

Available online at www.sciencedirect.com

ScienceDirect

journal homepage: <http://ees.elsevier.com/hsag/default.asp>

Full Length Article

The types and levels of physical activity and sedentary behaviour of Senior Phase learners in Potchefstroom



Johanna C.W. De Vos¹, Dorita Du Toit^{*}, Dané Coetzee²

Physical Activity, Sport and Recreation (PhASRec) Focus Area, North-West University, Potchefstroom Campus, South Africa

ARTICLE INFO

Article history:

Received 15 December 2015

Accepted 20 June 2016

Keywords:

Physical activity

Sedentary behaviour

Adolescents

Genders

ABSTRACT

Background: Worldwide, the health risks of decreasing physical activity levels and increasing sedentary behaviour among adolescents are a raising concern.

Objective: To determine the types and levels of physical activity as well as that of sedentary behaviour of a group Senior Phase learners in South Africa.

Methods: The adapted *Children's Leisure Activities Study Survey* (CLASS) questionnaire was used for determining the types and levels of physical activity and sedentary behaviour of 230 Grade 7 learners, from three schools in Potchefstroom. Data were analysed by means of the SAS statistics programme, and descriptive statistics, as well as independent t-tests and effect sizes (ES) were used.

Results: Moderate to high-intensity physical activity levels of between 334 and 361 min per week were found, and sedentary behaviour of between 3077 and 3410 min per week, which implies that between 70.7% and 71.9% of the participants, did not meet the recommended health-based guidelines. Higher activity levels were shown during weekends, where the boys were significantly more active than girls ($p < 0.001$; ES between 0.21 and 0.56), and girls showed more sedentary behaviours than the boys (ES between 0.18 and 0.20). The leisure time physical activities with the highest participation were soccer, recreational swimming, jogging and dancing, while the sedentary activities were listening to music, riding a vehicle and being busy on the phone.

Conclusion: Strategies need to be implemented to raise the physical activity levels of Senior Phase learners, especially during weekdays, and to decrease sedentary behaviour. With this view in mind, recommendations are made for Physical Education teachers.

Copyright © 2016, The Authors. Production and hosting by Elsevier B.V. on behalf of Johannesburg University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

* Corresponding author. Private Bag X6001, Faculty of Education Sciences, School of Education, North-West University, Potchefstroom Campus, Potchefstroom 2520, South Africa. Fax: +27 18 299 1716.

E-mail addresses: carinadv@live.co.za (J.C.W. De Vos), Dorita.DuToit@nwu.ac.za (D. Du Toit), 12129941@nwu.ac.za (D. Coetzee).

Peer review under responsibility of Johannesburg University.

¹ P.O. Box 39, Hartswater 8570, South Africa.

² Fax: +27 87 231 5480. Private Bag X6001, Faculty of Health Sciences, School of Biokinetics, Sport and Recreation, North-West University, Potchefstroom Campus, Potchefstroom 2520, South Africa.

<http://dx.doi.org/10.1016/j.hsag.2016.06.005>

1025-9848/Copyright © 2016, The Authors. Production and hosting by Elsevier B.V. on behalf of Johannesburg University. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

1. Introduction

Recent research findings show that childhood and adult physical activity levels have decreased during the past ten years in both developed and developing countries (McVeigh & Meiring, 2014; Telford et al., 2013), leading to concerns related to several health risks (Monyeki, 2013).

Physical activity entails any kind of movement that is initiated by energy-producing muscular function (World Health Organisation [WHO], 2015). Regular engagement in moderate to high-intensity physical activity has been shown to protect the individual from chronic diseases and conditions such as obesity, diabetes and coronary heart diseases (Spengler & Woll, 2013), to promote bone development and bone strength (Spengler & Woll, 2013), to provide psychological advantages such as self-confidence and self-image (Davies, Burns, Jewell, & McBride, 2011), and to prevent breast and colon cancer (WHO, 2015).

Physical activity levels have decreased in the past few years, amongst others, due to easy access to transport, because of unsafe circumstances and the distance between schools, businesses and living areas, which cause children to no longer be able to walk to school and parents to walk to their work (Monyeki, 2013). Studies in the field of physical activity increasingly show an inverted relationship between physical activity levels and time spent in sedentary behaviour (Torila & Monyeki, 2012; Van der Merwe, 2011). Sedentary behaviour is considered to be a group of habits that usually occur as an individual sits or lies, where little energy is required (Tremblay, Colley, Saunders, Healy, & Owen, 2010; British Heart Foundation National Centre [BHFNC], 2012), and has even been labelled as an independent health risk by some sources (WHO, 2015; BHFNC, 2012). The limiting of Physical Education periods in schools in preference of “academic” subjects, parents becoming over-protective in regarding children's outdoor play, and technology which has developed in such a way that each household has a computer and/or a television set available, also encourage sedentary behaviour in children (Torila & Monyeki, 2012).

In the current national school curriculum, as prescribed in the Curriculum and Assessment Policy Statement (CAPS), Physical Education has been made compulsory on the school timetable and has to be presented once a week (Department of Basic Education [DBE], 2011). However, recent studies indicate that a large number of schools have not consistently implemented this policy (Du Toit, Van der Merwe, & Rossouw, 2007; Van Deventer, 2012). Rajput and Van Deventer (2010) further found that South African schools often spend only 33% of the Physical Education periods on physical activity, which is detrimental, since children are often not exposed to physical activity other than at school. Van der Merwe (2013), in this respect, points out that 75% of South African children between ages seven and nine years use the internet for playing games, and 40% of adolescents in South Africa between 13 and 15 years of age use the internet for listening to music and for downloading it. Riddoch et al. (2004) indicate in their study that physical activity levels are inclined to decrease in children between nine and 15 years of age, with an accompanying increase in sedentary behaviour. According to the Medical

Research Council (MRC, 2002), 27% of South African girls and 22% of South African boys spend at least 3 h per day watching television.

