik het met ……..
- Ek hom/haar aangemoedig het om vrae te vra en het die nodige tyd gevat om die vrae voldoende en toepaslik te beantwoord.
- Ek tevrede is dat hy/sy al die aspekte van die navorsing soos hierbo bespreek het, tenvolle verstaan
- Ek nie ’n tolk gebruik het nie.

Geteken te (*plek*) .....….....…… op (*datum*) …… 20…

..... **.....**

Handtekening van persoon wat die toestemmingvorm hanteer

Handtekening van getuie

Verklaring deur die navorser

Ek *(naam*) ……..…… verklaar dat

- Ek die inligting in die dokument verduidelik het met ……..
- Ek hom/haar aangemoedig het om vrae te vra en het die nodige tyd gevat om die vrae voldoende en toepaslik te beantwoord.
- Ek tevrede is dat hy/sy al die aspekte van die navorsing soos hierbo bespreek het, tenvolle verstaan
- Ek nie ’n tolk gebruik het nie.

Geteken te (*plek*) .....….....…… op (*datum*) …… 20…

..... **.....**

Handtekening van navorser

Handtekening van getuie

ANNEXURES C

LEARNERS QUESTIONNAIRE

Questionnaire on Physical Activity

Welcome to Physical Activities Project! Your help is very much appreciated! There is no right or wrong answers. Just choose what is true for you.
THANK YOU!

I am: **O A boy** **O A girl**

I am: O 8 O 9 O 10 O 11 O 12 O 13 years old

I am studying at: O Grade 3 O Grade 4 O Grade 5 O Grade 6

My body mass is: _____kg My body height is:_____meter

1.	**Do you agree/disagree with the following?**	Strongly disagree	Disagree	Agree	Strongly Agree
a.	Being physically active helps to make me fit.	□	□	□	□
b.	Being physically active helps to relax me.	□	□	□	□
c.	Being physically active helps to improve my thinking.	□	□	□	□
d.	Being physically active helps to improve my analytic skills.	□	□	□	□
e.	Being physically active helps to enhance my self-concept.	□	□	□	□
f.	Being physically active helps to give me new experience	□	□	□	□
g.	Being physically active helps to give me more willpower.	□	□	□	□
h.	Being physically active helps to give me good health.	□	□	□	□
i.	Being physically active helps to improve my sleep.	□	□	□	□
j.	Being physically active helps to improve my school work.	□	□	□	□
2.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	It is important to spend time to be physically active.	□	□	□	□
b.	It is important to form a habit of being physically active.	□	□	□	□
c.	It is important to be physically active for my health.	□	□	□	□
d.	Being physically active is something I would not give up in	□	□	□	□
e.	Even if I have a lot of work to do, I still keep being physically	□	□	□	□
3.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	I learned about culture through video exercise.	□	□	□	□
b.	I learned about music through video exercise.	□	□	□	□
c.	I learned about art through video exercise.	□	□	□	□

d.	I learned about arithmetic through video exercise.	□	□	□	□
e.	I learned about language through video exercise.	□	□	□	□
f.	I learned about writing through video exercise.	□	□	□	□
g.	I learned about composition through video exercise.	□	□	□	□
h.	I learned about healthy lifestyle from video exercise.	□	□	□	□
i.	I learned about healthy diet from video exercise.	□	□	□	□
j.	I learned about hygiene from video exercise.	□	□	□	□
k.	I learned about environmental protection from video	□	□	□	□

4.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	I know how to choose physical activity in video exercise that suits me.	☐	☐	☐	☐
b.	I know how to do physical activity if there is a video exercise to follow.	☐	☐	☐	☐
c.	I can follow physical activity in video exercise with minimal mistakes even without a teacher.	☐	☐	☐	☐
d.	I know which my favorite physical activity is in video exercise.	☐	☐	☐	☐

5.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	I think physical activity is fun.	☐	☐	☐	☐
b.	I look forward to doing physical activity.	☐	☐	☐	☐
c.	I enjoy doing physical activity with my classmates.	☐	☐	☐	☐
d.	I achieve my physical activity goals even if I am tired.	☐	☐	☐	☐
e.	I persuade my friends to join me in doing physical activity.	☐	☐	☐	☐
f.	I feel better after physical activity.	☐	☐	☐	☐
g.	I feel stronger after physical activity.	☐	☐	☐	☐
h.	I feel more confident after physical activity.	☐	☐	☐	☐
i.	I think better after physical activity.	☐	☐	☐	☐
j.	I improve on my school work after physical activity.	☐	☐	☐	☐
k.	I think my good friends enjoy doing physical activity.	☐	☐	☐	☐
l.	I think my classmates enjoy doing physical activity.	☐	☐	☐	☐
m.	I think other children enjoy doing physical activity.	☐	☐	☐	☐
n.	I think my teachers enjoy doing physical activity.	☐	☐	☐	☐
o.	I think my parents/guardians enjoy physical activity.	☐	☐	☐	☐

