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RACIAL BACKGROUND AND POSSIBLE RELATIONSHIPS BETWEEN PHYSICAL ACTIVITY AND PHYSICAL FITNESS OF GIRLS: THE THUSA BANA STUDY

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ABSTRACT

The aim of this research was to investigate possible relationships between physical activity and physical fitness of girls between the ages of 13 and 15 years and the role of different racial backgrounds in this relationship. A cross-sectional research design was used to obtain information from 290 girls between the ages of 13 and 15 years, randomly selected from 16 schools in different districts in the Northwest Province of South Africa. They were classified as low, moderate or high active by means of the PDPAR (Previous day physical activity recall, Trost et al., 1999). Physical fitness was tested by means of a physical fitness battery of tests (Brewer, 1988; Docherty, 1996; Wood, 1997) consisting of abdominal strength, handgrip strength, bent-arm-hang, flexibility and VO_2 max tests. SAS was used to analyse activity patterns, while the Statistica for Windows programme was used to determine descriptive statistics. Variance of analysis (ANOVA) and Tukey post hoc tests were used to analyse the data for differences. The results indicate that the girls as a group were classified as low active, although different activity levels and physical activity patterns were found among the different racial groups. Relationships were found to exist between low PA levels of white and black groups in arm-strength endurance and flexibility, while abdominal strength of low active Indian girls were significantly higher compared to black girls.

Key words: Physical activity; Physical fitness; Race; Girls; Health; Physical activity patterns.

INTRODUCTION

Heath *et al.* (1994), Schmidt *et al.* (1998) and Van Mil *et al.* (1999) indicate a decline in physical activity levels (PA) among girls from different populations groups with increasing age. In this regard Meyers (as reported by Schmidt *et al.* 1998) reports lower physical activity levels (PA) for black girls compared to white and coloured girls. The National Health Interview Survey, Behavioural Risk Factor Surveillance and the Surgeon General's Report as reported by Kriska (2000) confirm the above-mentioned findings, and claim the reason for this lower PA levels of black children to be poor socio-economic conditions. Overall, literature indicates low intensity PA levels among 13-15 year old girls in general, while different activity preferences for girls belonging to different racial groups are also indicated (Schmidt *et al.*, 1998; Van Deventer, 1999).

The general viewpoint of Boreham *et al.* (1997) and Pate *et al.* (1997) is that physical fitness (PF) and physical activity (PA) provide a preventative effect on the risk of coronary heart

disease. PA and PF factors like cardiovascular fitness, strength, flexibility and body composition play an important role in maintaining physical health and, therefore, adequate PF and PA are needed for the prevention of these risk factors according to Riddoch and Boreham (1995) and Trost *et al*. (1999).

With regards to differences between population groups in PF, research indicates lower cardiovascular fitness for black compared to white girls (Corlett, 1984; Fares, 1984; Pivarnik *et al*. 1995). A positive relationship between PA and strength is reported by Bouchard *et al*. (1997) and Treuth *et al*. (1998). Also, research findings indicate significant differences between different population groups with regards to different strength components (grip-, abdominal-, arm- and shoulder strength) (Hemraj, 1975; Corlett, 1984; Ishiko, 1984; Corbin & Pangrazi, 1992; Anderson, 1994; Siniarska *et al*., 1998).

Research regarding PA and body composition shows a weak to moderate relationship between them (Rowland, 1996), while very little research has been published on the relationship between flexibility and PA. It seems that the flexibility of children is to a greater extent determined by genetic characteristics and to a lesser degree by PA (Corbin & Pangrazi, 1992, Marsh & Johnson, 1994; Raudsepp & Jurimae, 1996).

Van Deventer (1999) studied the activity preferences of 13-17 year old South African girls of different population groups, living in the Cape Province. No other relevant South Africa studies have been published, where PA and PF were studied or analysed among different population groups. Because of the relevance of such relationships for health purposes, and the lack of knowledge regarding such relationships among adolescent girls in South Africa, the objective of this study was to determine whether such relationships exist between PF and PA levels of 13-15 year-old girls of different population groups in the Northwest Province. The study is based on the hypothesis that PF has a significant relationship with PA, and that population groups will differ with regard to their physical activity levels, physical activity preferences and PF levels.

