The relationship of overweight and obesity to the motor performance of children living in South Africa

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Abstract

Objectives: This study aimed to determine the relationship between overweight and obesity and the motor performance of nine- to 13-year-old South African children.

Design: The study used a one-way cross-sectional design based on baseline measurements.

Settings and subjects: The research group comprised 280 Grade 4, 5 and 6 learners (128 boys and 152 girls) from two schools that represented a distribution of socio-economic status, race and gender.

Outcome measures: Anthropometric [(body mass index (BMI) and fat percentage] and motor performance measurements (fine manual control, manual coordination, body coordination and strength and agility) were obtained by means of the Fitnessgram and the Bruininks-Oseretsky Test of Motor Proficiency-II. International age-specific cut-off points were used to classify the children's body composition as normal weight, overweight or obese. Data were analysed by means of descriptive statistics, correlation matrices and analysis of variance, followed by a Tukey post hoc analysis.

Results: The results showed that running speed and agility decreased significantly with an increase in BMI. Muscular strength also decreased significantly with a smaller practical significance, while fine manual control, manual coordination, and body coordination showed the weakest relationship to BMI. Analysis of variance showed significant relationships between BMI and running speed and agility (p-value < 0.05). These relationships were influenced differently by gender and ethnicity.

Conclusion: The motor performance of young South African children was negatively influenced by overweight and obesity. Intervention strategies are recommended to reduce the consequences of overweight and obesity in the overall development of such children.

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Introduction

The prevalence of overweight and obesity in children in developed countries has increased by 300% over the past 40 years.[1] The prevalence in children in South Africa corresponds to the values in developed countries a decade ago. A study by Armstrong et al[2] on six- to 11-year-old South African children indicated that 14% of boys and 17.9% of girls were overweight, and 3.2% of boys and 4.9% of girls were obese. Pienaar et al[3] reported that 16.52% and 4.93% of girls in the North West province (in the 10- to 12-year-old age group) could be classified as overweight and obese, respectively.

The cause of this high prevalence of overweight and obesity in children is mainly ascribed to an unbalanced energy intake (calories obtained from food) and the burning of energy (calories burned by basal metabolism and physical activity).[4] However, studies that compared the energy intake of non-obese and obese adolescents showed that obese adolescents take in the same or even fewer calories than their non-obese friends.[5] It would appear as if insufficient burning of energy, rather than energy intake, is the cause of the high prevalence of overweight and obesity in children. In this regard, various researchers have reported low physical activity levels in present-day children.[6,7] Engelbrecht et al[8] found that 73.3% of South African girls in the 13- to 15-year-old age group had low physical activity levels.

Overweight and obesity in children are associated with various health-related conditions such as hypertension, impaired vascular function, dyslipidaemia, metabolic syndrome, type 2 diabetes, systemic inflammation and oxidative stress.[9] Research indicates that at least one cardiovascular risk factor is present in 75.4% of overweight and 81.9% of obese children.[10]

A number of studies that were performed on prepubescent children showed that body fat relates to different motor skill tasks.[11,12] Such motor skills include fine manual control, manual coordination, body coordination and strength and agility.

Fine manual control involves writing and drawing skills that require a high degree of precision.[13] Existing research posits that overweight and obesity influence passive activities such as sitting and writing, or drawing to a lesser extent, since the body is not expected to move against the gravitational pull of the earth.[12,14]

Manual coordination involves skills such as reaching for and the manipulation of objects, with an emphasis on speed and coordination of the hands and arms.[13] No significant differences could be found with regard to object-control skills in a study in which the gross motor performance of six to nine-year-old overweight boys and girls was determined by means of a gross motor development test.[15]These results are confirmed by Southall et al,[16] who could not find any statistically significant differences in object-control activities that were evaluated by means of the test of gross motor development in a research study to determine the physical competence of 33 overweight Grade 5 and 6 children. However, Okely et al[17] found that overweight Australian boys performed less well in object-control activities than normal-weight boys in Grades 6 and 10 in a study on grade 4,6,8 and 10 children. However, for object-control skills, the only demographic groups in which normal-weight students possessed a greater number of advanced skills than overweight students were boys in Grades 6 and 10.

