South African Journal for Research in Sport, Physical Education and Recreation, 2017, 39(1): 199 - 217.
Suid-Afrikaanse Tydskrif vir Navorsing in Sport, Liggaamlike Opvoedkunde en Ontspanning, 2017, 39(1): 199 - 217.
ISBN: 0379-9069

ACTIVITY PREFERENCES OF 9- TO 10-YEAR-OLD GIRLS AND THE RELATIONSHIP BETWEEN OBJECT CONTROL SKILLS AND PHYSICAL ACTIVITY LEVELS: THE NW-CHILD STUDY

Marilette VISAGIE, Dané COETZEE & Anita E. PIENAAR
Physical Activity, Sport and Recreation, Faculty of Health Sciences (PhASRec focus area), North-West University, Potchefstroom, Republic of South Africa

ABSTRACT

Early object control (OC) skills proficiency is reported to be related to long-term physical activity (PA). The percentage of participation in moderate- and high-intensity PAs and the relationship between PA levels and OC skills in 9- to 10-year-old girls in South Africa are described while considering ethnic differences in activity preferences. OC skills were assessed in 406 girls by means of the Test of Gross Motor Development-2 (TGMD-2), while the Children's Leisure Activities Study Survey was used to assess PAs and patterns in 406 girls (89 white, 317 black) with a mean age of 9.86±0.42 years. The activity choices of white and black girls differed, where black girls spent a high percentage of their time (83.60%) doing household chores, walking, rope skipping and playing street soccer, while white girls engaged more in sport and non-organised activities. Significantly ($p \leq 0.00$; $d=0.83$, $d=0.5$) more white girls participated in moderate- and high-intensity activities. PA choices showed a small relationship with OC skills. Girls should receive more exposure to be more physically active. More emphasis should be placed on activities that can improve OC skills.

***Key words*:** Motor proficiency; Children; Socio-economic status; Ethnic preference.

INTRODUCTION

The benefits of regular PA and adequate physical fitness are well established. Beneficial effects are reported on the growth and development, as well as physical, social and psychological health of children, while it also lays a foundation for a lifetime of health through active living (Sotheren *et al*., 1999; Janssen *et al*., 2004; Strong *et al*., 2005; Jandrić, 2010). Daily PA also contributes to improved body composition, sleeping patterns, social and cognitive skills development and establishes a positive foundation for healthy behaviour with the subsequent benefit of protection against the development of chronic diseases in adulthood (Janssen *et al*., 2004; Gallahue & Ozmun, 2006).

PA among children is promoted by well-developed fundamental movement skills, but also depends on environmental influences (Stodden *et al*., 2008; Van Biljon & Longhurst, 2011). Low PA levels and a sedentary lifestyle during the early years could be predictors of health problems later in life (Dehghan *et al*., 2005) and are linked to childhood obesity, which is associated with increased health risks that can impair physical health (Hassan *et al*., 2003). During childhood, the main opportunities for children to be physically active consist of

Physical Education (PE) classes, PA during breaks and during leisure time, and participation in sport and unorganised PA (Pahkala, 2009). At the age of 6 to 12 years, PA often revolves around fun and joyful play (Aznar-Lain & Webster, 2007).

According to the World Health Organization (WHO, 2013a), children aged 5 to 12 years should spend at least 60 minutes engaging in age-appropriate PA each day. This daily PA should include moderate- and vigorous-intensity physical activities to achieve optimal health, wellness, fitness and performance benefits (NASPE, 2004). The majority of children seem not to accumulate these recommended levels of PA (Hallal *et al.*, 2012). Sallis *et al*. (1993) reported a decrease of 50 to 75% in PA from 6 to 18 years for girls. These findings are supported by the WHO (2013b) that also reports a decrease in PA levels of girls from the age of six years until adolescence, when activity levels start to drop more sharply.

Key findings from the '2014 Report Cards on Physical Activity for Children and Young People' of different countries also indicate that children do not meet the required 60 minutes of moderate- to vigorous-intensity PA per day (Active Healthy Kids: Canada, 2014). Only 20% of 5- to 17-year-old Australian children met the Australian Physical Activity Guidelines for Children and Youth (Australian Government, 2013), while 33% of boys and 21% of girls aged 4 to 15 years in England met the United Kingdom Physical Activity Guidelines for Children (HSCIC, 2009. Furthermore, Currie *et al*. (2012) reported that 11- to 15-year-old Scottish adolescents had low levels of moderate- to vigorous-intensity physical activity (MVPA); where only 19% of boys and 11% of girls met the UK 'Start Active Stay Active' Physical Activity Guideline.

The results of the South African Report Card (Draper *et al*., 2014) revealed that almost half of 10- to 17-year-old children are insufficiently active, spending an average of 100 to 200 minutes a week, or less than 20 minutes each day being moderately to vigorously active. Sedentary behaviour is considered to be a problem among South African children in obtaining the required PA per day, with 22% of boys and 27% of girls between 10 and 17 years spending just under three hours per day watching television (Draper *et al*., 2014). Older children and girls are at greatest risk for not getting enough PA (MRC, 2002; HAKSA, 2014). Sport participation seems to be higher in urban areas, where 66% of children play sport, compared to less than 50% in rural areas. The South African Report Card (Draper *et al*., 2014) further revealed that boys are more likely to participate in sports (72%) than girls (43%).

Well-developed locomotor (running, hopping and jumping) and OC skills (catching, throwing and kicking) (Cliff *et al*., 2009) are fundamental motor skills (FMS) that are considered a primary underlying mechanism that promotes engagement in PA (Stodden *et al*., 2008). Barnett *et al*. (2015) conducted a stratified randomised study on 10-year-old children from 18 stratified and randomly selected primary schools in the New South Wales region in Australia. These researchers found that the ability to perform OC skills proficiently, such as catching, throwing and kicking at the age of 10 years, was a significant contributing factor in subsequent engagement in adolescent PA.

In the New Castle region of New South Wales, Australia, a study was conducted by Cohen *et al*. (2014) on 460 children (8.5±0.6 years, 54% girls). These researchers established that OC

skills were significantly associated with moderate to vigorous PA during lunch time and recess breaks. These researchers furthermore concluded that the type of games and equipment that are provided to children during lunch times and breaks may be indicative of the type of activities in which these children will engage. Soccer and basketball were the most popular break-time activities in this study, which require high activity and high levels of OC skills (Cohen *et al*., 2014). A study in Canada conducted by Guévremont *et al*. (2008) on 6- to 17-year-old children found that the type of activities the children participated in can be divided into three categories, namely sport activities (dance, gymnastics, aerobics, swimming, baseball, hockey and karate), non-sports activities (participation in any form of music, drama and art) and club or community group activities (Brownies, scouts and photography). In this study, girls were most likely to participate in non-sports activities, such as drama, art and community activities (Guévremont *et al*., 2008).

