Effects of an after-school physical activity programme on aerobic fitness and physical activity levels of adolescents from a disadvantaged community: PLAY Study

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Abstract

This article reports on the findings of a quasi-experimental study undertaken to determine the effects of an after-school physical activity intervention programme on the aerobic fitness and physical activity levels (PA levels) of adolescents living in a socio-economically disadvantaged community. The study comprised an experimental group of 252 African Grade 8 adolescents (116 boys and 136 girls) with a mean age of 14.8 years (±1.43) and a control group of 66 African Grade 8 adolescents (21 boys and 45 girls) with a mean age of 13.9 (±1.04). Members of the experimental group took part in the PA intervention programme twice a week for 60 minutes per session. The 60-minute programme was divided into 30 minutes of aerobic training, 15 minutes of strength and flexibility training and 15 minutes of sport-related ball skills. The experimental group was subdivided into sub-groups based on each individual’s attendance of the programme. The results reveal that the experimental sub-group with the highest programme attendance (>70%) exhibited higher levels of aerobic fitness and PA. These findings highlight the health benefits of encouraging adolescents to participate in high-intensity physical activity programmes. In addition, during the course of the intervention programme it emerged that many of the participants faced certain barriers that impeded their ability to participate in after-school activities. As such, it is recommended that such programmes be introduced during school hours for those adolescents residing in disadvantaged communities.

Keywords: Physical activity, intervention, aerobic fitness, adolescents, disadvantage community.

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Introduction

The World Health Organisation (WHO) describes physical activity (PA) as any bodily movement produced by skeletal muscles that requires energy expenditure, and identify physical inactivity as the fourth leading risk factor of global mortality, causing an estimated 3.2 million deaths globally (WHO, 2012).
Physical activity refers to a complex multi-dimensional behaviour that may be categorised by frequency, duration, intensity and type of activity (Miles, 2007). Engaging in physical activity leads to positive health benefits and makes an important contribution to a healthy lifestyle (Pate, Trost, Dowda, Ott, Ward, Saunders & Felton, 1999; Beets & Pitetti, 2004). Physical fitness refers to a person’s ability to carry out daily tasks with vigour and alertness, without undue fatigue and with ample energy to enjoy leisure time pursuits and to meet unforeseen emergencies (President’s Council on Physical Fitness and Sport, 1994; American College of Sports Medicine (ACSM), 2005). The health-related benefits of physical fitness include cardio-respiratory endurance, muscular endurance, muscular strength, body composition and increased flexibility. Cardio-respiratory endurance describes the ability to perform gross muscle, dynamic, moderate to high-intensity exercise for prolonged periods of time (ACSM, 2005) and determines performance levels in many activities. As such, cardio-respiratory endurance is considered an important physical fitness indicator.

The Centre for Disease Control and Prevention (2012) guidelines recommend that “children and adolescents should do 60 minutes (1 hour) or more of physical activity each day”. Anderson et al. (2006) argue that one hour per day of moderate-intensity activity for children is insufficient to influence their metabolic health positively. These authors suggest that children require higher physical activity levels to inhibit or prevent the clustering of cardiovascular risk factors, such as systolic blood pressure, triglycerides, ratio of total cholesterol to HDL, HOMA value, sum of four skin folds and aerobic fitness. Secondary recommendations by the Health Education Authority of England (Department of Health, 2011) stipulated that activity on at least two days of the week should include activities that will improve bone health, muscle strength and flexibility.

Many research studies report that physical activity decreases during adolescence, especially amongst girls (Engelbrecht, 2001; Leslie, Fotheringham, Owen & Bauman, 2001; Kemper, Twisk, Koppes, Van Mechelen & Post, 2001; Neumark-Sztainer, Story, Hannan, Tharp, & Rex, 2003; Beets & Pitetti, 2004; Malina, Bouchard & Bar-Or, 2004). In addition, other studies suggest that children’s physical activity levels traverse into adulthood, indicating that an inactive child is likely to be an inactive adult (Freedson, 1992; Pate et al., 1999; Matton, Thomis, Wijndaele, Duvigneaud, Beunen, Claessens, Vanreusel, Philipaerts & Lefèvre, 2006). This suggests that it is important to introduce children to physical activity early in their lives and to implement strategies such as physical activity intervention programmes during their adolescent years in order to ensure that they continue to be physically active to mitigate the health risks associated with decreasing physical activity levels.