METHODS

Research design

The research described in this article form part of a collaborative research initiative from the Faculty of Health Sciences, North-West University, concerned with children's health, wellness and physical fitness in the North-West Province (The Thusa Bana study). A cross-sectional research design was used. The research sample was constituted in co-operation with the statistical consultation service of the University. Two hundred and ninety girls between the ages of 13 and 15 years, selected from 16 secondary schools were included in the sample. Information was collected from the research population who represented a stratified random sample equally representing age and district and proportionately representing different racial groups living in the NW Province. Data was gathered over a period of 15 months (April 2000 to June 2001). A list of schools was obtained from the Department of Education of the North-West Province of which subjects from 16 schools were selected at random from each of five regions for the purpose of this study. Ethical approval was received from the University and

informed consent obtained from the parents of each child before they were allowed to participate in the study.

Subjects

The number of girls in each racial group was as follows: white girls (n=42), black (n=215), coloured (n=16) and Indian girls (n=17). In this study 35.7% of the subjects were classified, using per capita income as criterion, with low socio-economic status, while 67.3% were classified in the low to moderate socio-economic status groups. Only 26.7% subjects lived in high socio-economic conditions.

Test Materials

Demographic information, such as age, gender and race, was also collected by means of a questionnaire. The Previous Day Physical Activity Recall (PDPAR) questionnaire compiled by Trost *et al*. (1999) was used to record the daily activities of the children, in order to classify the child's physical activity level as low, medium or high. Weston *et al*. (1997) tested the PDPAR as reliable and valid (the test-retest reliability coefficient was 0.99, ($p<0.01$). It has also been used with success by various researchers (Pate *et al*., 1997; Prista *et al*., 1997).

With the aid of the PDPAR, information was collected about physical activity from 13:00 hours to 23:00 hours on the previous day in the week, as well as on one day over the previous weekend. Because of a low, but significant correlation between the week and weekend activity levels, the previous activity level of the weekday was used for classification purpose in this study. Respondents were individually questioned and expected to recall the previous day and to describe the activities that they had performed during each of the 30 minute-periods indicated on the PDPAR. The type of activity as well as the intensity level (MET value) were then indicated on the questionnaire. Intensity level was classified as high (3), medium (2) or low (1) according to the fatigue factor. Sketches of low (<3 METS), medium (>3 METS) and high (>6 METS) intensity activity were used to explain the classification to the subjects.

Additions regarding the inclusion and coding of activities were made on advice of Trost (2000), because of cultural differences in different countries. Additions were made from the "Compendium of physical activities" (Ainsworth *et al.*, 1993) and a questionnaire for Maputo youth (Prista & Marques, 2000). The additional activities were added under the headings of attending-to-self, transport, housework, outdoor activities, recreational activities, physical activities, sport and games. Twenty traditional games known to Tswana children of which the MET value of each game was measured by means of heart monitors during the game (Prista *et al*., 1997), were added. The metabolic equivalent (MET-value) represents an average person's resting metabolism or oxygen uptake (McArdle *et al*., 1994). MET value is used to express the intensity of the activity in a metabolically value (Trost *et al*., 1999). One-MET represents a resting metabolically value when sitting still (1 kcal/kg/hour, or 3.5 ml O_2/kg/min) (Ainsworth *et al*., 2000).

The MET values of the physical activities were taken directly from the "Compendium of physical activities" and the list of energy consumption of the PDPAR (Ainsworth *et al*., 1993; Weston *et al*., 1997). A relative energy value of 1 MET (1 kcal/kg/hour) was assigned per 30 minute-window. The values are used to estimate the total daily energy consumption, starting

with the energy consumption in a specific period, with a specific activity. The number of 30 minute-periods with a MET value equal to 6 METS or more is added. Respondents' activity levels are classified as highly active (3) if one or more 30 minute-periods with 6 METS are coded; as medium active (2) if two or more 30 minute-periods with 3 METS are coded (Pate *et al*. 1997). Respondents are classified as low active (1) if they do not comply with the high or medium activity standards (Pate *et al.*, 1997).