In this regard, Engelbrecht *et al*. (2004) conducted a study in the North West Province of South Africa on girls between 13 and 15 years, and they report low-intensity activity levels in 70.3% of the group. Ethnical differences in PA choices were also studied, as well as the possible links between PA and physical fitness. The results indicated that white girls had the highest participation rates in swimming and aerobics, which are classified as high-intensity physical activities (Engelbrecht *et al*., 2004). McVeigh *et al*. (2004) conducted a study on 381 nine-year-old South African children and reported that higher socio-economic conditions contributed to higher PA levels in children, which, in turn, contribute to improved sports skills. In addition, results showed that there were statistically significant ethnical differences in the type of activities in which the children engage (McVeigh *et al*., 2004). White children were more active than black children and more likely to engage in physical education classes during school hours and they watched less television than black children (McVeigh *et al*., 2004).

Limited research could, however, be found that relates to the PA patterns of young South African girls and the role that cultural and racial differences play in their PA choices. The few studies (Engelbrecht *et al*., 2004; McVeigh *et al*., 2004) that have been reported on South African children, identified differences between ethnic groups, which were mostly attributed to low socio-economic status, such as household responsibilities that are expected from girls from poorer households from an early age. Humbert *et al*. (2006) reported in this regard that in low-income settings barriers include PA, but are not limited to family obligations, the lack of safe areas to play, the lack of facilities and cost of participating in different activities. Little information is, however, available on the activities in which young pre-pubertal girls in South Africa participate. Worldwide girls are considered as at risk with low PA levels, and therefore information of this nature can help researchers obtain a better understanding on how to improve this risky health behaviour that is found among young girls. Of further interest is the possible relationship that PA has with participation in activities that need proficiency in OC skills, which is considered to be an important contributor to higher PA levels (Clark & Medcalf, 2002; Gallahue & Ozmun, 2006; Barnett *et al*., 2008; Hardy *et al*., 2010).

PURPOSE OF RESEARCH

The aim of this study was twofold. Firstly, the researchers endeavoured to describe the types of activities that girls engage in that contribute to moderate- and high-intensity PA. Secondly,

we wished to determine whether there is an interplay between PA levels and participation in activities that involve OC skills among 9- to 10-year-old girls living in the North West Province of South Africa. In exploring these relationships, the influence of ethnic differences in their activity choices will be taken into consideration.

METHODOLOGY

Research design

The study used a cross-sectional design that is based on data that was collected as part of a longitudinal research project (Child-Health-Integrated with Learning and Development [NW-CHILD study]) that ran over a period of 6 years (2010-2016), which consisted of baseline and 2 follow-up measurements. The baseline data was collected in 2010. The first follow-up measurement was conducted in 2013, and the last follow-up measurement will be conducted in 2016 on a randomised group of learners living in different regions in the North West Province of South Africa. For the purposes of this study, only the data from the first follow-up measurement in 2013 of the girls was used.

Participants

The research group was selected by means of a stratified random sample in conjunction with the Statistical Consultation Services of the North-West University. A list of names of schools in the North West Province was obtained from the Department of Education of the North West Province to determine the research sample. This list of schools was grouped into 8 educational districts, each representing 12 to 22 regions with approximately 20 schools (minimum 12, maximum 47) per region. Regions and schools were randomly selected with regard to population density and school status (Quintile 1, namely schools from poor economic sectors, to Quintile 5 being schools from higher economic sectors). A total of 20 schools were involved in this study, from 4 school districts, with a minimum of 40 children per school and with an equal gender distribution. For the purpose of this study, only the data of the girls tested in 2013 (N=406) was used. This group had a mean age of 9.86±0.42. Of the 406 girls, 89 were white and 317 were black. For the full description of the research design and the participants that were part of the 2010 measurements, see Kemp and Pienaar (2010).

Measuring instruments

Test of Gross Motor Development (TGMD-2)

The TGMD-2 test is a norm-referenced test battery designed to test the gross motor functioning of children from 3 to 10 years old (Ulrich, 2000). This test consists of 12 motor skills, and is divided into 2 subtests, namely locomotor (run, hop, gallop, leap, horizontal jump and slide) and OC (striking a stationary ball, stationary dribble, catch, kick, overhand throw and underhand roll) skills. For the purpose of this study, only the OC sub-test was used to see how the OC skills will influence the participation in physical activity levels and activities. Each of these FMS has 3 to 5 performance criteria. For example, there are 5 performance criteria for striking a stationary ball: (1) "Dominant hand grips bat above non-dominant hand"; (2) "Non-preferred side of the body faces the imaginary tossed ball with feet parallel"; (3) "Hip and

shoulder rotation during swing"; (4) "Transfers body weight to front foot"; and (5) "Bat contacts ball". Marks were allocated as follows: one point awarded for each correct execution of the specific skills and zero for a failed attempt. The child had 2 trials to perform each skill.

A visual demonstration of each skill was provided. The scores for the 2 trials were added together. To obtain the skill score, all the total scores for each criterion were added together to determine the sub-test raw score of 48 points. The child's age, gender and raw scores were used to calculate the standard score and percentile rank. The descriptive categories of the TGMD-2 are: excellent (sub-test standard score 17 to 20), good (15 to 16), above average (13 to 14), average (8 to 12), below average (6 to 7), poor (4 to 5) and very poor (1 to 3). A standard score between 1 and 3 was, therefore, considered to show very low mastery of the OC skill, while a score of 17 to 20 was considered very good mastery of the OC skill. The TGMD-2 is reliable in three areas, namely content-description validity, criterion-prediction validity and construct-identification validity (Ulrich, 2000; Cools *et al*., 2009; Zarezadeh *et al*., 2011; Kim *et al*., 2014). This test has been found to be reliable in all demographic sub-groups with quotients reaching or exceeding 0.87. A coefficient of 0.88 shows that the TGMD-2 scores are stable over time. For test score reliability, a coefficient of 0.98 was found. The TGMD-2 evidences a high degree of reliability (Ulrich, 2000; Cools *et al*., 2009; Zarezadeh *et al*., 2011; Kim *et al*., 2014).

Children's Leisure Activities Study Survey (CLASS)

This self-reported questionnaire was developed by Telford *et al*. (2004) on Australian children to examine 10- to 12-year-old children's physical activity from Monday to Sunday. This questionnaire includes different types of physical activities. The participants were asked to circle yes or no, which indicates whether the child does a particular activity during a school week (Monday to Friday) and over a weekend (Saturday to Sunday). If the child circled yes, he/she had to report how many times a week, as well as for how long (hours/minutes) this activity was performed (Telford *et al*., 2004). To test the reliability of the CLASS questionnaire, the hours per week allocated to each activity were converted to a total of minutes that were performed per week. The questionnaire was adapted with regard to the type of activities in which 9- to 10-year-olds in South Africa participated. Hundred and eight (180) schoolchildren were part of this pilot study.