6.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	I am confident with my strength.	☐	☐	☐	☐
b.	I am confident with my endurance.	☐	☐	☐	☐
c.	I am confident with my balance.	☐	☐	☐	☐
d.	I am confident with my agility.	☐	☐	☐	☐

e.	I am confident with my flexibility.	☐	☐	☐	☐
f.	I am confident with my rhythm.	☐	☐	☐	☐
g.	I am confident with my hand-eye coordination.	☐	☐	☐	☐
h.	I am confident in doing physical activity elegantly.	☐	☐	☐	☐
7.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	I try my best to engage in physical activity.	☐	☐	☐	☐
b.	My target is to go beyond what I have achieved in physical	☐	☐	☐	☐
c.	I keep striving for breakthroughs in physical activity.	☐	☐	☐	☐
d.	I just do my personal best in physical activity.	☐	☐	☐	☐
e.	I seek to explore my best potential in physical activity.	☐	☐	☐	☐

***** End of Questionnaire. Thank you very much for your help! *****

ANNEXURES D

TEACHERS QUESTIONNAIRE

Teacher Questionnaire On Physical Activity

Welcome to Physical Activities Project! Your help is very much appreciated! There is no right or wrong answers. Just choose what is true for you.
THANK YOU!

Average age of students at my school:

Grade 3:_____years old; Grade 4:_____years old; Grade 5:_____years old;
Grade 6:_____ years old;

Have your students used Brain Break before? ☐Yes ☐No

1.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	Being physically active helps to make my students fit.	☐	☐	☐	☐
b.	Being physically active helps to relax my students.	☐	☐	☐	☐
c.	Being physically active helps to improve my students' thinking.	☐	☐	☐	☐
d.	Being physically active helps to improve my students' analytic	☐	☐	☐	☐
e.	Being physically active helps to enhance my students' self-concept.	☐	☐	☐	☐
f.	Being physically active helps to give my students new experience every time.	☐	☐	☐	☐
g.	Being physically active helps to give my students more willpower.	☐	☐	☐	☐
h.	Being physically active helps to give my students good health.	☐	☐	☐	☐
i.	Being physically active helps to improve my students' sleep.	☐	☐	☐	☐
j.	Being physically active helps to improve my students' school work.	☐	☐	☐	☐
2.	**Do you agree/disagree with the following?**	Strongly Disagree	Disagree	Agree	Strongly Agree
a.	It is important for students to spend time to be physically active.	☐	☐	☐	☐
b.	It is important for students to form a habit of being physically	☐	☐	☐	☐
c.	It is important for students to be physically active for their health.	☐	☐	☐	☐
d.	Being physically active is something that students should not give up in their lives.	☐	☐	☐	☐
e.	Even if they have a lot of work to do, students should still keep being physically active.	☐	☐	☐	☐

3. Do you agree/disagree with the following?	Strongly Disagree	Disagree	Agree	Strongly Agree
a. Students learned about culture through video exercise.	☐	☐	☐	☐
b. Students learned about music through video exercise.	☐	☐	☐	☐
c. Students learned about art through video exercise.	☐	☐	☐	☐
d. Students learned about arithmetic through video exercise.	☐	☐	☐	☐
e. Students learned about language through video exercise.	☐	☐	☐	☐
f. Students learned about writing through video exercise.	☐	☐	☐	☐
g. Students learned about composition through video exercise.	☐	☐	☐	☐
h. Students learned about healthy lifestyle from video exercise.	☐	☐	☐	☐
i. Students learned about healthy diet from video exercise.	☐	☐	☐	☐
j. Students learned about hygiene from video exercise.	☐	☐	☐	☐
k. Students learned about environmental protection from video exercise.	☐	☐	☐	☐

4. Do you agree/disagree with the following?	Strongly Disagree	Disagree	Agree	Strongly Agree
a. My students know how to choose physical activity in video exercise that suits them.	☐	☐	☐	☐
b. My students know how to do physical activity if there is a video exercise to follow.	☐	☐	☐	☐
c. My students can follow physical activity in video exercise with minimal mistakes even without a teacher.	☐	☐	☐	☐
d. My students know which their favorite physical activity is in video exercise.	☐	☐	☐	☐

5. Do you agree/disagree with the following?	Strongly Disagree	Disagree	Agree	Strongly Agree
a. My students think physical activity is fun.	☐	☐	☐	☐
b. My students look forward to doing physical activity.	☐	☐	☐	☐
c. My students enjoy doing physical activity with their classmates.	☐	☐	☐	☐
d. My students achieve their physical activity goals even if they are tired.	☐	☐	☐	☐
e. My students persuade their friends to join them in doing physical activity.	☐	☐	☐	☐
f. My students feel better after physical activity.	☐	☐	☐	☐
g. My students feel stronger after physical activity.	☐	☐	☐	☐
h. My students feel more confident after physical activity.	☐	☐	☐	☐
i. My students think better after physical activity.	☐	☐	☐	☐
j. My students improve on their school work after physical activity.	☐	☐	☐	☐
k. My students think their good friends enjoy doing physical activity.	☐	☐	☐	☐
l. My students think their classmates enjoy doing physical activity.	☐	☐	☐	☐
m. My students think other children enjoy doing physical activity.	☐	☐	☐	☐
n. My students think their teachers enjoy doing physical activity.	☐	☐	☐	☐
o. My students think their parents/guardians enjoy physical activity.	☐	☐	☐	☐