Despite the importance of encouraging adolescents to continue to engage in physical activity, very few studies regarding the effects of school-based physical
activity intervention programmes on adolescents are reported on in the literature, with most studies focusing on children aged 8 to 12 years (Pangrazi, Beighle, Vehige & Vack, 2003; Roemmich, Gurgol & Epstein, 2004). These studies on children offer important insight into the benefits of physical activity intervention programmes. For example, Pangrazi et al. (2003) found that the physical activity levels of 9.8-year-old children increased, especially amongst the girls after participation in their programme of 12 weeks. In this intervention, children were encouraged to move for 15 minutes a day (teachers prompted children to move while walking and sitting was discouraged), and they participated in games and activities for 15 minutes a day. They were also encouraged to be physically active for 30 minutes a day, where this last aim was to encourage them to become self-directed in achieving 30 minutes of activity. Similarly, Roemmich et al. (2004) report that their intervention programme of six weeks aimed at 8-12 year old children increased physical activity by 24 percent in their intervention group compared to the control group. Their intervention entailed open-loop feedback and reinforcement on physical activity and watching television. The more activity counts the children accumulated, the more television time they received the following week. Ardoy, Fernández-Rodríguez, Ruiz, Chillón, España-Romero, Castillo, and Ortega (2011) conducted an intervention of 16 weeks on a sample of 12-14 year old adolescents who were divided in three groups. In the study, Group 1 received four standard-physical education sessions per week, Group 2 four high-intensity physical education sessions and the control group received standard physical education classes, two sessions per week. Doubling the number of physical activity sessions per week resulted in improvements in aerobic fitness and flexibility because of the higher frequency of participation and the increase in intensity, which were related to improvements in speed-agility. Jamner, Spruijt-Metz, Bassin and Cooper (2004) studied adolescent females who participated in an intervention of five sessions per week of 60 minutes (40 minutes activity time). The activities included aerobic dance, basketball, swimming and Tae Bo. These researchers found that the intervention had a significant effect on cardiovascular fitness, life style activity and light, moderate and high intensity activity. Whilst the findings of these different studies all point to the benefits of implementing physical activity intervention programmes, the extent to which youths engage in physical activity and, indeed, the type of physical activity they engage in is influenced by several factors, including their socio-economic environment.

Factors such as socio-economic background and gender are reported to play a role in the physical activity choices of children (Prista, Maia & Marques, 1997; Kriska, 2000; Prinsloo & Pienaar, 2003). In addition, parents and teachers are reported to have an influence on adolescents’ comprehension of the importance of physical activity and physical fitness (Borra, Kelly, Shirreffs, Neville & Geiger, 2003; Neumark-Sztainer, Story, Hannan, Tharp & Rex, 2003). In this regard, the Bronfenbrenner theory of Ecological systems is relevant as it indicates that the child’s holistic development is influenced by social, physical,
cognitive and emotional development (Paquette & Ryan, 2012), where each may influence a child’s development and perceptions. Moreover, socio-economic circumstances often influence a child’s type of housing, food, education, sports participation and family life. Janssen, Boyce, Simpson and Pickett (2006) report that physical activity is related to socio-economic status, and that physical inactivity increases with decreasing levels of material wealth.

Research findings suggest, for example, that children from rural communities are not regular participants of sport activities due to a lack of access to sport facilities, family responsibilities, a lack of information, a poor perception of their own talent or skills, and the limited time available to them (Coetzee, 2003). Notwithstanding this, these children’s physical activity levels are reported to be relatively high because they walk to school and do household chores; however, this, in turn, negatively influences the time they have available to participate in sport activities. The fact that the parents of these children are typically not educated about the importance of physical activity is also a contributing factor to their lack of participation in sport activities. Neumark-Sztainer et al. (2003) found that time constraints and limited support from peers, parents and teachers were factors associated with a decrease in physical activity.

Given the dearth of reported studies pertaining to the effects of physical activity intervention programmes on adolescents and the potential influence of socio-economic circumstances on participation in physical activities, this study investigated the aerobic fitness and physical activity levels of Grade 8 adolescents from disadvantaged backgrounds. The purpose of the study was to determine whether these adolescents’ aerobic fitness and physical activity levels would change after participation in an after-school physical activity intervention programme.