The activities that were replaced were pilot-tested on 9- to 10-year olds in Potchefstroom, North West Province of South Africa. The items were adapted by researchers and experts in the areas of PA and fitness, based on a research committee approach as stipulated by the guidelines of Frazer and Lawley (2000). Adhering to these guidelines, the words and phrases of the questionnaire were adapted to fit the South African context, names and descriptions of PAs and sport in the questionnaire items were adapted to typical South African PAs and sport (Tian *et al.*, 2014). According to the total minutes, the activities are classified into moderate-intensity, vigorous-intensity and combined moderate and vigorous-physical activity. Nineteen of the 31 activities classified by Telford *et al*. (2004) represent moderate-intensity physical activities (softball or karate or judo or wrestling, cricket, bicycling, dance, hockey, gymnastics, physical education class, playground equipment, playing in playhouse, playing with pets, school sport classes, athletics, skateboard, household chores, trampoline, travelling to school by walking, travelling to school by bicycling, walking for exercise and walking the dog). Twelve represent

vigorous physical activities (aerobics, rugby, basketball, running or jogging, netball, rollerblading, skipping, soccer or street soccer, swimming for fun, swimming laps, playing tag or chase, and playing tennis or hand tennis). The total number of yes and no answers were added up to determine how many of the activities that the child participated in represented moderate or vigorous physical activities. The reliability of the moderate and vigorous individual items in the CLASS self-report questionnaire ranged from 0.62 to 0.94 (Tian *et al*., 2014). Tian *et al*. (2014) reported internal consistency of the questionnaire items by means of Cronbach's alpha values that ranged from 0.71 to 0.84, $p<0.05$, for the CLASS questionnaire on 108 (n=45 boys; n=63 girls) South African children, and ICC (intra-class correlation coefficients) ranging from 0.73 to 0.95, $p<0.05$. For the purpose of this study, the CLASS questionnaire was translated to the learners' home languages.

Research procedure

Ethical approval was obtained from the Ethics Committee of the North-West University, Potchefstroom Campus (Ethics No. NWU-0070-09-A1), as well as the Department of Basic Education of the North West Province. A formal meeting was arranged with the principal of each school where the purpose and protocol of the study were explained in 2010 and again in 2013. Informed consent was obtained from the parents of each of the learners in 2013 when they were in Grade 3 (because of retention) and Grade 4. The purpose of this study was verbally explained to all participants. The participants had the chance to ask any questions about the research procedures and give their consent.

Learners, whose parents/legal guardians consented that they could participate in the study, were also evaluated in terms of their OC skills, physical fitness and physical activity. Instructions were translated by trained translators for the participants, if English was not their first language. The CLASS questionnaire was completed as follows: Children were sitting around a table, each with their own questionnaire in front of them. Each group was assisted by a post-graduate student in Human Movement Science, with specialisation in Kinderkinetics, and a translator. The Kinderkineticist explained the questionnaire step by step to the children, followed by the translation. The CLASS questionnaire was translated to the learners' home language to make it easier for the learners to answer the questionnaire.

Statistical analysis

The STATISTICA software package (StatSoft, 2013) was used to analyse the data. Data was firstly analysed for descriptive purposes on the basis of means (M), standard deviations (SD) and minimum and maximum values. The Spearman Rank Order correlation determined the relationship between OC skills and physical activity levels and patterns in the group. The strength of the relationship was set at $r\approx0.1$ indicating a small effect, $r\geq0.3$ indicating a medium effect and $r\geq0.5$ indicating a large effect. The level of statistical significance of the Pearson chi-square was set at $p\leq0.05$. Two-way frequency tables were used to compare the classification of the physical activity levels and the OC skills of the girls. The strength of the correlations is represented by the phi-coefficient with $w\approx0.1$ indicating a small effect, $w\approx0.3$ a medium effect and $w\geq0.5$ a large effect (Stodden *et al.*, 2008). Independent t-tests were used to analyse differences between the activity types and intensity level of activities of girls, black and white.

RESULTS

Table 1. **PERCENTAGE PARTICIPATING IN MODERATE- AND VIGOROUS-INTENSITY ACTIVITIES**

	YES		NO	
Physical activities (PA)	n	%	n	%
Moderate-intensity PA				
Household chores	314	77.33	92	22.66
Physical education class	278	68.74	128	31.52
Playing in playhouse/street	238	58.62	168	41.38
Playground equipment	202	49.75	204	50.25
Bicycling	166	40.89	240	59.11
Travel to school by walking	160	39.41	246	60.59
Walking for exercise	161	39.65	245	60.34
Playing with pets	151	37.19	255	62.81
School sport class	122	30.04	284	69.95
Dance	111	27.34	295	72.66
Athletics	94	23.15	312	76.85
Trampoline	74	18.23	332	81.77
Walking the dog	61	15.02	345	84.98
Hockey	44	10.84	362	89.16
Gymnastics	20	4.92	386	95.07
Skateboard	21	5.17	385	94.83
Softball/Judo/Karate/wrestling	13	3.20	393	96.80
Travel to school by bicycling	5	1.23	401	98.77
Cricket	5	1.23	401	98.77
Vigorous-intensity PA				
Skipping	290	71.43	116	28.57
Netball	202	49.75	204	50.25
Playing tag/chase	174	42.86	232	57.14
Swimming for fun	139	34.24	267	65.76
Running/jogging	113	27.83	293	72.16
Tennis/hand tennis	95	23.40	311	76.60
Soccer/street soccer	38	9.36	368	90.64
Rollerblading	27	6.65	379	93.35
Aerobics	22	5.42	384	94.58
Basketball	19	4.68	387	95.32
Swimming laps	10	2.46	396	97.54
Rugby	7	1.72	399	98.28

A 2-way table (Table 1) displays the nature of activities, as well as the number and percentage of girls who participated in the activities classified as moderate- and vigorous-intensity activities. Four hundred and six (406) girls completed the CLASS questionnaire, which includes 19 moderate-intensity physical activities and 12 vigorous-intensity physical activities. In the group, the highest number (77.33%, n=314) of the girls indicated that their time goes

into performing household chores, while 278 (68.74%) indicated that they participated in PE classes at school. A high number of the group (58.62%, n=238) also indicated that they spend time playing in playhouses or in the street. Rope skipping (71.43%, n=290) and netball (49.75%, n=202) were the 2 vigorous-intensity physical activities in which the girls participated mostly.

Table 2 displays the results in a 2-way table that was used to determine significant differences in time spent doing different moderate and vigorous physical activities between white and black girls. Statistically ($p \leq 0.001$) and practically significant differences were found, where the white girls participated more in the following moderate-intensity physical activities: playing on playground equipment (w=0.15), engaging in school sport classes (w=0.19), dance (w=0.13), walking the dog (w=0.14), hockey (w=0.31), gymnastics (w=0.18), skateboarding (w=0.19), bicycling (w=0.32), playing with pets (w=0.41) and on the trampoline (w=0.37).

Vigorous-intensity physical activities of the ethnic groups also differed significantly statistically ($p \leq 0.001$) and practically, where the white girls again participated more than the black girls in high-intensity activities, such as playing tag/chase (w=0.12), swimming laps (w=0.11) and swimming for fun (w=0.46). Black girls participated more in the following moderate-intensity physical activities: doing household chores (w=0.28), in PE classes (w=0.26) and travelling to school by walking (w=0.37) than the white girls. Black girls had statistical and small practical higher participation patterns (w=0.21) in rope skipping, while white girls displayed a statistical and medium practical higher participation patterns in rollerblading (w=0.41), of which both activities being categorised as high-intensity physical activities.