The recommended levels of physical activity for children and adolescents (six to 17 years) according to the American Centres for Disease Control and Prevention (CDC, 2015) and the World Health Organisation (WHO, 2015), include at least 60 min' daily physical activity, of moderate to high intensity. Moderate to high intensity activities entail perspiration and a raised heart rate, but to such an extent that an individual can usually still communicate during an exercise session, whereas a person will by no means be able to communicate while exercising at high intensity and will have to stop to catch his or her breath (WHO, 2015). The types of physical activities must furthermore comply with recommendations regarding enjoyment, variation and the developmental level of the learner (WHO, 2015; CDC, 2015). Recommended guidelines for maximum time spent on sedentary behaviour for adolescents constitute a maximum of two hours per day with reference to screen-time, which thus entails time spent watching television or using the computer, a tablet or a cell phone (Cotton, 2013; Australian Department of Health; [ADH], 2015). Results of studies in several countries indicate that modern-day children's physical activity levels and sedentary behaviour do not comply with the required levels. Telford et al. (2013) tested 853 primary school children (435 boys and 418 girls) in Australia, and found that the children's physical activity levels met the physical activity requirements during the week, but that their physical activity levels decreased during weekends. Martin, Morrow, Jackson, and Dunn (2000) tested 1326 individuals (18 years and older) in Texas and found that only 623 of the participants did indeed comply with physical activity guidelines. In Europe, Riddoch et al. (2004) tested 2906 children between ages nine and 15 years and found that the nine-year-old children did indeed conform to the requirements, but the older they became, the less they complied to the daily recommendations of being physical active. Koorts et al. (2011) investigated the physical activity levels of 2728 adolescents in the South-West of England (1299 boys and 1429 girls). The results of this study indicated that the boys complied with the guidelines better than the girls (Koorts et al., 2011). In another study, LeBlanc et al. (2015) investigated the time spent by 5844 children in sedentary behaviour in 11 countries and found that 54% of the children did not meet the prescribed guidelines for screen-time, while the “Physical Activity Report Card” of the USA (NPAP, 2014) reported similar tendencies.

In South Africa, studies also indicate inadequate physical activity levels and sedentary behaviour in children and adolescents. McVeigh and Meiring (2014) tested 767 adolescents in Southern Africa to determine the amount of time they spent on physical activities. The results bore evidence that a decrease in physical activity followed upon an increase in age, coupled with sedentary behaviour (McVeigh & Meiring, 2014). Compared to this, the study conducted by Craig, Bland, and Reilly. (2013) indicated that only 26% of adolescents in rural areas in South Africa complied with the world's recommended levels of physical activity. The authors noted that, although rural adolescents generally spend more time being physically active than urban adolescents (especially in walking), the intensity of

the physical activity is not always sufficient to comply with the guidelines (Craig et al., 2013). The HAKSA (*Healthy Active Kids in South Africa*) report card, which presents the results of a systematic review of the physical activity and nutritional status of children and youth in South Africa in the form of grades, indicates that South Africa has decreased in its total physical activity from a “C” average in 2010, to a “D” average in 2014 (Draper, Basset, De Villiers, & Lambert, 2014). For sedentary behaviour, an “F” was awarded, since studies indicate, according to the report card, that those South African children between ages 10 and 17 years spend more than three hours per day watching television (Draper et al., 2014). The report card further indicated that 72% of boys participate more in physical activities compared to girls (43%) (Draper et al., 2014). Reddy et al. (2007) also found that in rural areas, as many as 64% of girls and 45% of boys in South Africa participate in few or no physical activities. The lower physical activity levels of South African girls compared to those of boys, according to researchers, can often be ascribed to the type of physical activity preferred by the different genders (Reddy et al., 2007). Walter (2011) and Pienaar and Kemp (2014) report that boys often prefer playing outdoors in competitive sports and games, while girls rather play indoors or do household chores. However, a very limited amount of literature exists regarding the types of physical activities in which South African children participate.

The above-mentioned research findings indicate that children and adolescents in South Africa do not comply with the required norms for physical activity levels, and this is of grave concern, seen in the light of the mentioned health and other advantages of regular physical activity and low levels of sedentary behaviour. These advantages also form the basis for the main aim of Physical Education in the National Curriculum and Assessment Policy Statement (CAPS) (DBE, 2011), namely, to create the opportunity and to empower learners to participate in physical activities which promote movement and physical development. To comply with these requirements of the CAPS it is not only essential for a teacher in Physical Education to possess knowledge of the physical activity levels of his or her learners, but also to have knowledge of the differences between genders and the types of physical activities and sedentary activities in which the learners participate. Relatively few studies could be found regarding the physical activity levels, sedentary behaviour and the types of physical and sedentary activities in which South African adolescent boys and girls participate during weekdays and weekends; hence the aim of this study is to investigate the physical activity levels, sedentary behaviour and types of physical and sedentary activities of a group of South African adolescents in the Senior Phase.

2. Material and methods

2.1. Design

A quantitative cross-sectional design was used.