**Methodology**

Research design

This research forms part of the multi-disciplinary PLAY-study (Physical Activity in Youth). The study protocol was approved by the Ethics Committee of North-West University (04M01). The adolescents for the research study were drawn from two secondary schools in the low socio-economic township area of Ikageng, Potchefstroom in the North-West Province, South Africa. All the Grade 8 adolescents in these schools (N = 252: 116 boys and 136 girls) were asked to participate in the study. The two specific schools were chosen with the assistance of a local nutritional advisor from the NW Department of Health, who advised us that there was a high prevalence of growth retardation in these schools. The study had a longitudinal design stretching over a 3 year period, where the intervention that is reported in this study was done as part of the first year of this
longitudinal study design. Informed consent from the adolescents’ parents was obtained prior to each adolescent’s participation. This was a quasi-experimental study based on a six months physical activity intervention programme (26 weeks). Measurements were completed before the activity intervention at baseline (start in, March) and at the end of the intervention (end of Month six, September).

Subjects

The study’s intervention group comprised 252 African Grade 8 adolescents (116 boys and 136 girls) with a mean age of 14.8 years (standard deviation ±1.43) from School 1. From School 2, 66 Grade 8 adolescents (21 boys and 45 girls) with a mean age of 13.9 (standard deviation ±1.04) were selected to form the control group. The age disparity between the two schools was due to certain adolescents repeating the grade or having started school at a later age to the other adolescents. Fewer adolescents were involved in the second testing, with 216 adolescents from School 1 (92 boys and 124 girls) and 63 from School 2 (21 boys and 42 girls) because some left the school. A demographic questionnaire completed by each child served to ascertain that the adolescents from both schools came from the same socio-economic background; that is, a disadvantaged background.

School-based physical activity intervention

The school-based physical activity intervention programme was conducted over six months, twice a week for 60 minutes per session directly after school hours. The intervention had to be conducted directly after school hours because the school programme was full and no physical activity periods had been scheduled in the school’s curriculum. Although it is desirable to participate in activity sessions three times per week, the programme could only be conducted twice a week for practical reasons. However, most of the participating adolescents (96.4% in School 1 and 92.4% in School 2) walked to school for 30 minutes or more on each school day, which was considered a positive contributor to their daily physical activity (Lennox, Pienaar & Coetzee, 2007).

The intensity of the programme (energy expenditure) was monitored using accelerometers (Actical, Minimitter, Bend, Oregan), where different adolescents (three boys and three girls) were randomly selected before each session to wear one during the 60 minutes session. The 60-minute duration of the programme was divided into 30 minutes of aerobic training, 15 minutes of strength and flexibility training, and 15 minutes of sport-related ball skills activities. These activities were chosen because they were the ones that the adolescents had indicated being interested in, in a survey. The sessions started with all the children doing aerobic training (aerobic exercises, dancing, Kata boxing), after which they were divided into two smaller groups, where they participated in
strength and flexibility exercises and sport specific ball (soccer and netball) skill sessions. Postgraduate students trained in human movement science assisted in conducting the programme, as well as in keeping the attendance register during each session. Although the participants were encouraged to participate in the programme, their compliance was voluntary. Each learner’s attendance of the programme was calculated as a percentage of the entire 52 sessions. This attendance percentage was then used to divide the adolescents in the experimental group into attendance sub-groups, which is reported on in Table 1. As is evident from Table 1, only a small percentage of the participating adolescents attended the programme regularly.

Intensity of the physical activity (PA) during intervention

Energy expenditure during each session (twice/week) was determined using accelerometers (Actical, Mini-Mitter Co, Inc Bend, OR) because the aim of the aerobic session was to keep the adolescents in the moderate-to-high intensity zone for at least 30 minutes. Only six accelerometers were available and attached to different adolescents chosen randomly each time. The monitors were affixed above the iliac crest of the right hip with an elastic belt and adjustable buckle, and always oriented upwards in accordance with manufacturer's instructions and recommendations. Activity level during exercise was expressed in activity counts accumulated for one-minute units and the total was saved in the accelerometer’s memory. Energy expenditure was evaluated using the Actical software in METs (Metabolic Equivalents) (Ainsworth, 1993; Puyau, Adolph, Vohra & Butte, 2002). As the activity intervention relied on different levels of physical activity, model 2R was applied to calculations of energy expenditure (Actical Software Instruction Manual, 2003). In order to describe physical activity intensity the following cut-points (METs) were used: light (light < 2.7), moderate (mod 2.7 - 4.4), and vigorous (vig > 4.4) (Actical Software Instruction Manual). Data was expressed as activity counts (AC) as well. Table 1 provides an indication of the mean energy expenditure during the time of each session over the period of six months.