Figure 1 represents the descriptive statistics of the proficiency that the group obtained in the 6 OC skills and the OC standard score for the 6 OC skills. A Spearman Rank Order correlation was used to determine correlations between the 6 OC skills that were assessed (striking a stationary ball, stationary dribble, catch, kick, overhand throw and underhand roll) and the moderate-intensity and vigorous-intensity activities that the girls engaged in.

Table 3 indicates that stationary dribble and kicking showed correlations with a small practical significance ($r \geq 0.1$) with most of the moderate-intensity activities in which the group participated. Stationary dribble showed small practically significant correlations with bicycling (r=0.16), playing on playground equipment (r=0.11), playing with pets (r=0.17) and athletics (r=0.12), and a negative correlation with travel to school by walking (r=-0.10). Kicking showed a small practically significant correlation with household chores (r=0.10) and a negative correlation with hockey (r=-0.12), playing on playground equipment (r=-0.11), playing with pets (r=-0.20) and gymnastics (r=-0.10). These activities exhibited significant positive correlations ($p<0.05$) with 2 of the OC skills, although these correlations were of small practical significance.

Table 2. **PERCENTAGE OCCURRENCE OF ACTIVITIES: DIFFERENCES BETWEEN WHITE AND BLACK GIRLS**

Physical activities (PA)	**White (n=89)** %	n	**Black (n=317)** %	n	**Diff. ethnicity** %	**Significant differences** p	w
Moderate-intensity PA							
1 Playing with pets	**74.16**	66	26.81	85	47.35	***≤0.001****	**0.41**$^{\#\#}$
2 Walking to school	5.62	5	**48.90**	155	43.28	***≤0.001****	**0.37**$^{\#\#}$
3 Bicycling	**70.79**	63	32.49	103	38.30	***≤0.001****	**0.32**$^{\#\#}$
4 Trampoline	**44.94**	40	10.73	34	34.21	***≤0.001****	**0.37**$^{\#\#}$
5 Physical Education class	46.07	41	**74.76**	237	28.69	***≤0.001****	**0.26**$^{\#}$
6 Household chores	55.06	49	**83.60**	265	28.54	***≤0.001****	**0.28**$^{\#}$
7 Hockey	**29.21**	26	5.68	18	23.53	***≤0.001****	**0.31**$^{\#}$
8 School sports class	**47.19**	42	25.24	80	21.95	***≤0.001****	**0.19**$^{\#}$
9 Playground equipment	**64.04**	57	45.74	145	18.30	***≤0.002****	**0.15**$^{\#}$
10 Dancing	**38.20**	34	24.29	77	13.91	***≤0.009****	**0.13**$^{\#}$
11 Walking the dog	**24.72**	22	12.30	39	12.42	***≤0.003****	**0.14**$^{\#}$
12 Skateboard	**13.48**	12	2.84	9	10.64	***≤0.001****	**0.19**$^{\#}$
13 Athletics	**31.46**	28	20.82	66	10.64	*0.035*	**0.10**$^{\#}$
14 Gymnastics	**12.36**	11	2.84	9	9.52	***≤0.001****	**0.18**$^{\#}$
15 Playing (playhouse/street)	**64.04**	57	57.10	181	6.94	*0.239*	0.06
16 Walking for exercise	**42.70**	38	38.80	123	3.90	*0.507*	0.03
17 Softb./Judo/Karate/Wrestling	**5.62**	5	2.52	8	3.10	*0.143*	0.07
18 Bicycling to school	1.12	1	**1.26**	4	0.14	*0.917*	0.01
19 Cricket	1.12	1	**1.26**	4	0.14	*0.917*	0.01
Vigorous-intensity PA							
1 Swimming for fun	**75.28**	67	22.71	72	52.57	***≤0.001****	**0.46**$^{\#\#}$
2 Rollerblading	**25.84**	23	1.26	4	24.58	***≤0.001****	**0.41**$^{\#\#}$
3 Rope skipping	53.93	48	**76.34**	242	22.41	***≤0.001****	**0.21**$^{\#}$
4 Playing tag/chase	**53.93**	48	39.75	126	14.18	***≤0.017****	**-0.12**$^{\#}$
5 Soccer/street soccer	5.62	5	**10.41**	33	4.79	*0.170*	0.06
6 Netball	46.07	41	**50.79**	161	4.72	*0.431*	0.03
7 Basketball	1.12	1	**5.68**	18	4.56	*0.072*	0.09
8 Swimming laps	**5.62**	5	1.58	5	4.04	***≤0.029****	**0.11**$^{\#}$
9 Running/jogging	24.72	22	**28.71**	91	3.99	*0.458*	0.03
10 Aerobics	**6.74**	6	5.05	16	1.69	*0.533*	-0.03
11 Tennis/hand tennis	22.47	20	**23.66**	75	1.19	*0.815*	0.01
12 Rugby	1.12	1	**1.89**	6	0.77	*0.622*	0.02

