

The effect of a physical activity, diet and behaviour modification intervention on the self-perception of 9 to 12 year old overweight and obese children

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Abstract

The aim of the study was to determine whether a physical activity, diet and behaviour modification intervention would significantly improve the self-perception of 9 to 12 year old overweight and obese children. A convenience sample of 38 subjects between the ages of 9 and 12 years (mean age = 11.0) participated in the study. Twenty children (N = 20), 13 girls and 7 boys, participated in the intervention programme for 13 week (3 times/week), while 18 children (N = 18), 11 girls and 7 boys, served as a control group. Kinanthropometric measurements were used to assess body composition and self-perception was determined by using the Harter Scale for Self-Perception. The results showed low self-perception values compared to normal children, although the self-perception of overweight and obese children did not differ from each other. There was a significant increase in all subcomponents of self-perception in the experimental group, with the largest improvement in athletic, physical and global self-perception ($p < 0.05$). In contrast, the control group exhibited lower values in all the subcomponents with a significant decrease in social self-perception ($p < 0.05$). Waist and upper arm circumferences, as well as fat percentages of the experimental group decreased significantly, while the measurements of the same components in the control group increased. The multidisciplinary intervention programme not only possesses weight loss advantages for overweight and obese children, but has the advantage of improving self-perception. Participation in the programme also showed positive effects on the self-perception of both sexes, although the effect in the various subcomponents appears to be different.

Key words: *Overweight, obesity, children, self-perception, intervention.*

Introduction

Obesity is currently one of the world's largest epidemics (Craeynest, Crombez, De Houser & Deforche, 2006) and is regarded as a serious health problem (Goldfield *et al.*, 2007). The World Health Organisation (WHO, 2008) defines overweight and obesity as an excessive accumulation of body fat that occurs when energy intake exceeds energy expenditure. It is estimated that 22 million children worldwide under the age of five years are overweight (WHO, 2009). There is also an increase in overweight and obesity amongst children in South Africa (Steyn, Labadarios, Maunder, Nel & Lombard, 2005). A recent study by Armstrong, Lambert, Sharwood & Lambert (2006) to determine the prevalence

of overweight and obesity in 6 to 13 year old South African children showed that 14% of boys and 17.9% of girls were overweight and 3.2% of the boys and 4.9% of the girls were obese.

In addition to the various health implications of childhood obesity (Wabitsch, 2000; Must & Anderson, 2003; Van der Merwe, 2004), it can also lead to psychological problems that could result in children being at greater risk than children of normal weight to develop a poor self-perception (Israel & Ivanova, 2002). Included in these psychological and social consequences are negative stereotyping and social rejection (Doak, Visscher, Renders & Seidell, 2006), discrimination (Dietz, 1998), a lack of self-confidence (Wabitsch, 2000) and depression (Erickson, Robinson, Haydel & Killen, 2000; Doak *et al.*, 2006). All these consequences have a negative influence on self-perception, especially physical self-perception and self-confidence (Sung, Yu, So, Lam & Hau, 2005; Doak *et al.*, 2006; Franklin, Denyer, Steinbeck, Caterson & Hill, 2006).

Various studies have found that overweight and obese children have a poorer self-perception than children of normal weight (Kimm *et al.*, 1997; Davison & Birch, 2001; Israel & Ivanova, 2002). Research has further shown that overweight and obese girls exhibit a poorer self-perception in relation to overweight and obese boys (Brown *et al.*, 1998; Israel & Ivanova, 2002; Young-Hyman *et al.*, 2006). Studies also indicate a correlation between overweight and obesity and depression in girls, but not in boys (Erickson *et al.*, 2000; Goodman & Whitaker, 2002). Concerning race, differences were found in physical self-perception, white girls had a poorer physical self-perception than black girls (Kimm *et al.*, 1997; Brown *et al.*, 1998; Young-Hyman, Schlundt, Herman-Wenderoth & Bozylinski, 2003). Therefore, it would appear that overweight and obese children have a higher risk of psychosocial and psychological problems that they can carry with them into adulthood (Must & Strauss, 1999; Edmunds, Waters & Elliott, 2001).