Bleep test

The Bleep test was done during the baseline testing and at the end of the intervention programme. The Bleep test is an indirect measurement of VO2max. The aerobic capacity is determined by a 20-metre multi-stage running session, with a progressive increase in pace (Brewer, Ramsbottom & Williams, 1988). When a participant could no longer complete a lap within the required time, he/she was stopped and the number of 20-metre laps completed was recorded.
Previous day physical activity recall (PDPAR)

The previous day physical activity recall (PDPAR), compiled by Trost, Pate, Ward, Saunders and Riner (1999), was used to gather data concerning the adolescent’s physical activities during the previous day (that is, a 24-hour recall questionnaire) for a weekday and one day during the weekend. According to this, the adolescents’ physical activity level was classified as low (1), moderate (2) or high (3). The adolescents had to recall activities they had done for every half hour. The activities were coded with METs values for each activity. The activities were categorised into groups, such as grooming (A), transport (B), work indoors (C), work outdoors (D), recreational activities (E), physical activity (F), sport (G), recreational games (H) and other (I). Only those activities that took up to 0.5 percent and more of the time are presented in tables. Trained translators obtained the information during an interview.

Maturity

Sexual maturity was assessed by using the five-stage Tanner scale for breast development, pubic hair and age of menarche in females and for pubic hair and genital development in males (Faulkner, 1996).

Statistical analysis

The activities that the adolescents engaged in were analysed using the SAS-program (SAS, 1991). This program arranged the activities by order of highest occurrence and average number of half hour intervals spent on that activity. The data was analysed using Statistica for Windows (StatSoft Inc SA, 2008) and included the descriptive statistics of means, standard deviations (SD) and maximum and minimum values. The Tuckey post hoc analysis was used to determine whether significant differences existed between variables for the three attendance sub-groups in the experimental group and the control group.

Results

Table 1 summarises the mean energy expenditure during the intervention and indicates that the experimental group spent on average 58.5 percent of the 54.7 minutes on moderately intensive activities and 14.8 percent on vigorously intensive activities, averaging 40.1 minutes of the 54.7 minutes in the moderate to high physical activity zone. The remaining time went into organising and rotating from one activity to the following activity. The sub-group with the highest attendance rate was the youngest group (13.9 years) and consisted of more girls than boys; and were in an earlier maturation stage than the other groups (Table 2).
Effects of an after-school physical activity programme

Table 1: Mean energy expenditure during the activity sessions over the 6-months intervention period

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>SD</th>
<th>Minimum</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time monitored (minutes)</td>
<td>54.7</td>
<td>7.51</td>
<td>45.00</td>
<td>71.0</td>
</tr>
<tr>
<td>%Time (sed)*</td>
<td>1.2</td>
<td>1.89</td>
<td>0.00</td>
<td>6.7</td>
</tr>
<tr>
<td>%Time (light)</td>
<td>25.4</td>
<td>14.28</td>
<td>2.22</td>
<td>54.2</td>
</tr>
<tr>
<td>%Time (mod)</td>
<td>58.5</td>
<td>13.50</td>
<td>32.20</td>
<td>82.0</td>
</tr>
<tr>
<td>%Time (vig)</td>
<td>14.8</td>
<td>12.11</td>
<td>1.72</td>
<td>44.8</td>
</tr>
<tr>
<td>EE (sed) (kcal)#</td>
<td>0.5</td>
<td>0.80</td>
<td>0.00</td>
<td>3.1</td>
</tr>
<tr>
<td>EE (light) (kcal)</td>
<td>19.2</td>
<td>13.02</td>
<td>1.29</td>
<td>62.2</td>
</tr>
<tr>
<td>EE (moderate) (kcal)</td>
<td>83.8</td>
<td>25.37</td>
<td>39.85</td>
<td>126.2</td>
</tr>
<tr>
<td>EE (vigorous) (kcal)</td>
<td>31.0</td>
<td>29.51</td>
<td>3.11</td>
<td>109.4</td>
</tr>
<tr>
<td>Total EE (kcal)</td>
<td>134.4</td>
<td>32.70</td>
<td>73.25</td>
<td>209.3</td>
</tr>
</tbody>
</table>