Body coordination is an indication of balance skills, as well as coordination of the upper and lower limbs.[13] A lack of clarity exists with regard to the influence of overweight and obesity on static balance.[11,14,18] Wearing et al[14] indicated a negative influence on body control during static balance activities, while Goulding et al[18] reported no significant differences between obese and normal-weight children's performance of static balance activities on two feet. However, the performance of obese children was significantly worse when the base of support was made smaller, for example, when they had to stand on a single leg on a balance beam.

Strength and agility measure the strength of the major muscle groups, motor speed and other skills that play a role in the maintenance of a good body posture when walking or running.[13] In a study of 709 Greek school children at a primary school, Tokmakidis et al[19] reported that normal-weight children performed statistically better in a 10 x 5 m agility test than overweight and obese children. Overweight girls performed better than obese girls in tests that determined agility. In accordance with this, Du Toit and Pienaar[11] also found negative relationships between locomotor skills and overweight in preschool children.

It appears that, in general, little research has been published regarding the relationship between overweight, obesity and motor performance, and specifically in South Africa. Controversy still exists regarding the influence of overweight and obesity on different motor skill tasks.

This study aimed to determine the relationship between overweight and obesity and motor performance in Grade 4-6 children resident in South Africa, in order to establish recommendations for effective intervention programmes to eliminate possible motor developmental delays in children who are already experiencing problems with excessive weight.

Method

Research design

The study had a cross-sectional design.

Research group

The research group comprised 280 Grade 4, 5 and 6 learners (128 boys and 152 girls) from two schools in Potchefstroom. This constituted an availability sample, although the group represented a distribution of socio-economic status, race and gender. The age of the subjects varied between nine and 13 years, of whom 53 were nine years old, 77 were 10 years old, 94 were 11 years old, 51 were 12 years old and five were 13 years old. The majority of the learners (154) were white, 99 were black and 27 were coloured.

Measuring instruments

Anthropometric measurements

Body mass (kg), stature (m), and the triceps, subscapular, and medial calf skinfold (mm) were taken by trained level 2-certified anthropometrists according to the guidelines of the International Society for the Advancement of Kinanthropometry.[20] Each skinfold was taken twice to obtain the average of the two measurements. The body mass index (BMI) of each subject was calculated according to the formula of BMI = Body mass in kg/Body height in m^2 The age-specific cut-off points, as prescribed by Cole et al,[21] were used to categorise the subjects into normal-weight, overweight or obese groups. Table I summarises these cut-off points for nine- to 13-year-old children. Additionally, the cut-off points for the sum of the two skinfolds (triceps and subscapular) used by Lohman[22] were treated as a guideline only to confirm these categorisations (Table II).

Motor measurements

The subjects' motor performance abilities were determined by means of the Bruininks-Oseretsky Test of Motor Proficiency-II.[13] This test consists of four components, namely fine manual control (fine motor precision and fine motor integration), manual coordination (manual dexterity and upper-limb coordination), body coordination (balance and bilateral coordination), and strength and agility (running speed and agility and strength). For the purposes of this study, the shorter version (short form), which consists of 14 test items as prescribed by the authors of the measuring instrument, was administered. However, the following subitems were fully administered, namely bilateral coordination, balance and running speed and agility. This was because there was a need to analyse these components more exhaustively. The measuring instrument is gender and age specific and has been used successfully in various studies to determine the motor proficiency of children. The total point scores of the different subitems

Table I: Age-specific body mass index cut-off points for overweight and obesity in nine- to 13-year-old children

Age (years)	BMI cut-off points for overweight in boys	BMI cut-off points for obesity in boys	BMI cut-off points for overweight in girls	BMI cut-off points for obesity in girls
9	19.10	22.77	19.07	22.81
10	19.84	24.00	19.86	24.11
11	20.55	25.10	20.74	25.42
12	21.22	26.02	21.68	26.67
13	21.91	26.84	22.58	27.76

BMI: body mass index
Adapted from Cole et al[21]

Table II: Age-specific sum of two skinfold cut-off points for overweight and obesity in nine- to 13-year-old children

Age (years)	Sum of two skinfold cut-off points for overweight in boys	Sum of two skinfold cut-off points for obesity in boys	Sum of two skinfold cut-off points for overweight in girls	Sum of two skinfold cut-off points for obesity in girls
9	23	34	29	41
10	24	33	32	43
11	28	39	31	43
12	24	44	34	47
13	28	46	39	52

Adapted from Lohman[22]

were calculated according to the chronological age and gender of the subjects and then converted to standard scores and percentiles. These were comparable across age and gender.[13] Age equivalents for the different subtests and descriptive categories were also obtained.