Poor physical self-perception of overweight and obese children is further associated with lower physical activity (Norman, Schmid, Sallis, Calfas & Patrick, 2005), as these children withdraw from games and sporting activities due to a lack of self-confidence (Gillis, Kennedy & Bar-Or, 2006). This behaviour can contribute to a further increase in the degree of overweight or obesity (Al-Nakeeb, Duncan, Lyons & Woodfield, 2007). These results

motivate early treatment of overweight and obesity during childhood. Recent studies has proven that participation in physical activities can improve a child's physical self-perception and self- confidence (Goldfield *et al.*, 2007; Hughes, McLaughlin, McKay, Lafferty, McKay & Mutrie, 2007).

Goldfield *et al.* (2007) indicate that multidisciplinary interventions, with the aim of increasing physical self-perception of overweight and obese children, are not only advantageous to the psychological domain, but also to the physical aspects in that it increases the physical activity in children. Although the health advantages of increased physical activity enjoy support by researchers, the psychological advantages, which include the improvement in self-confidence and the increase in social involvement, are mostly underestimated (Eliakim *et al.*, 2002).

Few studies could be found that aimed to determine whether a physical activity, diet and behaviour modification intervention would lead to a significant improvement in the self-perception of 9 to 12 year old overweight and obese children. Therefore, the aim of this study was to analyse the self- perception of overweight and obese boys and girls, and to determine the effect of a physical activity, diet and behaviour modification intervention on the self-perception of 9 to 12 year old overweight and obese children.

Materials and Methods

Study participants

The research group was recruited by means of distributing notices at all primary schools in Potchefstroom. The notices invited the parents to enrol their children in this study. Primary school pupils in Potchefstroom between the ages of 9 and 12 years who were overweight or obese were approached in this manner to participate in the study. The schools that were approached exhibited a good distribution of socio-economic status, race and gender. The research group consisted of 38 children of whom 24 were girls and 14 boys. They were divided into an experimental (N = 20, boys n = 7, girls n = 13) and a control group (N = 18, boys n = 7, girls n = 11). The age of the children varied between 9 and 12 years of age, of which nine were 10 year olds, seventeen were 11 year olds and eight were 12 years old.

Research procedure

Ethical permission to conduct this study was obtained from the Ethics Committee of the NWU (No. 07M07). Medical clearance for each child was obtained from a medical doctor. The parents of the children completed an informed consent form after attending an information session held before the beginning of the intervention programme.

Anthropometric measurements

All the anthropometric measurements, which included body mass, stature and the triceps, subscapular and medial calf skinfold, were taken according to the International Society for the Advancement of Kinanthropometry (ISAK)-standard (Marfell-Jones, Olds, Stewart & Carter, 2006). Body mass was measured with a calibrated electronic scale, stature using a stadiometer and a John Bull skinfold calliper to measure skinfold thickness to the nearest 0.2 millimetre (mm). Each skinfold was measured twice to obtain an average of the two measurements. These specific skinfolds were measured, because according to Meridith and Welk (1999), they exhibit the highest correlation with the general fat percentage in children. The body mass index (BMI) of each child was then calculated using the formula $BMI = \text{body mass in kg} / (\text{stature/meter})^2$. As the BMI of children constantly changes as they age, Cole, Belizzi, Flegal and Dietz (2000) determined an age specific cut-off point to determine obesity in growing children, and this was used in this study to categorise the subjects as overweight or obese. Waist circumference and upper arm circumference were measured at the mid-acromial landmark, using a standard measuring tape (intervals of 0.1 mm).

Harter Self Perception Profile Questionnaire

The Harter Self Perception Profile Questionnaire (Harter, 1985) was used to measure the self-perception of the children. This measuring instrument consists of 6 subcomponents that determine the self-perception of children. The subcomponents include scholastic ability, social acceptance, athletic ability, physical appearance, behavioural patterns and global self-worth. The questionnaire was completed by the researcher in the presence of each child after each question was read out aloud so as to aid in clarity and answering of the questions. The information obtained from the Harter Self-Perception Profile Questionnaire (Harter, 1985) was processed as prescribed in the Harter manual (Harter, 1985). The Harter Self-Perception Profile shows high reliability and

validity (varies between 0.71 and 0.86) for the different subcomponents (Harter, 1985).