2.2. Study population

The population for the study was from three primary schools in Potchefstroom, a city in the North–West Province of South

Africa, of which one school consisted of learners mostly from a low socio-economic background, one school of which the learners were from a middle to high socio-economic background and the third school's learners were from a low to middle socio-economic background. The total group ($N = 230$) comprised ($n = 116$) girls and ($n = 114$) boys, of whom the ethnic composition was (White, $n = 41$; Black, $n = 141$; Coloured, $n = 48$), which can be considered representative of the population of Grade 7 learners in Potchefstroom. According to the DBE (2011) all Grade 7- to 9-learners are categorised in the Senior Phase of the General Education and Training (GET) band. All Grade 7-learners from each of the three schools, whose consent forms had been signed, were evaluated; therefore, this sample can be considered as an availability sample, since all available Grade 7-learners at the three schools formed part of the study population. Furthermore, this study population can also be seen as a purposive sample as the three schools were specifically selected from different socio-economic backgrounds.

2.3. Measuring instrument

The participants' physical activity levels were determined by means of the adapted *Children's Leisure Activities Study Survey* (CLASS) questionnaire (Tian, Du Toit, & Toriola, 2014), which was originally developed with the aim of measuring the physical activity and sedentary behaviour patterns of Australian six to 12-year-old children (Telford, Salmon, Jolley, & Crawford, 2004). The questionnaire was adapted and validated for Grade 7-learners in a South African context (Tian et al., 2014). The questionnaire comprises of two sections, namely demographic items and habitual participation in several physical activities as well as sedentary behaviour. The physical activity items entail a control list consisting of 30 physical activities. The data can be interpreted to determine the time spent on moderate intensity physical activity, high intensity physical activity and moderate to high intensity physical activity, measured in METS (Metabolic equivalent of task). From the activities of the CLASS questionnaire, 18 activities were classified as moderate to high intensity (3–5.9 METS) activities, for instance cycling and walking to school, and 12 activities as high intensity (6 + METS), for instance different types of competitive sports and running or jogging. The sedentary behaviour section of the questionnaire requests that learners report the amount of time they usually spend on activities, such as “Watching television”, “Playing indoors with toys” and “Listening to music”. According to Tian et al. (2014), the adapted CLASS questionnaire shows acceptable reliability (Cronbach alpha values between 0.71 and 0.84, $p < 0.05$) and validity ($r = 0.43$ to 0.63).

2.4. Data collection procedure

The questionnaire was distributed during a Life Orientation period at the schools and learners sat in the classroom and completed the questionnaire under supervision of the researchers, who assisted learners who had questions on the instructions of the questionnaires. Learners, who had not supplied signed informed consent forms at the time, did a

different Life Orientation activity addressing the theme of a healthy lifestyle, as part of the normal Life Orientation class.

2.5. Ethical issues

The study forms part of a larger project which has already been approved by the Ethics Committee of North–West University (Number NWU-0058-01-A1), and by the North West Department of Education. Informed consent forms were handed to the school principals, parents and learners to be signed prior to the commencement of the study. All information and data obtained during the study were at all times dealt with as being confidential among the learners and researchers. Furthermore, the learners were assured of anonymity, that they participated voluntarily in the study and that they could withdraw from the study at any stage if they so wished, without any prejudice against them.

2.6. Data analysis

Descriptive statistics were used to determine mean (M), minimum and maximum values, as well as standard deviations (SD), by means of the Statistical Analysis System (SAS, 2011) computer programme. The significance of the differences between genders was determined by means of independent t-tests and the level of significance was set at $p \leq 0.05$. To interpret practical significance of the differences, effect sizes (ES) were calculated by dividing the average difference by the largest standard deviation (SD), in accordance with the recommendations of Cohen (1988). In this respect it is recommended that an ES of 0.2 represents a small effect, 0.5 a medium effect and 0.8 a large effect (Cohen, 1988). Although the questionnaire did not ask learners which activities they prefer, the physical and sedentary activities in the questionnaire were further analysed by means of descriptive statistics so as to establish which activities are practised most in their free time by the total group, and by each gender. For this purpose the “Physical Education” item in the list of physical activities, and the “Homework” item in the list of items on sedentary behaviour, have not been included in the analyses, seeing that they are compulsory school activities and therefore not considered as an indication of voluntary leisure time activities.

3. Results and findings

Table 1 sets out the descriptive statistics of the physical activity levels of the total group, as well as those of the groups of boys and girls.

In Table 1 it is evident that the average moderate to high-intensity physical activity levels of the total group ($M = 347.77$ min/wk), boys ($M = 361.76$ min/wk) and girls ($M = 334.03$ min/wk) are lower than the 420 min per week (thus 60 min per day) as recommended by the WHO (2015) and the CDC (2015). As further displayed in Table 1, the percentages are between 70.7% and 71.9% for participants that do not comply with these guidelines for moderate to high-intensity physical activity levels.

When the minutes of moderate to high-intensity physical activity per day are calculated, the total group, the boys' group and the girls' group seem to be more active during weekends than on weekdays. It also is evident that the boys spend more time than the girls on total physical activity (moderate to high-intensity) as well as on high-intensity physical activity during weekdays, weekends and per week. The girls also seem to spend more time on moderate intensity physical activity during weekdays ($M = 139.56$), weekends ($M = 83.07$) and per week ($M = 211.08$), than the boys during weekdays ($M = 121.10$), weekends ($M = 78.88$) and per week ($M = 187.81$) (Table 1).