EE - energy expenditure, % Time – total accumulated minutes each activity range within the given interval, divided by time interval duration, multiplied by 100, * = categorised according to the software of Actical® accelerometer, # = energy expenditure calculated by Actical® software

The characteristics, which include maturation data of the different groups, are displayed in Table 2. The adolescents in School 1 (the experimentation group) were divided into three attendance sub-groups of the intervention (Group 1, above 70%, Group 2, 50-70%, Group 3, below 50%) and the adolescents from School 2, which was Group 4 - the control group. The maturation data is described by the five Tanner stages for pubic hair (boys and girls), genital (boys) and breast development (girls) and age of menarche among girls. Stage 1 indicates pre-puberty, Stage 2 the initial development of specific gender characteristics, Stages 3 and 4 are the developing stages and Stage 5 is the mature developmental stage (Faulkner, 1996).

Table 2: Attendance of the programme, age, gender and biological maturation of the different groups

<table>
<thead>
<tr>
<th>Groups</th>
<th>N</th>
<th>Percentage (%)</th>
<th>Age Boys</th>
<th>Boys (Hair)</th>
<th>Girls</th>
<th>Girls (Hair)</th>
<th>Boys (Gen)</th>
<th>Girls (Breast)</th>
<th>Menarche (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>School 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 (above 70%)</td>
<td>33</td>
<td>9.11</td>
<td>13.9</td>
<td>5</td>
<td>28</td>
<td>2.2</td>
<td>3.0</td>
<td>2.8</td>
<td>2.7</td>
</tr>
<tr>
<td>2 (50-70%)</td>
<td>56</td>
<td>15.47</td>
<td>14.3</td>
<td>22</td>
<td>34</td>
<td>2.9</td>
<td>3.1</td>
<td>2.7</td>
<td>3.1</td>
</tr>
<tr>
<td>3 (below 50%)</td>
<td>16</td>
<td>45.03</td>
<td>15.1</td>
<td>89</td>
<td>74</td>
<td>3.2</td>
<td>3.5</td>
<td>3.0</td>
<td>3.4</td>
</tr>
<tr>
<td>School 2</td>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 (control group)</td>
<td>66</td>
<td>13.9</td>
<td>21</td>
<td>45</td>
<td>2.9</td>
<td>3.3</td>
<td>2.9</td>
<td>3.1</td>
<td>45.5</td>
</tr>
</tbody>
</table>

(Gen)= Genitals, % of menarche= the percentage of girls who had reached menarche

The data were also analysed by comparing the three attendance sub-groups of the experimental group (Group 1, above 70%, Group 2, 50-70%, Group 3, below 50%) and Group 4, which was the control group, to explore the impact of the frequency of participating in the physical activity programme on their physical activity levels and aerobic fitness. Table 3 displays the energy expenditure, physical activity levels and aerobic capacity of the four different groups. These
results indicate little difference between the energy expenditure at baseline and follow-up between the different attendance sub-groups of the experimental group and the control group. Their physical activity level was however, already moderate during the week and their sum of METs showed an increase during the end testing. The aerobic capacity of Group 1, as measured by the Bleep test, also stayed the same from baseline to end testing (regardless of a significant increase in television viewing time in this group), while tendencies of decreasing values were evident in the other groups.

The PDPAR physical activity values indicate that the adolescents in all the attendance sub-groups of the experimental group and the control group were on average moderately active during the week and the weekends, both during baseline and end testing, although the control group had the lowest values. Significant differences were also found between Group 1 of the experimental group (above 70%) and Group 4, which was the control group (p = 0.020) during the weekend at baseline and between Group 3 of the experimental group and Group 4, the control group (p = 0.007) in their PDPAR values at the end testing and also during the weekend. The PDPAR category values stayed more or less the same in all the groups from baseline to follow-up during the week and the weekend. In all the groups, the television viewing hours increased during the week and weekend from baseline to the end testing, with the control group Group 4 showing the highest television viewing hours. The sum of METs values of Group 1 of the experimental group showed the biggest increase during the week from baseline to the end testing (p > 0.05). Group 1 of the experimental group sustained their activity levels during the week and increased their sum of METs values.
Table 3: Difference between baseline and end measurements in the different attendance groups of the intervention and the control group during the week and weekend.