* $p \leq 0.05$ Practical significance: w=0.01$^{\#}$ w=0.03$^{\#\#}$

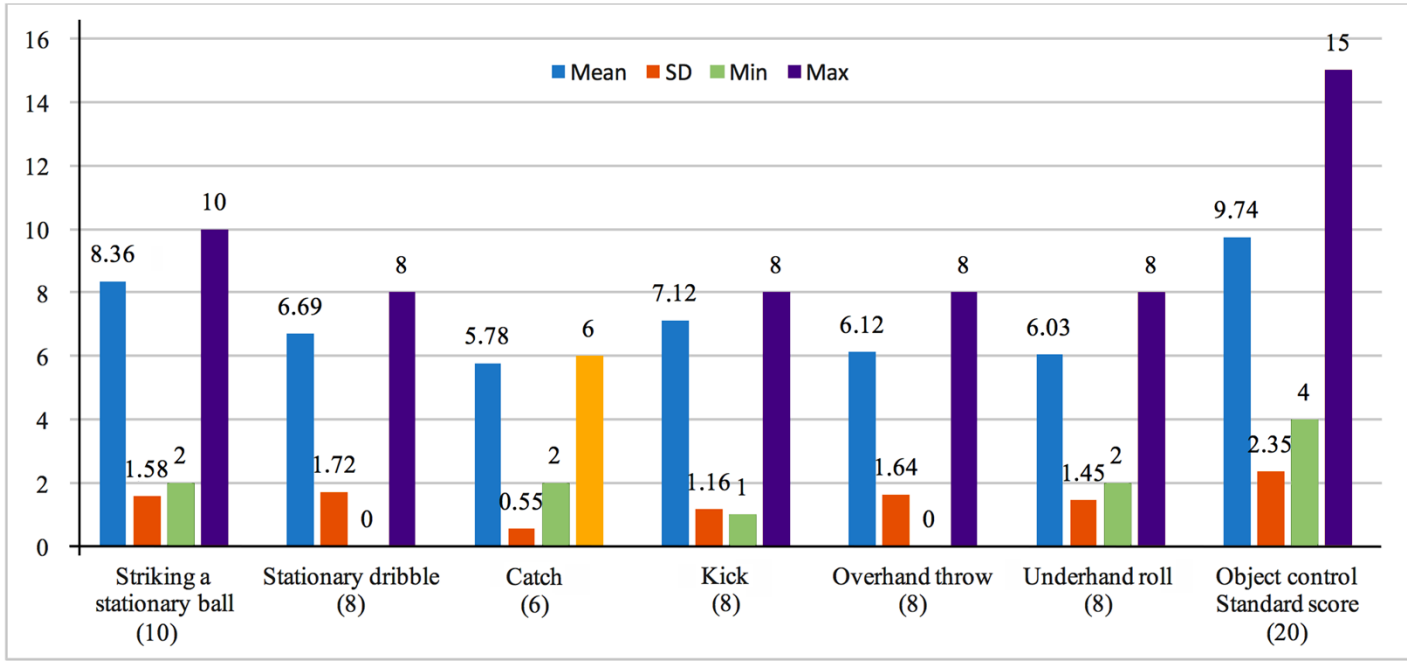

Figure 1. **DESCRIPTIVE STATISTICS: OBJECT CONTROL SKILLS PROFICIENCY**

Table 3. **RELATIONSHIPS BETWEEN OBJECT CONTROL SKILLS AND MODERATE- AND VIGOROUS-INTENSITY PHYSICAL ACTIVITIES**

Physical activities (PA)	Strike station. ball	Stationary dribble	Catch	Kick	Overhand throw	Underhand roll	Obj. control stand. score
Moderate-intensity PA							
Playing with pets	-0.03	**0.17**#*	0.04	**-0.20**#*	-0.04	**0.10**#	-0.00
Walk to school	-0.04	**-0.10**#*	-0.05	0.00	-0.02	-0.05	**-0.12**#*
Bicycling	-0.02	**0.16**#*	0.05	-0.05	-0.00	-0.03	0.05
Household chores	0.07	-0.01	-0.01	**0.10**#*	-0.09	-0.08	-0.01
Hockey	0.07	0.08	0.06	**-0.12**#*	0.00	**0.15**#*	0.06
Playground equipment	0.04	**0.11**#*	0.04	**-0.11**#*	0.03	0.04	0.06
Walking the dog	-0.04	**0.12**#	-0.07	-0.06	-0.02	-0.00	-0.00
Skateboard	**0.11**#*	0.03	0.03	0.04	-0.00	0.05	**0.10**#
Athletics	-0.04	**0.12**#	0.07	-0.02	0.07	-0.00	0.06
Gymnastics	0.01	0.04	0.07	**-0.10**#	-0.04	0.02	0.04
Total moderate activities	-0.02	**0.18**#*	-0.00	-0.02	0.04	0.01	0.08
Vigorous-intensity PA							
Swimming for fun	0.02	**0.15**#*	0.03	-0.07	-0.04	0.01	0.03
Netball	0.00	0.00	0.02	-0.05	0.03	0.09	**0.11**#
Basketball	0.04	-0.09	-0.06	0.02	-0.02	**-0.17**#*	-0.09
Running/ Jogging	0.03	0.03	-0.06	**0.10**#	0.02	0.00	0.07
Aerobics	-0.02	-0.06	-0.04	-0.06	0.03	**-0.14**#*	-0.09
Rugby	0.04	-0.00	-0.05	0.03	**-0.10**#	-0.04	-0.09
Total vigorous activities	0.04	**0.11**#	-0.05	-0.02	0.04	0.01	0.08

* $p \leq 0.05$ Practical significance: r=0.1 # small effect softb.=softball station.=stationary stand.=standard

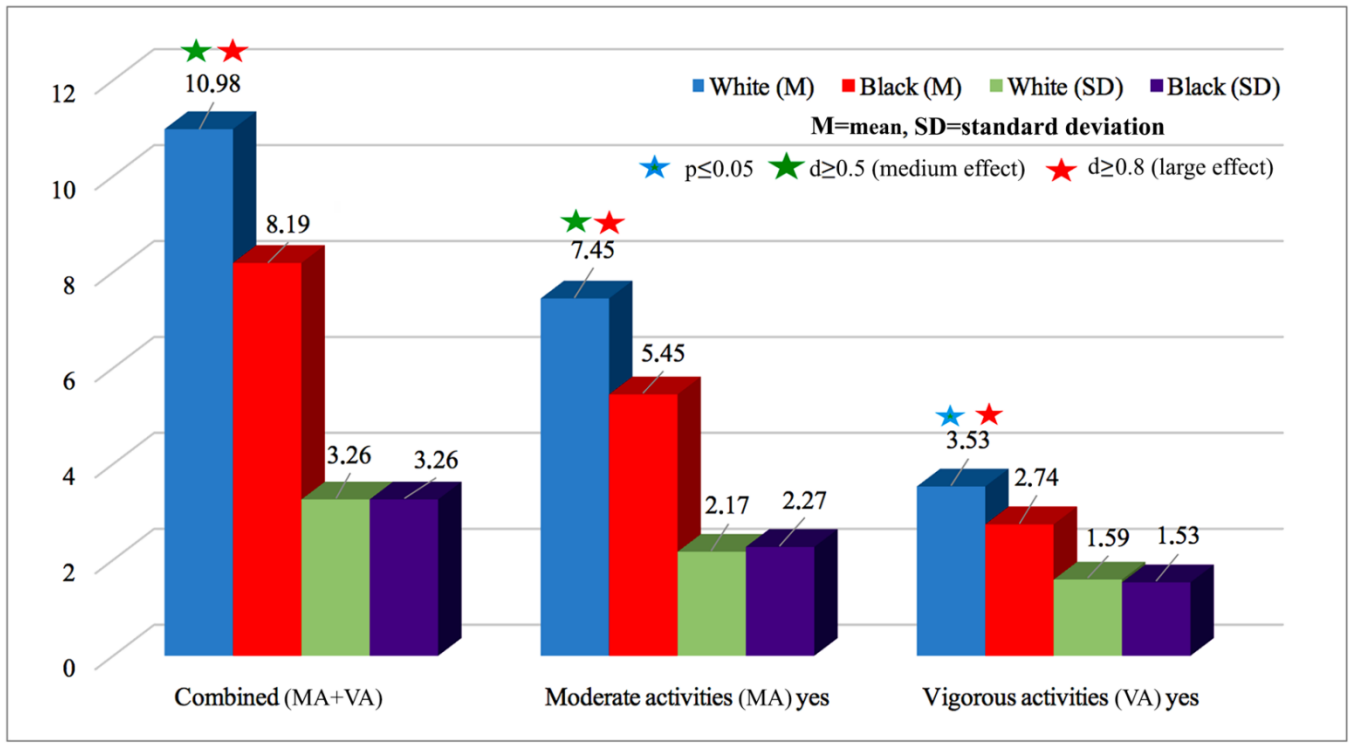

Figure 2. **SIGNIFICANCE OF DIFFERENCES BETWEEN MODERATE AND VIGOROUS PHYSICAL ACTIVITIES OF BLACK AND WHITE GIRLS**

With regard to catching and overhand throwing, no correlations were found with the various moderate-intensity activities, where underhand roll showed only a small practical relationship with hockey (r=0.15) and playing with pets (r=0.10). The OC standard score showed a small practical significant correlation with skateboarding (r=0.10) and a negative correlation with travelling to school by walking (r=-0.12). The total of all the moderate-intensity activities correlated with only one OC skill, namely stationary dribble (r=0.18). Stationary dribble and bicycling showed the highest practically and statistically significant correlations with each other (r=0.16; $p \leq 0.05$). Striking a stationary ball and catching indicated no significant correlations ($r \leq 0.1$) with any of the vigorous-intensity activities (see Table 3).