6. Do you agree/disagree with the following?	Strongly Disagree	Disagree	Agree	Strongly Agree
a. My students are confident with their strength.	☐	☐	☐	☐
b. My students are confident with their endurance.	☐	☐	☐	☐
c. My students are confident with their balance.	☐	☐	☐	☐
d. My students are confident with their agility.	☐	☐	☐	☐
e. My students are confident with their flexibility.	☐	☐	☐	☐
f. My students are confident with their rhythm.	☐	☐	☐	☐
g. My students are confident with their hand-eye coordination.	☐	☐	☐	☐
h. My students are confident in doing physical activity elegantly.	☐	☐	☐	☐
7. Do you agree/disagree with the following?	Strongly Disagree	Disagree	Agree	Strongly Agree
a. My students try their best to engage in physical activity.	☐	☐	☐	☐
b. My students' target is to go beyond what they have achieved in physical activity.	☐	☐	☐	☐
c. My students keep striving for breakthroughs in physical activity.	☐	☐	☐	☐
d. My students just do their personal best in physical activity.	☐	☐	☐	☐
e. My students seek to explore their best potential in physical	☐	☐	☐	☐

***** End of Questionnaire. Thank you very much for your help! *****

ANNEXURES E

JOURNAL OF MENTAL HEALTH AND PSYCHOLOGY AUTHOR GUIDELINES

MENTAL HEALTH AND PHYSICAL ACTIVITY

AUTHOR

INFORMATION PACK

TABLE OF CONTENTS

ISSN: 1755-2966

DESCRIPTION

Mental Health and Physical Activity is an international forum for scholarly reports on any aspect of relevance to advancing our understanding of the relationship between **mental health** and **physical activity**. Manuscripts will be considered for publication which deal with high quality research, comprehensive research reviews, and critical reflection of applied or research issues. The journal is open to the use of diverse methodological approaches. Reports of practice will need to demonstrate academic rigour, preferably through analysis of programme effectiveness, and go beyond mere description.

The aims of *Mental Health and Physical Activity* are:

(1) To foster the inter-disciplinary development and understanding of the mental health and physical activity field;
(2) To develop research designs and methods to advance our understanding;
(3) To promote the publication of high quality research on the effects of physical activity (interventions and a single session) on a wide range of dimensions of mental health and psychological well- being (e.g., depression, anxiety and stress responses, mood, cognitive functioning and neurological disorders, such as dementia, self-esteem and related constructs, psychological aspects of quality of life among people with physical and mental illness, sleep, addictive disorders, eating disorders), from both efficacy and effectiveness trials;
(4) To promote high quality research on the biophysical and psychosocial mechanisms involved to help our understanding of the link between physical activity and mental health, and guide intervention development;
(5) To provide an evidence-based source for professionals working in the field of mental health and a forum to consider service delivery issues.

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INTRODUCTION

Mental Health and Physical Activity (MENPA) is an international forum for scholarly reports on any aspect of relevance to advancing our understanding of the relationship between mental health and physical activity. Manuscripts will be considered for publication

which deal with high quality research, comprehensive research reviews, and critical reflection of applied or research issues. The journal is open to the use of diverse methodological approaches. Reports of professional practice will need to demonstrate academic rigour, preferably through analysis of programme effectiveness, and go beyond mere description.

Contact Details

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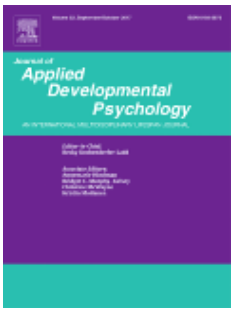
TABLE OF CONTENTS



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ANNEXURES G

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H C Sieberhagen — *Translator and Editor*

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CERTIFICATE

OF LANGUAGE EDITING

issued on 17 November 2017

I hereby declare that I have edited the language of the dissertation

The effect of HOPSports Brain Breaks® on physical fitness and attitudes towards physical activity on Grade 6-learners

by

J Bonnema

20544324

Dissertation submitted in fulfilment of the requirements for the degree *Master of Arts in Kinderkinetics* at the Potchefstroom Campus of the North-West University

The responsibility to accept recommendations and effect changes remains with the author

H C Sieberhagen

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ANNEXURES H

ETHICAL APROVAL CERTIFICATE

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05 August 2014

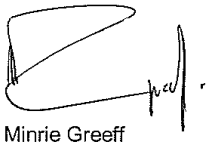
Dear Prof Moss

Ethics Application: NWU-00003-14-S1

The effect of structured physical activity intervention programmes on the body composition, physical fitness, physical activity and motor proficiency of Grade 6 and 7 learners

Thank you for amending your application. All ethical concerns have now been addressed and ethical approval is granted until 30/12/2016.

Yours sincerely



Prof Minrie Greeff
Chairperson Health Research Ethics Committee

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