<table>
<thead>
<tr>
<th>Week</th>
<th>Baseline</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (n=33)</td>
<td>Group 2 (n=56)</td>
<td>Group 3 (n=163)</td>
</tr>
</tbody>
</table>

| | M | SD | M | SD | M | SD | M | SD | p | M | SD | M | SD | M | SD | M | SD | p |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ? METs/16h | 79.69 | 13.52 | 81.43 | 12.69 | 83.04 | 13.63 | 84.12 | 14.14 | 81.86 | 13.99 | 82.05 | 17.78 | 82.92 | 15.81 | 84.75 | 16.62 | 0.62 |
| PA | 2.0 | 0.92 | 2.2 | 0.83 | 2.3 | 0.82 | 1.92 | 0.89 | 2.0 | 0.85 | 2.1 | 0.85 | 2.2 | 0.81 | 1.94 | 0.81 | 0.001 |
| TV hours | 1.7 | 1.33 | 1.7 | 1.26 | 1.9 | 1.41 | 2.44 | 1.35 | 1.4 | 2.7 | 1.54 | 2.3 | 1.89 | 2.4 | 1.78 | 2.68 | 1.55 | 0.12 |
| Bleep | 4.6 | 1.66 | 5.5 | 1.78 | 5.5 | 2.01 | 4.45 | 1.60 | 2.4 & 3.4 | 4.5 | 1.47 | 5.0 | 2.28 | 5.09 | 2.27 | 4.07 | 1.64 | 3.4 |

<table>
<thead>
<tr>
<th>Weekend</th>
<th>Baseline</th>
<th>End</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1 (n=33)</td>
<td>Group 2 (n=56)</td>
<td>Group 3 (n=163)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>M</th>
<th>SD</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>? of METs</td>
<td>74.32</td>
<td>16.13</td>
<td>78.66</td>
<td>19.33</td>
<td>77.57</td>
<td>19.61</td>
<td>73.40</td>
<td>20.78</td>
<td>75.08</td>
</tr>
<tr>
<td>PA</td>
<td>2.4</td>
<td>0.79</td>
<td>2.2</td>
<td>0.90</td>
<td>2.1</td>
<td>0.89</td>
<td>1.80</td>
<td>0.85</td>
<td>1.4</td>
</tr>
<tr>
<td>TV hours</td>
<td>2.5</td>
<td>1.48</td>
<td>3.2</td>
<td>1.95</td>
<td>3.1</td>
<td>2.14</td>
<td>3.39</td>
<td>2.40</td>
<td>3.7*</td>
</tr>
</tbody>
</table>

Group 1 = above 70%, Group 2 = 50-70%, Group 3 = below 50%, Group 4 = Control group, 16h = measurement period for PDPAR, *= p<0.05 (differences between, ? METs/16h, PA = PDPAR physical activity category (physical activity according to level: 1 = low active, 2 = moderately active, 3 = highly active))
Discussion

The poor effect of the physical activity intervention programme on the physical activity levels and aerobic fitness of the group of adolescents who participated in the intervention should be evaluated against the background of the many factors that may have played a role in the results. Although the parents and adolescents all consented for participation in the PA programme, attendance of the intervention programme directly after school hours for two days of the week was not compulsory. Only 33 adolescents (9.1%), who were mainly girls, and the youngest and the less biologically mature (when compared to the other groups), attended the programme on a regular basis (70% attendance and more). The compliance of this group to the programme may possibly be because that group consisted of younger girls who still enjoyed physical activity and who are indicated in the literature as being more active than older girls (Neumark-Sztainer et al., 2003; Hamlin & Ross, 2005). Furthermore, a higher preference for aerobic and dance-related exercises, which formed a significant part of the programme, might also have contributed to the higher number of girls in this group. Jamner et al. (2004) used almost the same activities in their study, which included aerobic dance, basketball, swimming and Tae Bo, and found these activities to have a significant effect on cardiovascular fitness. In contrast, the current study did not show a significant effect. Possible reasons for this may be that their programme was presented in five sessions per week, compared to ours of two sessions per week, and because their study was only conducted on girls. These results highlight that the type of activities that are selected for intervention programmes is important in a PA intervention. Therefore, it is recommended that similar interventions should adapt the content of the programme to accommodate the interests of both boys and girls or that adolescent boys and girls should participate in separate programmes.