Physical fitness test battery

Physical fitness was estimated from the scores of different physical fitness tests. This included measuring strength, flexibility, aerobic endurance and body composition. All the tests was integrated in a single test battery to determine the child's fitness level. It consisted of the following parameters:

- Seven-phase sit-up test measuring abdominal muscle strength, scoring the subject from level 0 to level 7 (Wood, 1997).
- Bent arm hang for measuring arm-strength endurance. A horizontal overhead bar is used and the amount of time is recorded (Wood, 1997).
- Left and right handgrip strength was measured by a Lafayette handgrip dynamometer (Wood, 1997).
- The modified sit-and-reach test measures the flexibility of lower back and hamstrings by means of a box with a measuring stick (Australian Sports Commission, 1995).
- The bleep test is an indirect test, which measures the VO_2 maximum by recording the level at which the respondent drops out of a 20 m, paced multi-stage shuttle-run (Brewer *et al*., 1988).
- Stature, body mass, fat percentage and BMI index (L/M^2) were established. The equation for determining fat percentage of Boileau *et al*. (1985) for girls in the age group 13-15 years was used.

Statistical analysis

The Statistica for Windows computer package (Statsoft, 1995) and SAS (1999) were used to analyse the data. Analysis of means (M), standard deviations (SD), minimum and maximum values were used for descriptive purposes. Variance of analysis (ANOVA), and Tukey post hoc analysis were used to statistically interpret the difference between groups (Thomas & Nelson, 1996). A p-value of <0.05 (95% significance level) was accepted as a statistical difference between groups. The activities the girls participated in, were grouped according to means of occurrence in half hours (SAS, 1999).

RESULTS AND DISCUSSION

From the number of girls classified as low, medium or high active in each race group, a pattern was established (Table 1) which indicated that less white girls (61%), were low active than black (72.9%), coloured (87.5%) and Indian girls (94%). No Indian girls were active enough to be grouped in the high intensity activity level while only one coloured girl was classified into the high activity group. According to other research, white children (67%) were also more active than black children (53%) (Trost *et al*., 1999). Gordon-Larsen *et al*. (1999) did longitudinal research on the relationship between PA and different racial groups

and indicated that black and Indian adolescent girls had the lowest PA levels compared to other racial groups.

TABLE 1. **PA LEVEL (1-3) OF EACH RACIAL GROUP AND PERCENTAGE OF GIRLS FROM DIFFERENT RACIAL GROUPS CLASSIFIED IN EACH PA LEVEL**

Race groups	N	*M*	SD	PA-Low %	PA-Moderate %	PA-High %
White	42	1.5	0.77	61.0%	21.4%	16.6%
Black	215	1.3	0.53	73.0%	23.2%	3.7%
Coloured	16	1.18	0.54	87.5%	6.2%	6.2%
Indian	17	1.06	0.24	94.1%	5.8	0%

The activities classifying girls as having low activity levels are presented according to order of most occurrences in Table 2 and represents 213 girls of different races. From this it is clear that the majority of girls (73.3%) in this survey had low intensity activity levels. The activities the girls participated in are grouped in passive (M<3) and active (M>3) activities according to the METS- value of the activities. Table 2 indicated that more white girls participated in organized school sports like athletics, jukskei and netball than any other group, which correlates with findings of Van Deventer (1999) stating that white girls engage more vigorously in school sport. Traditional games and house chores occured more among black girls (Table 2 and 3). Prista (1998) found the same tendency under Mozambican children and confirmed that traditional games and house chores have a significant impact on their PF. Walking, family care and house chores are distinct features of low socio-economic groups (Kriska, 2000) which correlate with the activities listed in Table 2 for black and coloured children. The majority of black and coloured groups in this survey came from poor socio-economic conditions.

According to Van Deventer (1999) homework, house chores, religious meetings and family-gatherings are activities most frequently engaged in by coloured children in the Cape, which also correlate with the activities of the coloured girls in Table 2. Only a small number of activities of coloured girls were classified in the high intensity level, which may be a contributing factor to their low PA level classification.

Walking slowly was the activity most frequently engaged in by of all the different racial groups. The PDPAR recall over weekdays showed that girls walk home after school hours and back and forth to friends and shops. The Indian girls were the most inactive group and the mean for their walking activities (M=0.73) was also the lowest compared to the other racial groups. Van Deventer (1999) investigated the daily physical activities of children from different races between the ages of 14 to 17 years, and noted that more low intensity activities prevailed for girls than boys. This correlates with the passive activities (TV watching and sleep) that were most frequently observed among all the racial groups. Watching TV (M=6.06 half hours) had the highest time allocation among the Indian girls while coloured girls spend most of their time sleeping (M=5.85). Watching TV is one of the activities girls spend most of their time on, and research indicates that pre-adolescent girls (11 years) spend

more than three hours watching TV per day. According to Pate *et al*. (1997) these children have a 2.9 times greater tendency to be inactive. TV watching patterns of Indian girls in this survey correlated with this tendency. Andersen *et al*. (1998) also found in this regard that 26% American children watched more than four hours TV and 67% two hours per day. It is further indicated by this researchers that 42% of black girls watched more than two hours TV and that their body mass-index and body mass were higher compared to groups that watched less than two hours TV per day.