With regard to sedentary behaviour (Table 1), the total group's average number of minutes spent on sedentary activities in their leisure time was during weekdays ($M = 1888.75$), during weekends ($M = 1470.50$) and during the entire week ($M = 3245.17$). The total group, girls and boys, further seem more sedentary during weekends than on weekdays, and girls seem to be more sedentary than boys on weekdays, during weekends and during the entire week.

The significance of the differences between the genders was subsequently calculated, and the results are displayed in Table 2.

It is clear from Table 2 that there is a statistical ($p < 0.001$) and small practical significant ($ES = 0.21$) difference between the boys and girls regarding the average number of minutes spent on physical activity of moderate intensity during weekdays, whereas the boys spend more time on moderate intensity physical activities than the girls. Regarding the participation in high-intensity physical activity during the weekends, the boys once again were statistically ($p < 0.001$) and practically ($ES = 0.48$) more active than the girls.

The total number of minutes spent by the boys on high-intensity physical activity was statistically significantly ($p < 0.001$) larger than that of the girls, with practical significance of a medium effect ($ES = 0.56$). The total number of minutes of moderate-intensity physical activity per week did not differ statistically significantly between the genders, but the difference did indeed lean towards practical significance of a small effect ($ES = 0.17$).

With reference to the number of minutes spent on sedentary behaviour, no statistically significant differences were found between the boys and the girls, although the girls demonstrated more sedentary behaviour during weekdays than did the boys, with practical significance of a small effect ($ES = 0.20$). The difference between the boys and the girls regarding the total sedentary time per week also leaned towards practical significance of a small effect ($ES = 0.18$).

The types of physical activities in which the learners participate most in their leisure time were subsequently investigated and the ten activities in which learners participated most, are reflected in Fig. 1. The five activities in which most of the learners out of the total group participate, comprise recreational swimming (“swimming for the fun of it”) (66.1%), jogging (66.1%), household chores (65.2%), dancing (64.3%) and tennis or hand tennis (an indigenous game in which a ball is struck to one another with the hand) (59.1%) (see Fig. 1). The five activities in which the boys participated most were soccer (86.84%), tennis or hand-tennis (72.80%),

Table 1 – Descriptive statistics regarding physical activity levels and sedentary behaviour in Senior Phase learners.

Physical activity/ sedentary behaviour category	Total group (N = 230)					Boys (n = 114)					Girls (n = 116)				
	M	Min	Max	SD	% Not complying with guide-lines	M	Min	Max	SD	% Not complying with guide-lines	M	Min	Max	SD	% Not complying with guide-lines
Total PA weekdays (min)	219.56	22.5	820	123.09	94.6	223.85	22.5	745	122.04	92,1	215.34	23.75	820.00	124.50	95.7
Moderate-intensity PA weekdays (min)	130.41	8.75	595	83.31		121.10	10	437.5	79.67		139.56	8.75	595.00	86.10	
High-intensity PA weekdays (min)	84.69	0	318.75	56.54		98.96	0	318.75	57.39		70.68	0	277.50	52.25	
Total PA weekends (min)	140.08	0	607.5	102.91	53.9	150.09	0	607.5	113.71	56,5	130.25	14	560.00	90.48	59.1
Moderate intensity PA weekend (min)	80.99	0	352.5	63.90		78.88	0	352.5	68.60		83.07	5	328.75	59.14	
High-intensity PA weekend (min)	56.29	0	307.5	49.37		69.43	0	307.5	53.84		43.38	0	232.50	40.81	
Total PA per week (min/wk)	347.77	46.25	1345	202.75	71.3	361.76	50.5	1345	213.04	71,9	334.03	46.25	1275.00	192.04	70.7
Total moderate intensity PA per week (min/wk)	199.54	17.5	802.5	130.50		187.81	17.5	718.75	133.33		211.08	20	802.50	127.19	
Total high-intensity PA per week (min/wk)	140.98	0	626.25	93.93		168.38	0	626.25	96.53		114.06	0	487.50	83.29	
Sedentary behaviour weekdays (min)	1888.75	171.00	6340.00	1100.46		1769.11	171.00	4700.00	1012.90		2006.33	310.00	6340.00	1172.71	
Sedentary behaviour weekends (min)	1470.50	0	6340.00	927.14		1410.54	0	4460.00	889.86		1529.42	0.00	6340.00	962.57	
Total sedentary behaviour per week (min/wk)	3245.17	260.00	12640.00	1788.78		3077.80	260.00	9040.00	1690.72		3409.65	455.00	12640.00	1872.90	

PA = physical activity; Total PA = total moderate to high-intensity physical activity; Min = minimum value; Max = maximum value; M = mean value; SD = standard deviation.