Figure 2 reports the results of the independent t-testing of differences in participation in moderate and vigorous physical activities between white and black girls. Participation in moderate and vigorous physical activities (MVPA) and moderate activities was statistically ($p \leq 0.05$) and practically significantly different between the two ethnic groups, showing a large effect ($d \geq 0.8$), where the white girls had higher participation rates. White girls participated more than black girls in moderate and vigorous activities (MVPA) (M=10.98), moderate activities (M=7.45) and vigorous activities (M=3.53).

DISCUSSION

The aim of this study was to describe the activities that girls engage in, the contribution of these activities to physical moderate- and high-intensity levels and whether interdependence exists between these physical activity levels and the OC skills that the girls engaged in between the ages of 9 to 10 years, taking into consideration ethnic differences in their activity patterns.

The results showed differences in the activity choices of black and white girls. Black girls engaged more in household chores and they were also more likely to travel to school by walking and doing rope skipping. Although no similar studies could be found on 10-year-old girls, the results of the study by Sedibe *et al.* (2014) agree with this finding, with the exception of differences in the ages of the studied groups. These researchers (Sedibe *et al.*, 2014) studied urban girls, 18 years of age who lived in Soweto, a township southwest of Johannesburg in South Africa, and found that they participated mainly in household chores. Besides performing household chores, participants were not physically active at school or home (Sedibe *et al*., 2014). A possible reason for the low engagement in activities other than household chores by these black girls, is probably inadequate sport facilities at school and culturally-required responsibilities that they have to adhere to. White girls in the current study engaged in activities such as bicycling, hockey, playing on playground equipment, playing with pets, trampoline jumping and swimming for fun.

These activities correlate with the findings of Hovell *et al*. (1999), who reported that girls tend to engage more in individual activities, such as walking, running, jogging, dancing, bicycling and gymnastics, while Engelbrecht *et al.* (2004) reported that 13- to 15-year-old white girls revealed the highest participation patterns in swimming and aerobics. A possible reason for these activity choices among white girls may be due to more opportunities and available equipment to be more physically active, as these children come from homes where the families are generally financially able to provide opportunities for recreation and physical activity.

Katapally and Muhajarine (2014) also report in this regard that the socio-economic status of a family has a positive role to play in increased MVPA, as children from such families have more parental support and can be driven to facilities with PA access.

The findings of the current study further indicated significantly higher participation levels among white girls in moderate and vigorous activities compared to black girls, which corresponds with the findings of Broderson *et al*. (2007) and McVeigh *et al*. (2004), who showed that white girls, 9 to 12 years of age, were more physically active than black girls. The results of the current study further revealed that 9- to 10-year-old girls were more likely to participate in non-sports or non-organised activities with clear cultural differences in the choices of their activities. This finding also agrees with the findings of Guévremont *et al*. (2008), who showed that girls, aged 6 to 17 years, were more likely to participate in non-sport activities, and are more interested in drama, art and engaging in community activities.

However, it appears from the results that there were only small significant interrelationships between the OC skills and the moderate- and vigorous-intensity physical activity levels of the girls. The possible reasons for this lack of a strong association between OC skills and physical activities that the girls engaged in, can perhaps be explained by the fact that a large number of the physical activities that they engaged in or chose to participate in were non-organised activities that may not have much of an OC component, whereas the physical activities of older children may be the result of participation in sports-related activities (in the more active children). Another possible reason is that all the girls in our study did not have access or exposure to activities or programmes that are based on the use of OC skills.

Environmental factors, such as the lack of access, resources, space and qualified teachers might definitely be contributing factors. Bremer and Lloyd (2014) also examined the relationship between FMS and physical activity in 6- to 9-year-old girls (n=25), and found that proficiency in OC skills was not related to their physical activities. They attributed the lack of association in their study to girls not choosing to participate in activities that require OC skills (such as baseball, basketball, football), of which many may not be considered gender-appropriate for young girls. They also concluded that a lack of proficiency in OC skills inhibits girls from engaging in activities that require OC skills, thereby limiting their opportunity to develop these skills.

These results are contradictory to the results of Barnett *et al*. (2009), where OC skills competence was associated with physical activity. Their study was completed on younger children, and they found that actual OC skills proficiency showed significant relationships with moderate to vigorous physical activities in 102 children (56% boys, 44% girls) aged 4 to 8 years (6.3±0.92) (Barnett *et al*., 2009). Cohen *et al*. (2014) also found that OC skills were significantly associated with MVPA during lunch times and recess breaks and they attribute this finding to the type of games and equipment provided to children during lunch times and recess breaks, such as soccer balls and basketballs, which require high levels of OC skills competency. A possible reason for the above findings could therefore be based on the type of sports the girls participated in during school hours.

The school environment can also exert an influence on activity levels of children during vacations and school breaks. The provision of facilities and equipment, such as balls and skipping ropes, could therefore have contributed to increased levels of physical activity among the girls during breaks. It would therefore appear that access to a variety of facilities, spaces and equipment could encourage girls to be more physically active and in this way create supportive environments that can promote physical activity. Another possible reason for the poor relationships that were found in the current study could be that girls between 9 and 10 years of age do not participate in sports, such as basketball. Underhand rolling showed a small relationship with hockey. This relationship could perhaps be explained by similar actions, such as the deep bending of the knees that is used when playing hockey. Dribbling and handling of balls are used during netball practices, which can explain the relationships that were established between these skills.

If we consider the relationships of moderate-intensity physical activities with OC skills, negative correlations were found between traveling to school by walking, playing with pets, playground equipment, hockey and gymnastics and OC skills. Three of the vigorous-intensity physical activities also showed a negative correlation with the OC skills, namely aerobics, basketball and rugby. A possible explanation for this poor relationship that was found with aerobics is that this kind of activity does not require any form of OC skills. Only a few children, however, participated in these activities, which could have influenced the strength of the relationships. The results showed that netball was a popular sports activity in which both white and black girls engaged. It was also the only sport activity that requires the use of OC skills, which correlates with the overall OC skills mastery score, which confirmed the relationship, although small, between OC skills and an increase in vigorous physical activity. Walking to school had an inverse relationship with OC skills; this can be explained based on the fact that walking has no OC skills component. Many girls from low socio-economic status spend their time walking to school, and although walking is conducive to health, it does not contribute to the age appropriate skills that these girls can develop to improve their physical activity levels.

In this study, the white girls participated more than the black girls in activities of moderate- and vigorous-intensity, separately or in MVPA. A likely reason for this is that the parents of the white girls in this study were predominantly from a higher social economic status and could have exposed their children to additional activity programmes because they could afford it, whereas most black girls did not receive the same kind of exposure to different kinds of activities because of their economic constraints, as they were predominantly from low social economic status. McVeigh *et al.* (2004) report in this regard that black girls are more active at an informal level, where their activity level is more based on informal play activities.