TABLE 2. **LIST OF PASSIVE AND ACTIVE ACTIVITIES OF LOW ACTIVE GIRLS FOUND AMONG DIFFERENT RACIAL GROUPS**

WHITE GROUP (n=26)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Sleep	0.9	3.60	6	Walk slowly	2.8	1.50
2	Watch TV	1.5	3.00	18	Swim (recreative)	5.0	0.15
3	Homework	1.4	1.92	22	Ride bike	3.0	0.08
4	Eat	1.5	2.00	27	Jog	7.0	0.08
5	Study	1.8	1.46	29	Play with pet	3.0	0.08
7	Bath	2.0	1.46	30	Athletics	5.0	0.08
8	Visit	1.5	1.00	31	Walk fast	5.0	0.04
9	Sit	1.0	0.80	32	Wash clothes	3.0	0.04
10	Travel by car	1.5	0.73	33	Netball	6.0	0.04
11	Shopping	2.0	0.53	34	Play hiding	3.0	0.04
12	Cook	2.1	0.46				
13	Listen to music	1.5	0.40				
14	Needlework	1.5	0.40				
15	Read book	1.3	0.26				
16	Darts	2.5	0.26				
17	Wash dishes	1.6	0.26				
19	Religious routine	1.5	0.26				
20	Talk on phone	1.5	0.11				
21	Sing	2.0	0.11				
23	House chores	2.1	0.07				
24	Play cards	1.5	0.07				
25	Play piano	2.5	0.07				
28	Comp./TV games	1.5	0.07				

BLACK GROUP (n=157)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Sleep	0.9	4.77	4	Walk slowly	2.8	1.26
2	Watch TV	1.5	4.19	16	Wash clothes	3.0	0.25
3	Eat	1.5	1.57	21	Fetch water	3.8	0.13
4	Sit	1.0	1.10	26	Walk fast	5.0	0.05
5	Home-work	1.4	0.99	27	Netball	6.0	0.05
7	Study	1.8	0.79	28	Soccer	7.0	0.05
8	Wash dishes	1.6	0.70	29	Jump rope	10.0	0.04
9	Cook	2.1	0.68	30	Child care	3.0	0.04
10	House chores	2.1	0.60	32	Play with stones	3.0	0.03
11	Write	1.8	0.59	33	Play with tins	3.0	0.03
12	Read book	1.3	0.59	34	Unpack goods	5.0	0.03
13	Visit	1.5	0.36	35	Kick ball	3.0	0.03
14	Wash	2.0	0.35	35	Play house-house	3.0	0.02
15	Travel by car	1.5	0.28	38	Carry wood	5.0	0.02
17	Religious routine	1.5	0.24	39	Baseball	6.7	0.01
18	Sing	2.0	0.19	40	Tennis	7.0	0.01
19	Shopping	2.0	0.15				
20	Iron	2.3	0.13				
22	Listen music	1.5	0.11				
23	Prepare bedding	2.0	0.10				
24	Talk on phone	1.5	0.08				
25	Play cards	1.5	0.06				
31	Comp./TV games	1.5	0.03				
45	Tell stories	1.5	0.01				

COLOURED GROUP (n=14)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Sleep	0.9	5.85	7	Walk slowly	2.8	1.00
2	Watch TV	1.5	3.85	15	Play with pet	3.0	0.28
4	Study	1.8	2.35	17	Wash clothes	3.0	0.07
5	Visit	1.5	1.42	19	Walk fast	5.0	0.07
6	Home-work	1.4	1.28				
8	Sit	1.0	0.85				
9	Travel by car	1.5	0.50				
10	Bath	2.0	0.42				
11	Religious routine	1.5	1.35				
12	Wash dishes	1.6	0.28				
13	Sing	2.0	0.28				
14	Listen to music	1.5	0.28				
16	Cook	2.1	0.07				
18	Shopping	2.0	0.07				