Procedure

Ethics approval for the study was obtained from the Ethics Committee of North-West University (Number 07M07). The provincial Department of Education and the principals of the two schools were approached to obtain permission for the study. Informed consent forms were distributed among all the Grade 4, 5 and 6 learners of the schools, as well as their parents or guardians. This was carried out a week prior to commencement of the study. All learners whose parents consented took part in the study. Learners were informed that their participation in the study was voluntary and that they could withdraw at any time. Tests were carried out in the school halls at the schools. A private cubicle was constructed in which the evaluator could measure skinfolds for the body composition tests. A male anthropometrist took the measurements of the male learners, while the measurements of the female learners were taken by a female anthropometrist.

Statistical analysis

The data were analysed by means of the Statistica® computer programme[23] for descriptive purposes (means, standard deviations and maximum and minimum values). Relationships were determined between the variables through the Pearson's correlation coefficient as the data showed a normal distribution. A p-value that was smaller than 0.05 was considered to be statistically significant. To determine the practical significance of correlations, correlation coefficients were used as effect sizes according to the guidelines of Cohen[24] with regard to practical significance in correlation research. In this regard, Cohen[24] proposed that a correlation coefficient (effect size) of 0.1 should be taken to represent a small effect, 0.2 a medium effect, and 0.5 a large effect. Analysis of variance was performed to determine differences among the normal-weight, overweight and obese children. Differences between the groups were analysed through a Tukey post hoc analysis.

Results

The results, as described in Table III, showed that 15.5% of the subjects could be classified as overweight and 6.5% as obese, that girls (12.2%) showed a higher prevalence of overweight and obesity than boys (9.8%), and that white children (15.1%) showed the highest prevalence, followed by black children (5.8%) and coloureds (1.1%).

Table IV displays the Pearson's correlation coefficients that were used to analyse the possible relationships between BMI and body fat percentage with the different motor performance variables. The analysis indicated that BMI and body fat percentage had dissimilar correlations with the motor performance variables. The relationships of body fat percentage to the variables were slightly higher than those of BMI. Positive correlations with medium practical significance were found with running speed. Agility, as well as strength, showed negative correlations with small to medium practical significance. Fine manual control, manual coordination and body coordination variables showed no relationships with BMI or body fat percentage, with the exception of standing on one leg with the eyes closed on a balance beam. This showed a negative correlation with a small practical significance with BMI and body fat percentage, and copying a square, as well as dribbling a

Table III: Demographic characteristics of the group, classified into different body mass index categories

Variables	Total (n)	Total (%)	Normal weight (n)	Normal weight (%)	Overweight (n)	Overweight (%)	Obese (n)	Obese group (%)	Overweight and obese (n)	Overweight and obese (%)
Gender										
Boys	128	45.7	101	36.1	20	7.2	7	2.5	27	9.8
Girls	152	54.3	118	42.1	23	8.3	11	4.0	34	12.2
Age (years)										
9	53	18.9	44	15.7	6	2.2	3	1.1	9	3.2
10	77	27.5	64	22.9	10	3.6	3	1.1	13	4.7
11	94	33.6	66	23.6	20	7.2	8	2.9	28	10.1
12	51	18.2	40	14.3	7	2.5	4	1.4	11	4.0
13	5	1.8	5	1.8	0	0	0	0	0	0
Race										
White	154	55	112	40.0	31	11.2	11	4.0	42	15.1
Black	99	35.4	83	29.6	9	3.2	7	2.5	16	5.8
Coloured	27	9.6	24	8.6	3	1.1	0	0	3	1.1
Total	**280**	**100**	**219**	**78.2**	**43**	**15.5**	**18**	**6.5**	**61**	**22**

O: overweight

Table IV: Pearson correlation coefficients (r) of body mass index and body fat percentage with the different motor performance variables in the total group (n = 280)