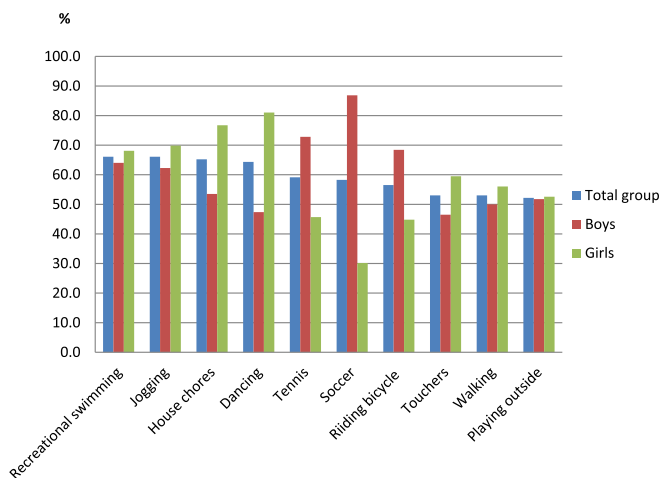
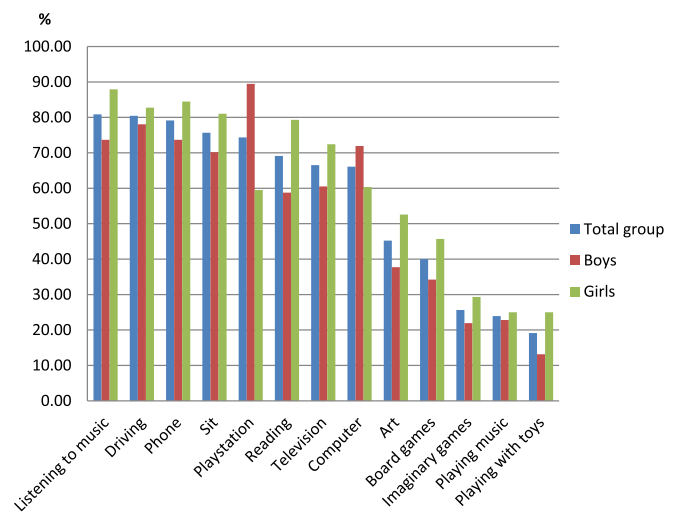
Table 2 – Significance of differences between genders regarding physical activity levels and sedentary behaviour.

Physical activity category	Girls (n = 116) M	Boys (n = 114) M	Significance of differences			
			df	t	p	ES
Total PA weekdays (min)	215.34	223.85	228.00	0.52	0.601	0.07
Moderate intensity PA weekdays(min)	139.56	121.10	228.00	−1.69	0.093	0.21 [#]
High-intensity PA weekdays (min)	70.68	98.96	228.00	3.91	≤0.001*	0.49
Total PA weekends (min)	130.25	150.09	228.00	1.47	0.144	0.17
Moderate intensity PA weekends (min)	83.07	78.88	228.00	−0.50	0.621	0.06
High-intensity PA weekends (min)	43.38	69.43	228.00	4.14	≤0.001*	0.48 [#]
Total PA per week (min/wk)	334.03	361.76	228.00	1.04	0.301	0.13
Total Moderate intensity PA per week (min/wk)	211.08	187.81	228.00	−1.35	0.177	0.17
Total High-intensity PA per week (min/wk)	114.06	168.38	228.00	4.57	≤0.001*	0.56
Sedentary behaviour weekdays (min)	2006.33	1769.11	228.00	−1.67	0.102	0.20 [#]
Sedentary behaviour weekends (min)	1529.42	1410.54	228.00	−0.97	0.332	0.12
Total Sedentary behaviour per week (min/wk)	3409.65	3077.80	228.00	−1.41	0.160	0.18

PA = physical activity; Total PA = total moderate to high-intensity physical activity; M = mean; df = Degrees of freedom; * = Statistically significant where $p \leq 0.05$; # = practical significance of a small effect where $ES \geq 0.2$; ^ = medium effect where $ES \geq 0.5$ and □ = of a large effect where $ES \geq 0.8$.

cycling (68.84), recreational swimming (64.03%) and jogging (62.28%). The girls participated most in dancing (81.0%), household chores (76.7%), skipping (75.0%), jogging (69.8%) and recreational swimming (68.1%).

The sedentary activities in which the participants took part most are reflected in Fig. 2, where it can be seen that the five sedentary activities in which the total group participated most, comprised listening to music (81%), riding in a vehicle (80%), being busy on their phones (79%), sitting and chatting (76%) and playing Playstation (an electronic television game) (74.4%). The five sedentary activities in which boys demonstrated the highest participation were Playstation (89%), riding in a vehicle (78%), listening to music (74%), being busy on their phones (74%) and computer games (71.9%). The sedentary activities in which girls participated most, were listening to music (88%), being busy on their phones (84%), riding in a vehicle (83%), sitting and chatting (81%), and reading (79.3%).

**Fig. 1 – The types of physical activities in which Senior Phase learners participated most.****Fig. 2 – The types of sedentary activities in which Senior Phase learners participated most.**

4. Discussion

The purpose of the study was to analyse the types and levels of physical activity and sedentary behaviour of Senior Phase learners. From the results it is evident that more than 70% of the participants in this study do not comply with the health-based guidelines for physical activity. This is slightly lower than the 80% of the world's adolescent population who do not comply with the guidelines according to the WHO (2015). Davies et al. (2011) report that between 10% and 35% of girls, and between 19% and 53% of boys in England, Northern Ireland and Wales did not meet the guidelines for total physical activity, which is lower than the percentages reported in our study. However, fewer participants in our/this study conformed to the guidelines than the study of Riddoch et al. (2004) involving 2185 nine-to 11-year-old-learners in Europe. It is furthermore clear that the results of our study are also in contrast with those of Butcher, Sallis, Mayer, and Woodruff (2008) which indicated that between 40% and 57%

of adolescents in a 100 cities in the USA did not conform to the guidelines of being active. In contrast, Hume et al. (2009) found that Australian boys and girls spend an average of 195 min and 156 min, respectively, per day on moderate to high physical activities.