INDIAN GROUP (n=16)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Watch TV	1.5	6.06	9	Walk slowly	2.8	0.73
2	Sleep	0.9	2.60	15	Part-time job	5.0	0.26
3	Eat	1.5	2.30	17	Traditional dance	3.0	0.13
4	Sit	1.0	1.93	21	Cricket	5.0	0.06
5	Homework	1.4	1.60				
6	Religious routine	1.5	1.06				
7	Study	1.8	0.93				
8	Visit	1.5	0.73				
10	Shopping	1.5	0.60				
11	Bath	2.0	0.53				
12	House chores	2.1	0.40				
13	Travel by car	1.5	0.33				
14	Listen music	1.5	0.26				
16	Internet	1.5	0.13				
18	Wash dishes	1.6	0.06				
19	Read book	1.3	0.03				
20	Comp./TV games	1.5	0.06				

O=order of frequency *M*=mean half hours MET= Metabolic equivalent of activity

The previously discussed findings could serve as reasons for the low PA levels of all the girls who participated in this study. White and coloured girls spend between one and a half and two hours per day watching TV and using the computer, while black and Indian girls spend between two and three hours per day watching TV and in front of the computer. Harten (1999) stated in this regard that one main reason for this decline in PA could be the technological progress of the 20th century. A clear tendency was observed among the Indian girls who were the less active group in comparison to other races with the highest TV and computer usage. A somewhat controversial result has shown that black girls were the second lowest active group, where it has been assumed that they will have higher PA levels due to more rural conditions (open spaces, less access to technology (computers and TV) and traditional chores). Violence on the other hand, may have also restricted those in more densily populated areas from freely participating in activity. However, it seems that the activity patterns of different racial groups do influence their PA levels.

Table 3 represents listed passive and active activity preferences of girls (N=77) that are classified in the moderate to high PA-level and are presented according to frequency of occurrence. According to the PDPAR-scores, 61 girls (21%) were classified in the moderate intensity level, while only 16 girls (5.5%) fell in the high intensity group. Van Mechelen *et al*. (2000) report that girls 13 to 17 years of age showed an increase in participating in activities with a moderate intensity level, but a decrease in high intensity activities. In their research, the intensity level of activities were grouped into three levels; 4-7 METS (moderate), 7-10 METS (high) and more than 10 METS (very high), and according to these intensities, most of the activities in Table 3 fall in the moderate intensity levels. This finding is substantiated by the fact that girls in the North-West Province also took less part in high intensity activities (n=16, 5.5%). With regard to specific activities, white girls engaged in the low and moderate to high categories, and it was seen that their participation in organised sports contributed more to the moderate intensity levels than leisure activities.

It is striking that the highly active classified white girls spend more time on passive activities such as sleep, watching TV, homework and computer-games than the low active white girls. However, white girls who were classified in the high intensity level participated in high intensity activities such as dancing, swimming, bike riding, jogging and aerobics which was not the case among those classified in the low activity group.

Black girls who are classified as moderate to highly active, participate in greater a variety of activities such as rope-jumping, volleyball, soccer, baseball, tennis and variety of traditional games (Table 3), compared to those classified as low active (Table 2). A major difference was observed in the activities that coloured girls engaged in in the high and low active groups. A possible reason for higher intensity classification of the high- active coloured girls could be participation in netball and stone throwing games, which have higher MET-values compared to the activities low active coloured girls engaged in such as walking slowly and playing with pets. A difference noted between the low and moderate active Indian girls were fast walking in comparison to walking slowly. The moderate activities also represented only one moderate active Indian girl. White, black and Indian girls who were classified in the moderate to high active group, spent a high percentage of their time walking, which contributed to their higher intensity levels.

TABLE 3. **LIST OF PASSIVE AND ACTIVE ACTIVITIES OF HIGHLY ACTIVE GIRLS FROM DIFFERENT RACIAL GROUPS**

WHITE GROUP (n=16)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Sleep	0.9	4.75	5	Dance	3.0	
2	Watch TV	1.5	3.37	7	Walk slowly	2.8	
3	Eat	1.5	1.75	12	Swim	5.0	
4	Homework	1.4	1.50	13	Netball	6.0	
6	Bath	2.0	0.93	15	Touch rugby	3.0	
8	Sit	1.0	0.75	16	Ride bike (slow)	3.0	
9	Study	1.8	0.68	17	Ride bike (fast)	5.0	
10	Computer games	1.5	0.56	19	Jog	7.0	
11	Travel by car	1.5	0.43	20	Mountain climbing	7.0	
14	Visit	1.5	0.31	23	Part time job	5.0	
18	Cook	2.1	0.25	27	Aerobics	5.0	
21	Read book	1.3	0.18	28	Play with pet	3.0	
24	House chores	2.1	0.12	33	Cricket	5.0	
25	Shopping	2.0	0.12	36	Load goods	3.0	
26	Listen to music	1.5	0.12	37	PT	5.0	
29	Wash dishes	1.6	0.06				
31	Talk on phone	1.5	0.06				