Variables	BMI (r)	Body fat % (r)
Fine manual control		
Fine motor precision		
Drawing lines through paths (crooked)	0.01	0.01
Folding paper	0.06	0.05
Fine motor integration		
Copying a square	-0.09	-0.12*
Copying a star	-0.06	-0.04
Manual coordination		
Manual dexterity		
Transferring pennies	-0.02	-0.09
Upper-limb coordination		
Dropping and catching a ball (both hands)	0.07	0.05
Dribbling a ball (alternating hands)	-0.09	-0.17*
Body coordination		
Balance		
Standing with feet apart on a line (eyes open)	0.07	0.05
Walking forward on a line	0.03	0.04
Standing on one leg on a line (eyes open)		
Standing with feet apart on a line (eyes closed)	-0.06	-0.04
Walking forward heel to toe on a line	-0.03	0.01
Standing on one leg on a line (eyes closed)	0.02	-0.08
Standing on one leg on a balance beam (eyes open)	-0.07	-0.03
Balance cont.		
Standing heel to toe on a balance beam	-0.08	-0.11
Standing on one leg on a balance beam (eyes closed)	-0.13*	-0.17*
Bilateral coordination		
Touching nose with index fingers (eyes closed)		
Jumping jacks	-0.01	-0.04
Jumping in place (same sides synchronised)	0.00	0.02
Jumping in place (opposite sides synchronised)	0.01	-0.03
Pivoting thumbs and index fingers	0.01	-0.02
Tapping feet and fingers (same sides synchronised)	0.07	0.06
Tapping feet and fingers (opposite sides synchronised)	-0.09	-0.13*
Strength and agility		
Running speed and agility		
Shuttle run	0.37*	0.45*
Stepping sideways over a balance beam	0.03	0.04
One-legged stationary hop	-0.21*	-0.21*
One-legged side hop	-0.30*	-0.29*
Two-legged side hop	-0.12	-0.15*
Strength		
Knee push-ups	-0.28*	-0.37*
Sit-ups	-0.06	-0.17*

* Where p-value < 0.05; effect size of 0.1 represents a small practical effect, 0.2 a medium practical effect, and 0.5 a large practical effect
BMI: body mass index

ball with alternating hands, which both show negative correlations with a small practical significance with body fat percentage.

In order to obtain a more in-depth analysis of the abovementioned relationships, Table V describes the means, standard deviations and minimum and maximum values of the different motor variables of the subjects in the different BMI groups.

Table V shows that no clear tendencies could be found in the fine manual control and the manual coordination motor

Table V: Motor performance variables of the subjects in the different body mass index groups

Variables	Normal weight				Overweight				Obese			
	n = 219				n = 43				n = 18			
	0.1	0	7	0.6	0.1	0	1	0.3	0.2	0	2	0.5
Fine motor precision												
Drawing lines through paths (crooked)	0.1	0	7	0.6	0.1	0	1	0.3	0.2	0	2	0.5
Folding paper	9.3	0	12	3.3	9.8	2	12	2.4	9.4	4	12	2.5
Fine motor integration												
Copying a square	4.5	0	5	0.8	4.6	3	5	0.5	4.2	2	5	1
Copying a star	3.5	0	5	1.5	3.9	0	5	1.2	3.1	0	5	1.4
Manual dexterity												
Transferring pennies	15.2	7	20	2.4	14.9	10	19	2.1	15.2	11	20	2
Upper-limb coordination												
Dropping and catching a ball (both hands)	4.7	0	7	0.9	4.7	1	6	0.8	4.9	4	5	0.3
Dribbling a ball (alternating hands)	8.9	3	11	2.1	8	3	10	2.5	8.1	2	10	2.9
Balance												
Standing with feet apart on a line (eyes open)	10	5	10	0.3	10	10	10	0	10	10	10	0
Walking forward on a line	6	5	6	0.2	6	6	6	0	5.9	5	6	0.2
Standing on one leg on a line (eyes open)	10	10	10	0	10	10	10	0	10	10	10	0
Standing with feet apart on a line (eyes closed)	9.8	3	10	0.8	9.7	5	10	1	9.7	4	10	1.4
Walking forward heel to toe on a line	6	3	10	0.4	6.2	6	10	0.9	5.7	3	6	0.8
Standing on one leg on a line (eyes closed)	9.2	2	10	1.8	9.3	5	10	1.4	9	5	10	1.8
Standing on one leg on a balance beam (eyes open)	9.9	4	10	0.7	9.8	6	10	0.7	9.6	5	10	1.2
Standing heel to toe on a balance beam	9.9	2	10	0.7	9.7	5	10	1	9.6	6	10	1.1
Standing on one leg on a balance beam (eyes closed)	7.1	2	10	2.6	6.7	3	10	2.6	5.8	1	10	2.9
Bilateral coordination												
Touching nose with index fingers (eyes closed)	4	4	4	0	4	4	4	0	4	4	4	0
Jumping jacks	4.8	0	5	0.7	4.9	1	5	0.6	4.6	1	5	1.1
Jumping in place (same sides synchronised)	5	0	5	0.4	4.9	3	5	0.3	4.9	4	5	0.2
Jumping in place (opposite sides synchronised)	3.8	0	5	1.9	3.6	0	5	1.9	3.7	0	5	2.1
Pivoting thumbs and index fingers	4.4	0	5	1.4	4.5	0	5	1.3	4.3	0	5	1.6
Tapping feet and fingers (same sides synchronised)	9.9	0	10	0.9	10	10	10	0	10	10	10	0
Tapping feet and fingers (opposite sides synchronised)	5.8	0	10	4	5.4	0	10	4.2	4.2	0	10	4.5
Running speed and agility												
Shuttle run	8.3	6.3	10.8	0.8	8.4	5.8	10.8	0.8	9.6	7.5	12.8	1.2
Stepping sideways over a balance beam	31.2	16	50	6.5	32.9	21	50	7.1	31.1	21	50	7.7
One-legged stationary hop	37.6	14	58	5.5	37.2	21	50	4.4	33.6	19	40	5.3
One-legged side hop	30	9	45	5.8	29.1	14	39	5.4	22.9	12	34	5.4
Two-legged side hop	34.5	23	60	5.5	35	17	50	6.1	31.1	20	39	5.2
Strength												
Knee push-ups	14.7	3	70	6.4	12.8	1	22	4.7	8.9	1	21	5.2
Sit-ups	20.8	5	34	5.6	20.4	0	36	7.2	19.1	14	26	4.3