Intervention

The duration of the intervention programme was 13 weeks and took place three times a week after school hours. The research group was divided into 6 groups so that each subject could receive individual attention. The intervention consisted of two components, namely a physical activity component that was offered twice a week and a behaviour modification component (which also included physical activity) which took place once a week. The “Sports, Play and Active Recreation for Kids (SPARK)” (McKenzie *et al.*, 2000) curriculum and guidelines indicated in Eat Well and Keep Moving (Cheung, Gortmaker & Dart, 2001) were used as a foundation for the programme.

The physical activity component consisted of activities such as aerobics, strength and flexibility exercises as well as basic sport skills. The 60 minutes sessions were subdivided into 30 minutes of aerobic exercises, 15 minutes strength and flexibility exercises and 15 minutes basic sport skills. The target energy expenditure during the intervention was 100 kilocalories per exercise session and was determined by means of Actical[®] accelerometers (Mini Mitter Company, Inc, 2003). Also the aim of the physical activity component was to improve the self-perception of the subjects by making it enjoyable, thereby increasing internal motivation.

The behaviour modification component, with the aim of adapting the lifestyle of the subjects, took place once a week and consisted of lessons on healthy eating habits, nutrition choices, self-perception, methods to increase physical activity and addressing physical activity goals. Lessons that were aimed at improving self-perception included team building activities, activities that made a person feel good about himself/herself (which includes activities that focus on the building of self-perception) and evaluation activities (which include the evaluation of the self and evaluation of subjects by team mates). The 60 minutes per session were subdivided into 20 minutes of nutrition information, 20 minutes of behavioural training, and 20 minutes of physical activity that took place in the form of a game. Each child also received a home-based programme that had to be followed at least twice a week. The home-based programme consisted of categories of aerobic, leg, arm and abdominal exercises. During the home-based

programme the children could choose two exercises from each category to perform. As the intervention programme commenced during school holidays, a week-long holiday programme was offered by recreation specialists in which the children participated. The holiday programme was conducted in the form of an adventure programme and components such as problem solving, self-perception, motivation and team building were addressed. Three information sessions were held in the evenings in which parents were taught about nutrition choices and physical activities.

Data analysis

The STATISTICA software package (Statsoft, 2008) was used to analyse the data. Data were analysed for descriptive purposes based on the means (m), standard deviation (sd) and maximum and minimum values. Pre and post-test differences were determined by means of t-testing and the level of significance was set at 0.05. Effect size (ES) d , the difference in the averages of the groups divided by the biggest standard deviation of the pre-test was used to indicate practical significance. An ES value of equal to and higher than 0.8 is regarded as of high practical significance; from 0.5 as medium practical significance and 0.2, as small practical significance.

Results

Table 1 displays the descriptive statistics of the participants. The group consisted out of 13 overweight (5 boys and 8 girls) and 25 obese children (9 boys and 16 girls). Thirty five percent of the experimental group were overweight and 65% obese, while 33.3% were overweight and 66.7% obese in the control group, which portrays a relatively equal distribution with regard to the percentage overweight and obese children in each group.

Table 2 reflects the mean values of all the subcomponents of self-perception of the group before the intervention and before they were divided into an experimental and control group. It also reflects the significance of differences in the subcomponents of self-perception of the boys and girls. The group exhibited poor values in all subcomponents as is clear from the mean values of the various subcomponents of self-perception which was 2.71 or lower (out of a possible 6). The lowest mean values in the group were obtained in the athletic and physical self-perception subcomponents, and this was also found in both sexes.

Significant gender differences occurred, where the girls exhibited significantly higher values in scholastic and behaviour self-perception, whereas the boys exhibited significantly higher values in athletic self-perception.

Table 1. Descriptive statistics of 9 to 12 year old overweight and obese children

Group	N	Overweight N (%)	Obese N (%)
Experimental			
Boys	7	4(57.1)	3(42.9)
Girls	13	3(23.1)	10(76.9)
Total group	20	7(35.0)	13(65.0)
Control			
Boys	7	1(14.0)	6(86.0)
Girls	11	5(45.5)	6(54.5)
Total group	18	6(33.3)	12(66.7)
All groups	38	13(34.2)	25(65.8)

N – number of children; % - percentage.