BLACK GROUP (n=57)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Sleep	0.9	5.0	4	Netball	6.0	0.96
2	Watch TV	1.5	3.94	7	Walk slowly	2.8	0.84
3	Eat	1.5	1.58	15	Jump rope	10.0	0.25
5	Home-work	1.4	1.50	17	Tennis sport	7.0	0.25
6	Sit	1.0	0.75	18	Wash clothes	3.0	0.18
8	Wash dishes	1.6	0.81	21	Soccer	7.0	0.17
9	House chores	2.1	0.60	25	Walk fast	5.0	0.10
10	Bath	2.0	0.58	26	Stones	3.0	0.10
11	Cook	2.1	0.58	28	Fetch water	3.8	0.08
12	Read book	1.3	0.53	30	Volleyball	4.0	0.08
14	Church	1.5	0.29	31	Tennis(recreation)	7.0	0.10
16	Visit	1.5	0.22	33	Kick ball	3.0	0.07
19	Shopping	2.0	0.17	34	Child care	3.0	0.07
20	Write	1.8	0.17	35	Ride a bike	5.0	0.05
22	Travel by car	1.5	0.12	36	Hula hoop	5.0	0.05
23	Iron	2.3	0.12	37	Play with pet	3.0	0.03
27	Acting	2.0	0.10	38	Baseball	6.7	0.04
29	Play cards	1.5	0.08	40	Play with doll	2.5	0.02
32	Prepare bed	2.0	0.06	42	Toudhers	6.0	0.03
41	Make fire	2.0	0.05	43	Ride a bike	3.0	0.02
				45	Chop wood	6.0	0.02
				47	Drum magarettes	6.0	0.02
				49	Marbles	3.0	0.02
				50	Hiding	3.0	0.02
				51	Topspinning	2.0	0.02

COLOURED GROUP (n=2)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Sleep	0.9	6.0	3	Netball	6.0	3.5
2	Watch TV	1.5	5.0	5	Stones	3.0	1.5
4	Eat	1.5	2.0	9	Wash clothes	3.0	0.5
6	Bath	2.0	1.0				
7	Wash dishes	1.6	0.5				
8	Cook	2.1	0.5				
10	Play doll	2.5	0.5				

INDIAN GROUP (n=1)

PASSIVE				ACTIVE			
O	Activity	MET	*M*	O	Activity	MET	*M*
1	Home-work	1.4	5.0	7	Walk fast	5.0	4.0
2	Watch TV	1.5	4.0				
3	Eat	1.5	4.0				
5	Study	1.8	3.0				
6	Sit	1.0	1.0				

O = Order of frequency *M* = mean half hours MET = Metabolic equivalent of activity

Table 4 shows the descriptive information of the physical fitness status of girls in the different racial groups classified as low active, as well as significant differences between the groups. The results show a tendency where white girls achieved the highest scores in comparison to the other groups in most of the strength (handgrip strength) and arm-strength endurance (bent-arm-hang) variables. Significant differences (p=0.0000) favouring white girls were found between white and black girls regarding arm-strength endurance, which is also in accordance with literature that indicates that white girls have greater strength than black girls (Corlett, 1984). The stature of the white girls was also statistically higher (p=0.0000) than those of the black girls (Table 4). The body/mass index (BMI) serves as a possible explanation for the higher scores of the white girls (Corlett, 1984). However, according to Table 1 the white girls were the most active racial group, probably because of more opportunities to improve arm-strength endurance, while proper nutrition could also be a reason for the higher arm strength endurance among them compared to the black girls. Their activity choices (Table 3) like

swimming and aerobics may therefore have contributed to their higher strength endurance level. Bouchard *et al*. (1997) and Treuth *et al*. (1998) support the results by reporting a positive relationship between the strength of girls and a high PA level.