SD: standard deviation

performance variables with an increase in BMI, although negative correlations emerged between body fat percentage and copying a square and dribbling a ball with alternating hands. The results showed clear decreasing tendencies with an increase in BMI in three of the nine balancing test items. These were standing on one leg on a balance beam with the eyes open, standing heel to toe on a balance beam, and standing on one leg on a balance beam with the eyes closed (all three are performed on a balance beam). The results showed clear decreasing tendencies with an increase in BMI in one of the seven bilateral coordination test items, namely, tapping feet and fingers (opposite sides synchronised). Two of the five running speed and agility test items, namely, one-legged hops and one-legged side hops (both on one leg), also showed a decreasing tendency with an increase in BMI. An increasing tendency with an increase in BMI was further seen in the shuttle run test item of the running speed and agility subtest, which showed that subjects with a higher BMI performed less well in the test than those with a lower BMI.

Table VI displays only the variables (determined by analysis of variance) that showed statistical significance of differences in the normal-weight, overweight and obese groups when compared to the total group, and with regard to race and gender. From this, the biggest group differences was seen in the running speed and agility test items. Considering the motor performance of the total group, the normal-weight, overweight and obese groups differed significantly from one another in the shuttle run, one-legged stationary hops and one-legged side hops test items.

The group differences were further analysed with reference to gender and ethnicity. From this analysis, it appeared that normal-weight and obese boys, in addition to the abovementioned differences, differed significantly from one another in the knee push-ups test item. If ethnicity is taken into account, it appeared that the black participants in the normal-weight and obese groups differed significantly from each other in the walking forward heel to toe on a line and also in the knee push-ups activity. No significant

Table VI: Variables that showed significance of differences in the normal-weight, overweight, and obese groups with regard to the total group, and race and gender

Variables	Normal n = 219	Overweight n = 43	Obese n = 18
	Mean	Mean	Mean
Balance			
Walking forward heel to toe on a line			
Black	5.99[c]	6.44	5.86[a]
Running speed and agility			
Shuttle run			
Total group	8.34[c]	8.44[c]	9.57[ab]
Boys	8.06[c]	8.08[c]	9.53[ab]
Girls	8.58[c]	8.76[c]	9.60[ab]
White	8.15[c]	8.40[c]	9.37[ab]
Black	8.57[c]	8.51[c]	9.88[ab]
One-legged stationary hop			
Total group	37.64[c]	37.23	33.56[a]
Girls	37.81[c]	36.48	32.64[a]
One-legged side hop			
Total group	30.05[c]	29.14[c]	22.94[ab]
Girls	30.81[c]	29.48[c]	23.36[ab]
White	29.05[c]	28.29	23.27[a]
Black	31.01[c]	32.44[c]	22.43[ab]
Strength			
Knee push-ups			
Boys	16.72[c]	15.15	10.43[a]
Black	14.01[c]	12.00	6.14[a]

a: normal weight, b: overweight; c: obese

correlations could be established in the coloured group. This can possibly be ascribed to the fact that only three coloured subjects were overweight and no coloured subjects were obese.