CONCLUSION

This study provided valuable insight regarding the activity preference of 9- to 10-year-old girls and the possible relationship between OC skills and physical activity levels and types of 9- to 10-year-old girls and how these are influenced by ethnicity. It can be confirmed that 9- to 10-year-old girls in South Africa are physically active, but that the activities that they engage in do not have a very strong relationship with their OC skills proficiency.

The results also indicated that physical activity preferences of these girls revealed that a high percentage of their physical activities do not include activities that make use of OC skills. As early OC skills proficiency is found to be related to long-term physical activity by researchers, strategies should be put in place to improve the engagement of girls in activities that can advance their OC skills proficiency. Further studies are therefore recommended on this topic, which can further our understanding of the physical habits of young girls in order for researchers to improve their physical activity levels and their subsequent health. Girls in low socio-economic areas do not have natural exposure to OC skills and engagement in physical activities due to cultural responsibilities that take a high percentage of their free time; therefore, the need to develop specific strategies to promote more exposure among these girls is needed.

IMPLICATIONS FOR FUTURE RESEARCH

Early childhood is an important period in the FMS development of a child, but also to establish building blocks that will be conducive for positive physical activity behaviour. The school is considered an important place to improve physical activity. The playground areas of the school should therefore be beneficial to improve physical activity and engagement in activities that encourage engagement in OC skills, especially in schools in low socio-economic status environments, where equipment, play surfaces and spaces need attention to increase such activities. It is recommended that knowledgeable people in the field of motor development, such as well-trained physical education teachers, should be appointed in schools who will be able to develop the OC skills of the children and who can identify and rectify poor OC skills proficiency timeously. In turn, it may contribute to higher physical activity levels among young girls.

Acknowledgements

The authors wish to thank the Medical Research Council of South Africa (MRC) for the research grants received, as well as the Sugar Association of South Africa (SASA) for the financial support that made this study possible. Thanks also goes to the Kinderkinetics honours students of the North-West University, Potchefstroom Campus for assisting with the data collection. Any opinion, findings and conclusions or recommendations expressed in this article are the opinion of the author(s) and therefore the MRC does not accept any liability in this regard.

REFERENCES

ACTIVE HEALTHY KIDS: CANADA (2014). "The 2014 Active Healthy Kids Canada Report Card on Physical Activity for Children". Hyperlink: [http://truesportpur.ca/active-healthy-kids-canada]. Retrieved on 15 February 2015.

AUSTRALIAN GOVERNMENT (2013). "Australian Government, Department of Health and Ageing (2011/13)". Hyperlink: [www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-food-monitoring.htm#1113]. Retrieved on 15 February 2015.

BARNETT, L.M.; MORGAN, P.J.; VAN BEURDEN, E. & BEARD, J.R. (2008). Perceived sports competence mediates the relationship between childhood motor skill proficiency and adolescent physical activity and fitness: A longitudinal assessment. *International Journal of Behavioural Nutrition and Physical Activity*, 5(1): 1-12.

BARNETT, L.M.; RIDGERS, M.D. & SALMON, J. (2015). Associations between young children's perceived and actual ball skill competence and physical activity. *Journal of Science in Medicine and Sport*, 18(2): 167-171.

BARNETT, L.M.; VAN BEURDEN, E.; MORGAN, P.J.; BROOKS, L.O. & BEARD, J.R. (2009). Childhood motor skill proficiency as a predictor of adolescent physical activity. *Journal of Adolescent Health*, 44(3): 252-259.

BREMER, E. & LLOYD, M. (2014). The importance of fundamental motor skill proficiency for physical activity in elementary school age females. *PHEnex Journal*, 6(2): 1-12.

BRODERSON, N.H.; STEPTOE, A.; BONIFACE, D.R. & WARDLE, J.R. (2007). Trends in physical activity and sedentary behaviour in adolescence: Ethnical and socioeconomic differences. *British Journal of Sports Medicine*, 41(3): 140-144.

CLARK, J.E. & MEDCALFE, J.S. (2002). The mountain of motor development: A metaphor. In J.E. Clark & J.H. Humphrey (Eds.), *Motor development: Research and reviews* (pp. 163-190). Reston, VA: National Association of Sport and Physical Education.

CLIFF, D.P.; OKELY, A.D.; SMITH, L. & MCKEEN, K. (2009). Relationships between fundamental movement skills and objectively measured physical activity in pre-school children. *Paediatric Exercise Science*, 21(4): 436-439.

COHEN, K.E.; MORGAN, P.J.; PLOTNIKOFF, R.C.; CALLISTER, R. & LUBANS, D.R. (2014). Fundamental movement skills and physical activity among children living in low-income communities: A cross-sectional study. *International Journal of Behavioural Nutrition and Physical Activity*, 11(April): 49 (Online).

COOLS, W.; DE MARTELAER, K.; SAMAEY, C. & ANDRIES, C. (2009). Movement skill assessment of typically developing preschool children: A review of seven movement skill assessment tools. *Journal of Sports Science and Medicine*, 8(2): 154-168.

CURRIE, C.; ZANOTTI, C.; MORGAN, A.; CURRIE, D.; DE LOOZE, M.; ROBERTS, C.; SAMDAL, O.; BARNEKWO, V. & SMITH, O.R.F. (2012). *Social determinants of health and well-being among young people: Health Behaviour in School-aged Children (HBSC) study*. International report from the 2009/2010 survey. Copenhagen (Denmark): World Health Organization.

DEHGHAN, M.; AKHTAR-DANESH, N. & MERCHANT, A.T. (2005). Childhood obesity, prevalence and prevention. *Journal of Nutrition*, 4(September): 24 (Online).

DRAPER, C.; BASSET, S.; DE VILLIERS, A. & LAMBERT, E.V. (2014). Results from South Africa's 2014 Report Card on Physical Activity for Children and Youth. *Journal of Physical Activity and Health*, 11(Supp. 1): S98-S104.

ENGELBRECHT, C.; COETZEE, B. & PIENAAR, A.E. (2004). Racial background and possible relationships between physical activity and physical fitness of girls: The Thusa Bana Study. *South African Journal for Research in Sport and Physical Education*, 26(1): 45-50.

FRAZER, L. & LAWLEY, M. (2000). *Questionnaire design and administration: A practical guide*. New York, NY: Wiley.

GALLAHUE, D.L. & OZMUN, J.C. (2006*). Understanding motor development: Infants, children, adolescents, adults* (6th ed.). Dubuque, IA: McGraw-Hill.

HALLAL, P.C.; ANDERSON, L.B.; BULL, F.C.; GUTHOLD, R.; HASKELL, W. & EKELUN, U. (2012). Global physical activity levels: Surveillance progress, pitfalls, and prospects. *Lancet*, 380(9838): 247-257.

HARDY, L.L.; REINTEN-REYNOLDS, T.; ESPINEL, P.; ZASK, A. & OKELY, A.D. (2010). Prevalence and correlates of low fundamental movement skill competency in children. *Journal of American Academy of Paediatrics*, 130(2): 390-398.

HASSAN, M.K.; JOSHI, A.V.; MADHAVAN, S.S. & AMONKAR, M.M. (2003). Obesity and health-related quality of life: A cross-sectional analysis of the US population. *International Journal of Obesity*, 27(10): 1227-1232.