With regard to time spent on sedentary activities the average time of the total group was approximately 3245.17 min per week; thus 463.6 min per day, similar to the average time of 462.6 min per day spent by 12 to 15-year-old American adolescents on sedentary behaviour (NPAP, 2014). However, the average time per day spent on sedentary behaviour by the population in the current study is less than the 516 min per day found by LeBlanc et al. (2015) among more than 5000 children in 11 countries, and the 546 min per day reported in the HAKSA report card (Draper et al., 2014) for South African children, but more than the 401 min per day found by Telford et al. (2013) among Australian adolescents. In all comparative studies discussed above, however, the authors came to the conclusion that the adolescents spend too much time on sedentary behaviour, which implies the same for the learners in the current study.

The results also indicate that boys are physically more active than girls, a tendency generally reported in literature (Koorts et al., 2011). Studies in South Africa produced similar results (Draper et al., 2014; McVeigh & Meiring, 2014; Micklesfield et al., 2014; Walter, 2011). Furthermore the results of the current study indicate that boys participate in more high-intensity physical activities than girls do, which correspond with results found in several studies (Pienaar & Kemp, 2014; Telford et al., 2013). These differences between the genders support the statement of Walter (2011) and Pienaar and Kemp (2014) that more boys than girls prefer participating in competitive sports.

It can be deduced from the results that girls spend more time on sedentary behaviour than do boys, which is supported by the results of LeBlanc et al. (2015) with 5844 children in 11 countries, including South Africa, as well as the results of Toriola and Monyeki (2012) among 283 fourteen-year-old learners in the North West Province of South Africa.

The low levels of physical activity found in the current study raise some concern, since too low levels of moderate to high-intensity physical activities are associated with several health risks, amongst others obesity, hypertension, diabetes mellitus and chronic heart diseases (Spengler & Woll, 2013). Studies (LeBlanc et al., 2015; Mitchell, Rodriguez, Schmitz, & McGovern, 2013) furthermore found a relationship between too much time spent in sedentary behaviour, and obesity and metabolic risks. According to LeBlanc et al. (2015), too much time spent on sedentary behaviour leads to unhealthy eating habits, which in turn results in overweight and obesity. Tremblay et al. (2010) found in an overview study, in which they compared 232 studies, that sedentary behaviour is related to undesirable body composition, lowered values for self-image and pro-social behaviour, and poorer academic performance. Furthermore, Monyeki (2013) points out that those physically inactive adolescents are inclined to become physically inactive adults.

One of the reasons for the low levels of physical activity, as well as high levels of sedentary behaviour among Senior Phase learners in the current study can be found in the

problems experienced with the presentation of Physical Education in South African schools. In this regard, research shows that problems such as the little time allocated per week (one hour) for Physical Education, untrained teachers and a lack of facilities and apparatus, lead to Physical Education often being presented ineffectively (Du Toit et al., 2007; Van Deventer, 2012; Van der Merwe, 2011). Furthermore, Van der Merwe (2011) points out that the ineffective presentation of Physical Education leads to learners' movement skills not being optimally developed and that they then are often not motivated to participate in physical activities in their leisure time. This statement is supported by the results of the study of Kubayi and Amusa (2014) among 172 adolescents in a rural area in the Limpopo Province where the participants indicated that a constructive programme for Physical Education at the school, and a reminder of the health advantages of physical activity, motivated them to participate in physical activity. Tian, Du Toit, and Toriola (2015) found that the physical activity levels of South African Senior Phase learners had increased after the presentation of a quality-enhanced Physical Education programme in which Physical Education teachers were well-trained, a variety of motivation strategies were followed, self-made apparatus was used and physical activities had formed part of the learners' homework. With such a quality-enhanced Physical Education programme, the physical activity levels of Senior Phase learners can be increased, even if Physical Education is presented only once a week.

The finding of the situation where levels of physical activity are higher during weekends than on weekdays in all the groups in the current study, is in contrast with findings that adolescents and children usually are more active during the week than during weekends (McMinn, Griffin, Jones, & Van Sluijs, 2012; Telford et al., 2013). Reasons for this can possibly be found in the usually higher frequency of periods for Physical Education per week in schools in developed countries compared to that in South Africa (Du Toit et al., 2007; Van der Merwe, 2011), as well as that South Africa, in general, has a warm climate for the greater part of the year, which is more suitable for outdoor activities. The finding that both the boys and the girls spend more time per day on both physical activity and in sedentary behaviour over weekends compared to weekdays, seems contradictory. However, as the learners have more leisure time over weekends than during weekdays, more time is available to be physically active and sedentary in their free time over weekends.

The warm climate of South Africa can furthermore be one of the reasons for recreational swimming and jogging making out some of the activities in which most learners in this study participated. Furthermore, the high participation in household chores, especially by the girls, is a culture-own activity which is a traditional gender role for girls especially, particularly in rural areas in South Africa (Kubayi & Amusa, 2014). The high participation in soccer by the total group, and especially by the boys in this study, correlates with the results of the studies performed by Walter (2011) and Nongogo, Kubayi, and Amusa (2013) who found that soccer was the most popular physical activity among boys, particularly black boys, and that physical activity preferences are often ethnic-bound. The activity in which most girls participated, namely dancing, is supported by the findings of Walter (2011) and

Nongogo et al. (2013) who mention that girls are more inclined to participate in non-contact, non-competitive and more recreation-based physical activities. The high percentage of the total group, boys and girls, that indicated “jogging” as a physical activity in which they participate, correlates with the findings of the study performed by Micklesfield et al. (2014) in which 92% of their random South African sample of 11 to 15-year-olds reported that they walk or run instead of using transport. In this respect Monyeki (2013) points out that walking is the primary mode of transport in rural areas in South Africa.