Discussion

The results of the study showed that the incidence of overweight and obesity largely corresponded to the results of other researchers in South Africa, and more specifically to statistics reported in North West province.[3] Armstrong et al[2] also found that girls were more inclined to overweight and obesity than boys. This was confirmed by the results of this study. This could possibly be explained by the fact that girls reach puberty earlier than boys. This is accompanied by the accumulation of body fat, whereas boys are more inclined to obtain higher muscle mass during puberty.[12] Another explanation could be that girls are inclined to have lower physical activity levels than boys,[8] and that it is this insufficient energy consumption, rather than excessive energy intake, that is the cause of the higher prevalence of overweight and obesity in girls. White children showed the highest prevalence of overweight and obesity, followed by black children and lastly, coloured children. This is also in accordance with the statistics of Armstrong et al.[2]

The results appear to be in agreement with existing research with regard to the subjects' motor performance abilities. No clear relationships could be established between overweight and obesity and fine manual control skills (fine motor precision and fine motor integration) or manual coordination skills (manual dexterity and upper-limb coordination activities). This corresponds to the results reported by Marshall and Bouffard,[15] as well as Southall et al.[16]

When body coordination (balance and bilateral coordination) was analysed, it appeared that generally, the subjects' balancing ability was not influenced negatively by the prevalence of overweight and obesity. Only one item, where the subjects were asked to stand on one leg with their eyes closed while on a balance beam, showed a negative significant relationship with body fat percentage. Furthermore, other test items that were performed on the balance beam showed decreasing tendencies in scores with an increase in BMI and body fat percentage. This finding is supported by the results of Goulding et al[18] which indicated that obese children's balance was significantly worse when the base of support was made smaller, i.e. when standing on a balance beam. Analysis of variance showed that ethnicity played a role in the significance of differences found between the normal-weight and obese group of children. Black obese boys differed significantly from normal-weight boys in their performance of heel to toe forward walking on a line test item.

The results showed that the strength and agility skills (running speed and agility and strength) of the subjects were especially influenced by overweight and obesity. Significant group differences were found among the normal-weight, overweight, and obese groups in three of the five running speed and agility test items. This finding is in accordance with the results of Tokmakidis et al.[19] In their study, Parizkowa and Hills[12] indicated that activities during which the body had to be displaced were negatively influenced by overweight and obesity. Gender- and ethnic-specific analyses of variance also showed that black, normal-weight and obese boys differed significantly from one another in the performance of the knee push-ups test item. It appeared that the arm muscle strength of the black boys decreased as their body mass increases.

Limitations of the study were that the socio-economic demographics and the ethnicity of the black group were not specified. These factors, as well as age, have been shown to influence motor performance. Also, an availability sample was used, which could also have impacted on the results. Therefore, these findings justify further research with regard to these factors, different ages, genders and the relationships between the motor performance abilities and overweight and obesity that were established in this study. However, the findings have implications for educators and practitioners who work with overweight and obese children. Motor performance abilities that show a correlation with overweight should receive as much attention as physical fitness in remedial or physical education programmes.

Conclusion

The purpose of this study was to determine the relationship between overweight and obesity and the various motor performance abilities of children. The results showed that running speed and agility, strength and balance were negatively influenced by overweight. The results confirmed the findings of studies from other countries. South African children are not an exception with regard to the effect of overweight and obesity on motor performance abilities.

Although these results cannot be generalised because of the limitations of the study, they indicate that professionals who work with overweight and obese learners in these age groups in South Africa should be aware of the possible effects of body composition on the learners' motor development, in addition to other health risks usually associated with overweight and obesity. Emphasis is placed on participation in physical activities and the development of motor and sport skills within physical education in the South African school curriculum.[24]There is high prevalence of overweight and obesity in this group of learners, a finding observed in other South African studies.[2,3] Motor competency for participation in physical activities and sport is essential, so professionals such as therapists, kinderkineticists and physical education teachers who work with overweight and obese learners should evaluate and give attention to these learners' motor skills in order to enable and encourage them to be physically active.

Conflict of interest

The authors have no conflicts of interest to declare.

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