Another point of interest is that the adolescents in this study came from low socio-economic backgrounds where they are expected to perform numerous household chores. As the programme had to be attended after school hours, such commitments may have prevented some from participating in the programme on a regular basis. The younger participants are likely to have had fewer responsibilities, which may account for their more regular attendance of the programme. Barriers such as school homework, home responsibilities and duties around the house that were beyond their control could therefore have prevented the group from regular participation in the intervention. Lennox et al. (2007) investigated reasons for the poor attendance of the group where adolescents indicated that parents’ encouragement and understanding of the importance of physical activity would have motivated them to participate more in PA. However, duties at home after school would understandably have higher priorities among parents for the free time of their adolescents. The literature indicates that parental knowledge plays an important role in the PA levels of adolescents, which is supported by the findings of this study. It is also reported that parents and teachers have an influence on how adolescents understand the importance of physical activity and physical fitness (Borra, et al., 2003; Neumark-
Sztainer, Story, Hannan, Tharp & Rex, 2003). These researchers concluded that if adolescents receive more support and encouragement from their parents and teachers they will engage more in physical activities. If parents also have more knowledge about the importance of physical activity, this better understanding may contribute to a greater encouragement of adolescents to be more active and to participate in physical activities and sport.

Reported statistics concerning the distances school goers live from schools in all the provinces of South Africa indicate that 41 percent of those in the North-West Province of the country have to travel more than 30 minutes to reach the nearest school (South African Child Gauge, 2008/2009). Most of the adolescents in this study indicated that they had to walk distances of between three and five kilometres to school and back, which add up to between six and ten kilometres per school day. That amount of walking requires much energy and is likely to have dampened their enthusiasm for partaking in after-school activities. This may account for the low attendance rate of the group. For them to participate in an activity programme with a high intensity level for an hour after school and then to walk home afterwards for long distances might have been too daunting. The fact that they choose to engage in sedentary activities like television viewing (see Table 3) after school hours for up to two hours and especially over weekends (2.5-3.5 hours) is therefore not surprising. As such, introducing a physical activity session as part of the school curriculum that takes place during school hours is recommended in disadvantaged communities such as the one investigated in this study.

It should be noted that the experimental group were already moderately active before the intervention started, which may be attributed to them walking long distances to and back from school. Although the energy expenditure, physical activity levels and the aerobic fitness of the sub-group with the highest attendance of the experimental group stayed the same after the intervention, which may be attributed to the intervention programme, there were tendencies of lowered physical activity and aerobic fitness in the other sub-groups of the experimental group. The sum of METs values increased during the week in Groups 1 and 2 of the experimental group, as well as in the control group but decreased during the weekend from baseline to the end testing, which could possibly be explained by the active mode of transport to school; that is, long-distance walking. When maturity is taken into consideration, aerobic fitness should have increased, especially among boys (Malina et al., 2004), although among girls, a decrease might have been observed. The results in the current study differ slightly.

Conclusions

Participating in an after-school physical activity programme was therefore not the answer to improve the physical activity and aerobic fitness of this group of adolescents living in a disadvantaged community. The inclusion of physical activity
programmes during school hours will therefore be necessary to overcome the many barriers school goers have to overcome in low socio-economic environments to be active. It is recommended that physical education classes should be re-introduced into the school curriculum so that all school goers can benefit from activity programmes such as this one. During such physical education classes, time needs to be allocated to teaching the adolescents about health, physical activities and the risk factors of inactivity. From these results, it is also recommended that more information about health and physical activity behaviour should be provided to parents and adolescents, especially to those who live in disadvantaged environments, in order to make them more aware of the importance of regular physical activity and to emphasise the contribution of physical activity to health. The types of activities that are included in such programmes also need attention. The activities that were included in this intervention were selected based on input received from the adolescents, but to get more adolescents, especially boys to participate more regularly, other types of aerobic activities must be considered. More sport-skill-related activities should for instance be introduced to capture the interest of boys. The results reported in this article provide more knowledge about the effects of an after-school physical activity intervention programme and highlight the problems that need to be addressed to make such programmes more effective.

References


Effects of an after-school physical activity programme