TABLE 4. **SIGNIFICANCE OF DIFFERENCES IN PF VARIABLES OF GIRLS WITH DIFFERENT RACIAL BACKGROUNDS CLASSIFIED IN THE LOW ACTIVITY LEVEL**

	Racial groups (N=213)				Significance of differences	
Body composition and PF variables	**White (n=26)** ***M***	**Black (n=15)** ***M***	**Coloured (n=14)** ***M***	**Indian (n=16)** ***M***	**p-level**	**Groups**
Body mass (kg)	51.9	46.3	47.7	48.0	NS	
Stature (cm)	162.9	153.2	159.6	159.2	0.00*	White/Black
Fat percentage (%)	24.7	24.4	23.3	27.0	NS	
BMI	20.0	19.6	19.0	19.2	NS	
Handgrip R (kg)	27.1	24.4	23.3	24.0	NS	
Handgrip L (kg)	25.5	22.8	21.9	23.2	NS	
Abdominal strength (7 level)	3.7	2.5	2.7	4.4	0.03*	Indian/Black
Bent arm hang (sec)	8.0	2.8	6.0	5.1	0.00*	White/Black
Sit-and-reach (cm)	26.5	33.0	28.6	24.3	0.03*	Black/White
					0.02*	Black/Indian
VO_2 max (ml/kg^{-1}/min^{-1})	30.4	28.5	30.22	27.2	NS	

NS=not significant; $p<0.05$* significant difference

Black girls showed the highest scores for flexibility and were also significantly more flexible than white and Indian girls. Literature indicates that flexibility is mostly determined by genetic factors (Malina & Bouchard, 1991), although the great variety of activities the black girls participated in could also have contributed to these results.

Indian girls differed statistically from black girls regarding their abdominal strength. This higher abdominal strength in the Indian group is contradictory to the fact that they were the lowest activity group, therefore lower abdominal strength would have been expected to be the norm. The PDPAR-recall indicated walking, shopping, running and traditional dancing as physical activities that Indian girls participated in. Traditional dancing could have contributed to their higher abdominal strength, although genetic factors are reasoned to have the greatest influence (Malina & Bouchard, 1991).

No significant differences exist in VO_2max between the different population groups, although the white girls obtained the highest VO_2max scores. Literature indicates that white girls usually perform better in aerobic fitness than black girls due to a smaller percentage of muscle mass among the latter group (Pivarnik *et al*., 1995). The PDPAR also indicate that white girls engaged in aerobic fitness programs and jogging (Table 2 and 3), which may have contributed to the results. Morrow and Freedson (1994) indicate a poor to moderate relationship between PA and VO_2max.

From the results the conclusion can be made that the physical activity levels and patterns of girls from different racial groups have a positive relationship with their physical fitness, especially arm strength endurance and to a lesser degree body composition. The results also showed that the physical activity levels and patterns of girls from different racial groups differ.

CONCLUSION

A shortcoming of this study is the fact that the PA levels of the girls is based on information gained on only the frequency of occurrence of activities and was analysed for only one weekday. However, the findings indicate that the physical activity patterns of low active girls from different racial groups did influence the low active groups' physical activity levels during the week. The results correspond with the findings of the study of Van Deventer (1999) which show that coloured girls spend more time on low intensity activities such as homework, house chores, religious practice and reading, which led to their low active classification.

Choice of activity with a high-energy expenditure differs somewhat between the different racial groups, compared to the low intensity activities they engaged in. However, the majority of activities the girls engaged in were categorised as low intensity level activities. Significant differences occurred between white and black children in favour of the white girls regarding body composition and arm-strength endurance and these differences were explainable by their physical activity levels. Genetic factors also might have played a role in the obtained results where the abdominal strength of the Indian girls and flexibility of the black girls were to a lesser extent influenced by PA. The conclusion that can be made from the results is that a positive relationship does exist between PA and PF variables, especially with regards to arm-strength endurance, and body composition of 13 to 15 year old girls from different racial groups in the North-West Province of South Africa. These results correlate with the findings of Rowland and Freedson (1994) and Marsh and Johnson (1994) who indicated a positive relationship between PA and PF.

It can be recommended that urgent attention regarding the low PA levels of 13 to 15 year old girls in general and coloured and Indian girls in particular is needed. The importance of PA should be emphasised and professionals working with this age group should be educated to guide the child to improved and increasing PA and PF. Little information with regard to PA and PF regarding race, socio-economic status and other important population characteristics are available, therefore, Sallis (1993) emphasised the importance of further research on this topic. More research on PF of South Africa children at present is also necessary to develop new norms as well as information regarding the MET-values of traditional activities of children from South Africa.

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