5. Conclusions, limitations and recommendations for future research

The results of this study indicate that the physical activity levels and sedentary behaviour of Senior Phase learners in a city in the North–West Province of South Africa, do not comply with the health-based guidelines for physical activity and sedentary behaviour. The results also show that boys are more active and perform more high-intensity levels of physical activity than do the girls, and that this group of adolescents is physically more active and sedentary over weekends than during the week. The physical activities that showed the highest participation also reflect that boys were more interested in more competitive physical activities, while the girls spent more time on non-competitive, recreation-based activities. With regard to sedentary activities, “listening to music” and being busy on the phone” appeared strongly, although boys listed electronic games more and girls social activities such as “chatting” more.

However, the results of this study need to be interpreted in the light of a few limitations. Firstly, a relatively small sample was used from one area in South Africa, which confounds generalizability. For future research larger and more random groups of participants in South Africa are recommended. Secondly, the limited ability of children and adolescents to accurately recall their physical activities in self-reported questionnaires is well-recognised in the literature (Telford et al., 2013; Tian et al., 2014), which possibly could have influenced the results.

With future research in mind, it is also recommended that screen-time, as a sub-section of sedentary behaviour, be more specifically investigated and compared with international guidelines. Other recommendations that can be made, stemming from this study, are that strategies be implemented to raise the physical activity levels of Senior Phase learners, especially during weekdays, and the time spent on sedentary behaviour be decreased. In this respect the effective implementation and presentation of Physical Education in South African schools can play an integral role, since it affords children the opportunity of being physically active. By participating in Physical Education lessons learners can, by means of the development of movement skills, be further motivated and enabled to participate in several physical activities in their leisure time, which will in addition lessen their time spent in sedentary behaviour. The types of activities in which the highest participation is demonstrated in this study can further be an indication of learners' preferences regarding

physical activity, which can be applied by teachers when developing Physical Education programmes based on learners' preferences in order to increase their participation in several physical activities during their leisure time.

REFERENCES

- Australian Department of Health (ADH). (2015). *Australia's physical activity and sedentary behaviour guidelines*. Retrieved from <http://www.health.gov.au/internet/main/publishing.nsf/Content/health-pubhlth-strateg-phys-act-guidelines>.
- British Heart Foundation National Centre (BHFNC). (2012). *Interpreting the UK physical activity guidelines for children and young people (5-18)*. Loughborough University: British Heart Foundation National Centre.
- Butcher, K., Sallis, J. F., Mayer, J. A., & Woodruff, S. (2008). Correlates of physical activity guideline compliance for adolescents in 100 U.S. cities. *Journal of Adolescent Health*, 42(4), 360–368.
- Centres for Disease Control and Prevention (CDC). (2015). *How much physical activity do children need?* Division of Nutrition, Physical Activity, and Obesity. Retrieved from <http://www.cdc.gov/physicalactivity/basics/children/>.
- Cohen, J. (1988). *Statistical power analysis* (2nd ed.). New York: Academic Press.
- Cotton, R. T. (2013). Staying active when time is in short supply. *American College of Sports medicine Fit Society Page*, 15(3), 1–7.
- Craig, E., Bland, R., & Reilly, J. (2013). Objectively measured physical activity levels of children and adolescents in rural South Africa: High volume of physical activity at low intensity. *Applied Physiology, Nutrition, and Metabolism*, 38(999), 81–84.
- Davies, D. S., Burns, H., Jewell, T., & McBride, M. (2011). *Start active, stay active. A report on physical activity for health from the four home countries* (pp. 1–61). Chief Medical Officers.
- Department of Basic Education (DBE). (2011). *Curriculum and assessment policy statement. Life skills grades 4 – 6* (pp. 1–67). Pretoria: Author.
- 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(1), S98–S104.
- Du Toit, D., Van der Merwe, N., & Rossouw, J. P. (2007). Return of physical education to the curriculum: Problems and challenges facing schools in South Africa communities. *African Journal for Physical, Health Education, Recreation and Dance*, 13(3), 241–253.
- Hume, C., Salmon, J., Veitch, J., O'Connell, E., Crawford, D., & Ball, K. (2009). *Children who meet recommendations for physical activity and screen-time despite socio-economic disadvantage: C-PAN* (pp. 1–22). Centre for Physical Activity and Nutrition Research.
- Koorts, H., Mattocks, C., Ness, A. R., Deere, K., Blair, S. N., Pate, R. R., et al. (2011). The association between the type, context, and levels of physical activity amongst adolescents. *Journal of Physical Activity and Health*, 8, 1057–1065.
- Kubayi, N. A., & Amusa, L. O. (2014). Correlates of physical activity participation among secondary school students in Hlanganani rural area of Limpopo Province, South Africa. *African Journal for Physical, Health Education, Recreation and Dance (AJPHERD)*, 20(3:2), 1173–1181.
- LeBlanc, A. G., Katzmarzyk, P. T., Barreira, T. V., Broyles, S. T., Chaput, J., Church, T. S., et al. (2015). Correlates of total sedentary time and screen time in 9–11 year-old children around the world: The international study of childhood obesity, lifestyle and the environment. *PLoS One*, 1–20.