HSCIC (HEALTH AND SOCIAL CARE INFORMATION CENTRE, LIFESTYLE STATISTICS) (2009). *Health Survey for England – 2008: Physical activity and fitness*. London (United Kingdom): National Statistics, Health and Social Care Information Centre, Government Digital Service.

HAKSA (HEALTHY ACTIVE KIDS SOUTH AFRICA) (2014). *The 2014 Healthy Active Kids Report Card*. Rondebosch, Cape Town (South Africa): Sports Science Institute of South Africa.

HOVELL, M.F.; SALLIS, J.F.; KOLODY, B. & MCKENZIE, T.L. (1999). Children's physical activity choices: A developmental analysis of gender, intensity levels, and time. *Paediatric Exercise Science*, 11(2): 158-168.

HUMBERT, M.L.; CHAD, K.E.; SPINK, K.S.; MUHAJARINE, N.; ANDERSON, K.D.; BRUNER, M.W.; GIROLAMI, M.W.; ODNOKON, T.M. & GRYBA, C.R. (2006). Factors that influence physical activity participation among high- and low- SES youth. *Qualitative Health Research*, 16(4): 467-483.

JANDRIĆ, S. (2010). Differences between boys and girls in terms of physical activity. *Journal of Physical Education and Sports*, 3(2): 85-88.

JANSSEN, I.; GRAIG, W.M.; BOYCE, W.F. & PICKETT, W. (2004). Association between overweight and obesity with bullying behaviours in school-aged children. *Journal of Paediatrics*, 113(5): 1187-1194.

KATAPALLY, T.R. & MUHAJARINE, N. (2014). Towards uniform accelerometry analysis: A standardization methodology to minimize measurement bias due to systematic accelerometer wear-time variation. *Journal of Science and Medicine in Sport*, 13(2): 379-386.

KEMP, C. & PIENAAR, A.E. (2010). The effect of a physical activity, diet and behaviour modification intervention on the self-perception of 9- to 12-year-old overweight and obese children. *African Journal for Physical, Health Education, Recreation and Dance*, 16(1): 101-116.

KIM, S.; KIM, M.J.; VALENTINI, N.C. & CLARK, J.E. (2014). Validity and reliability of the TGMD-2 for South Korean children. *Journal of Motor Behaviour*, 46(5): 351-356.

MCVEIGH, J.A.; NORRIS, S.A. & DE WET, T. (2004). The relationship between socio-economic status and physical activity patterns in South African children. *Acta Paediatrica*, 93(7)*:* 982-988.

MRC (MEDICAL RESEARCH COUNCIL) (2002). "The 1st South-African nation youth risk behaviour survey". 4 December 2002. Hyperlink: [http://www.mrc.ac.za//healthpromotion/YRBSpart3.pdf]. Retrieved on 15 February 2015.

NASPE (NATIONAL ASSOCIATION OF SPORT AND PHYSICAL EDUCATION) (2004). *Physical activity for children: A statement of guidelines for children ages 5-12* (2nd ed.). Reston, VA: NASPE Publications of health, physical education, recreation and dance.

PAHKALA, K. (2009). Physical activity in adolescence with special reference to cardiovascular health. Unpublished PhD thesis. Turku (Finland): University of Turku, Research Centre of Applied and Preventive Cardiovascular Medicine, the Paavo Nurmi Centre and the Department of Paediatrics.

SALLIS, J.; NADER, P.; BROYLES, S.; BERRY, C.; ELDER, J.; MCKENZIE, T. & NELSON, J. (1993). Correlates of physical activity at home in Mexican-American and Anglo-American preschool children. *Journal of Health Psychology*, 12(5): 390-398.

SEDIBE, M.H.; GRIFFITHS, P.L.; DOAK, C.M.; FEELEY, A.B.; VOOREND, C. & NORRIS, S.A. (2014). Narratives of urban female adolescents in South Africa: Dietary and physical activity practices in an obesogenic environment. *South African Journal of Clinical Nutrition*, 27(3): 114-119.

SOTHEREN, M.S.; LOFTIN, M.; SUSKIND, R.M.; UDALL, J.N. & BLECKER, U. (1999). The health benefits of physical activity in children and adolescents: Implications for chronic disease prevention. *European Journal of Paediatrics*, 158(4): 271-274.

STATSOFT (2013). *Statistica for Windows. Release 5.5: General conventions and statistics*. Tulsa, OK: StatSoft.

STODDEN, D.F.; GOODWAY, J.D.; LANGENDORFER, S.J.; ROBERTON, M.A.; RUDISILL, M.E. & GARCIA. C. (2008). A developmental perspective on the role of motor skill competence in physical activity: An emergent relationship. *Quest*, 60(2): 290-306.

STRONG, W.B.; MALINA, R.M.; BLIMKIE, C.J.; DISHMAN, R.K.; GUTIN, B.; MUST, A.; NIXON, P.A.; PIVARNIK, J.M.; ROWLAND, T.; TROST, S. & TRUDEAU, F. (2005). Evidence based physical activity for school-age youth. *Journal of Paediatrics*, 146(6): 732-737.

TELFORD, A.; SALMON, J.; JOLLEY, D. & CRAWFORD, D. (2004). Reliability and validity of Physical Activity Questionnaire for Children: Children's Leisure Activities Study Survey (CLASS). *Paediatric Exercise Science*, 16(1): 64-78.

TIAN, H.; DU TOIT, D. & TORIOLA, A.L. (2014). Validation of the Children's Leisure Activities Study Survey Questionnaire for 12-year old South African children. *African Journal for Physical, Health Education, Recreation and Dance*, 20(4): 1572-1586.

ULRICH, D.A. (2000). *The test of gross motor development* (2nd ed.). Austin, TX: Pro-Ed, Inc.

VAN BILJON, A. & LONGHURST, G.K. (2011). Effects of a Kinderkinetic programme on the gross motor abilities in pre-school children. *African Journal for Physical, Health Education, Recreation and Dance*, 17(3): 441-449.

WHO (WORLD HEALTH ORGANISATION) (2013a). "Physical activity". Hyperlink: [http://www.who.int]. Retrieved on 6 September 2013.

WHO (WORLD HEALTH ORGANISATION) (2013b). "Girls' participation in physical activities and sports: Benefits, patterns, influences and ways forward". Hyperlink: [http://www.icsspe.org]. Retrieved on 6 September 2013.

ZAREZADEH, M.; FAROKHI, A. & KAZEM NEZAD, A. (2011). Determining reliability and validity of Test of Gross Motor Development (Ulrich, 2000) in 3-11 aged children of Tehran city (In Persian). *Olympic*, 18(4): 85-98.

Prof Dané Coetzee: Physical Activity, Sport and Recreation Research (PhASRec) focus area; North-West University (Potchefstroom Campus), Private Bag X6001, Potchefstroom2520, Republic of South Africa. Tel.: +27 (0)18 299 1792 / +27 (0)82 260 5974. Fax.: +27 (0)18 299 1825. Email: 12129941@nwu.ac.za

(Subject Editor: Dr Eileen Africa)