- Martin, S. B., Morrow, J. R., Jackson, A. W., & Dunn, A. L. (2000). Variables related to meeting the CDC/ACSM physical activity guidelines. *Official Journal of the American College of Sports Medicine*, 2087–2092.
- McMinn, A. M., Griffin, S. J., Jones, A. P., & Van Sluijs, M. F. (2012). Family and home influences on children's after-school and weekend physical activity. *European Journal of Public Health*, 23(5), 805–810.
- McVeigh, J., & Meiring, R. (2014). Physical activity and sedentary behavior in an ethnically diverse group of South African school children. *Journal of Sports Science and Medicine*, 13, 371–378.
- Micklesfield, L. K., Pedro, T. M., Kahn, K., Kinsman, J., Petitfor, J. M., Tollman, S., et al. (2014). Physical activity and sedentary behaviour among adolescents in rural South Africa: Levels, patterns and correlates. *BMC Public Health*, 14(40), 1–10.
- Mitchell, J. A., Rodriguez, D., Schmitz, K. H., & McGovern, A. J. (2013). Greater screen time is associated with adolescent obesity: A longitudinal study of the BMI distribution from ages 14 to 18. *Obesity*, 21, 572–575.
- Monyeki, M. A. (2013). Physical activity and health in children: How much do we know? *African Journal for Physical, Health Education, Recreation and Dance (AJPHERD)*, 20(2:1), 323–342.
- MRC (Medical Research Council). (2002). The 1st South-African nation youth risk behaviour survey. Retrieved from <http://www.mrc.ac.za/healthpromotion/YRBSpart3.pdf>.
- National Physical Activity Plan Alliance (NPAP). (2014). The 2014 United States report card on physical activity for children & youth. Retrieved from http://www.physicalactivityplan.org/reportcard/NationalReportCard_longform_final%20for%20web.pdf.
- Nongogo, P., Kubayi, N. A., & Amusa, L. O. (2013). An assessment of physical activity and sport participation pattern of Daveyton High school learners, South Africa. *African Journal for Physical, Health Education, Recreation and Dance*, 1(2), 432–441.
- Pienaar, A. E., & Kemp, C. (2014). Motor proficiency profile of grade 1 learners in the North West Province of South Africa: NW-Child Study. *South African Journal for Research in Sport, Physical Education and Recreation*, 36(1), 167–182.
- Rajput, D. I., & Van Deventer, K. J. (2010). An epoch of controversy within physical education and sport in post-apartheid South-Africa: A review. *African Journal for Physical, Health Education, Recreation and Dance*, 16(1), 140–158.
- Reddy, P., Coopoo, Y., Norris, S., Puoane, T., Kruger, S., Lambert, M., et al. (2007). *Healthy Active Kids South Africa. Report card on the physical activity, nutrition and tobacco use for South African children and youth* (pp. 1–6).
- Riddoch, C. J., Andersen, L., Wedderkopp, N., Harro, M., Klasson-Heggebo, L., Sardinha, L. B., et al. (2004). Physical activity levels and patterns of 9- and 15-year-old European children. *Medicine & Science in Sports & Exercise*, 86–92.
- SAS Institute Inc. (2011). *SAS OnlineDoc® 9.3*. Cary, NC: SAS Institute Inc.
- Spengler, S., & Woll, A. (2013). The more physically active, the healthier? The relationship between physical activity and health-related quality of life in adolescents: The MoMo Study. *Journal of Physical Activity and Health*, 10, 708–715.
- Telford, A., Salmon, J., Jolley, D., & Crawford, D. (2004). Reliability and validity of physical activity questionnaire for children: The children's leisure activities study survey (CLASS). *Pediatric Exercise Science*, 16(1), 64–78.
- Telford, R. M., Telford, R. D., Cunningham, R. B., Cochrane, T., Davey, R., & Waddington, G. (2013). Longitudinal patterns of physical activity in children aged 8 to 12 years: the LOOK study. *International Journal of Behavioral Nutrition and Physical Activity*, 10(81), 1–12.
- Tian, H., Du Toit, D., & Toriola, A. L. (2014). Validation of a physical activity questionnaire for 12-year old South African children. *African Journal for Physical, Health Education, Recreation and Dance*, 20(4:2), 1572–1586.
- Tian, H., Du Toit, D., & Toriola, A. M. (2015). The effects of an enhanced quality Physical Education programme on the physical activity levels of Grade 7 learners in Potchefstroom, South Africa. *Journal of Physical Education and Sport Pedagogy*. <http://dx.doi.org/10.1080/17408989.2015.1072509>. Retrieved from.
- Toriola, O. M., & Monyeki, M. A. (2012). Health-related fitness, body composition and physical activity status among adolescent learners: The PAHL Study. *African Journal for Physical, Health Education, Recreation and Dance*, 18(4), 795–811.
- Tremblay, M. S., Colley, R. C., Saunders, T. S., Healy, G. N., & Owen, N. (2010). Physiological and health implications of a sedentary lifestyle. *Applied Physiology, Nutrition, and Metabolism*, 35, 725–740.
- Van Deventer, K. J. (2012). School physical education in four South African provinces: A survey. *South African Journal for Research in Sport, Physical Education and Recreation*, 34(1), 153–166.
- Van der Merwe, N. (2011). *Evaluering van die her-implementering van Liggaamlike Opvoeding in Suid-Afrikaanse skole*. Potchefstroom: NWU (Thesis – PhD).
- Van der Merwe, P. (2013). South Africa's adolescents in a wired world. *International Journal of Criminology and Sociology*, 2, 348–361.
- Walter, C. M. (2011). In-school physical activity patterns of primary school learners from disadvantaged schools in South Africa. *African Journal for Physical, Health Education, Recreation and Dance (AJPHERD)*, 17(4), 779–788.
- WHO (World Health Organization). (2015). *Physical activity. Media centre*. Retrieved from <http://www.who.int/mediacentre/factsheets/fs385/en/>.