Table 2. Subcomponents of self perception of the group (N = 38) and boys (n = 14) and girls (n = 24) separately during the pre-test

Subcomponent	Group		Boys		Girls		df	t	p-value
	M (N= 38)	sd	M (N= 14)	sd	M (N = 24)	sd			
Scholastic	2.57	0.60	2.32	0.46	2.72	0.63	36	2.05	0.0474*
Social	2.10	0.59	2.15	0.64	2.07	0.57	36	-0.42	0.6803
Athletic	1.76	0.41	2.01	0.31	1.62	0.40	36	-3.18	0.0030*
Physical	1.85	0.55	2.01	0.46	1.75	0.58	36	-1.45	0.1561
Behaviour	2.71	0.50	2.36	0.38	2.91	0.46	36	3.73	0.0007*
Global	2.23	0.49	2.19	0.44	2.26	0.52	36	0.47	0.6446

M - mean; sd – standard deviation; df – degree of freedom; *p-value < 0.05.

The total group was further analysed separately as overweight and obese children with regard to self-perception. Table 3 indicates the mean values of all the

subcomponents of self-perception during the pre-test, as well as the significance of differences between overweight and obese children. The lowest mean values in both overweight and obese children were obtained in the subcomponents of athletic and physical self-perception. It further appears that the self-perception values of the overweight and obese children did not differ significantly from each other ($p > 0.05$). The group was then divided into an experimental group and a control group and analysed accordingly.

Table 3. Mean self perception values and significance of differences in subcomponents of self perception of the overweight (n = 13) and obese (n = 25) children during the pre-test

Subcomponent	Overweight		Obese		df	t	p-value
	M (n = 13)	sd	M (n = 25)	sd			
Scholastic	2.35	0.42	2.68	0.65	36	1.66	0.1065
Social	2.05	0.61	2.12	0.59	36	0.32	0.7478
Athletic	1.83	0.51	1.73	0.36	36	-0.72	0.4764
Physical	2.06	0.54	1.74	0.53	36	-1.78	0.0837
Behaviour	2.80	0.22	2.66	0.60	36	-0.81	0.4238
Global	2.45	0.30	2.12	0.53	36	-2.02	0.0510

M - mean; sd – standard deviation; df – degree of freedom; *p-value < 0.05.

Table 4 gives a description of the self-perception subcomponent values of the boys and girls in each group during the pre-test as well as the significance of differences between these groups. The table indicates some differences with regard to the subcomponents of the experimental and control groups, but only in the boys of the respective groups. Boys in the experimental group differed significantly from the boys in the control group with regard to the social and physical self-perception (the boys in the experimental group showed better social and physical self-perception) ($p < 0.05$), while no differences were apparent in the girls from both groups in any of the subcomponents.

The effect of the intervention programme was analysed with regard to body composition. Table 5 describes the anthropometric data of both the experimental and the control group during the pre and post-test analyses.

Table 4. Subcomponents of self perception of the boys and girls during the pre-test
 N – number of children; p – significance; *p-value < 0.05:pre-test-differences.

Subcomponent	Boys		p-value	Girls		p-value
	Experimental (n=7)	Control (n=7)		Experimental (n=13)	Control (n=11)	
Scholastic	2.46±0.48	2.19±0.43	0.2845	2.28±0.78	2.60±0.39	0.4147
Social	2.53±0.67	1.77±0.34	0.0230*	2.04±0.52	2.10±0.65	0.7982
Athletic	1.97±0.41	2.06±0.20	0.6257	1.60±0.43	1.64±0.39	0.8308
Physical	2.27±0.49	1.76±0.25	0.0292*	1.72±0.59	1.78±0.61	0.8124
Behaviour	2.50±0.40	2.23±0.34	0.1940	3.03±0.53	2.76±0.32	0.1614
Global	2.37±0.43	2.00±0.40	0.1205	2.29±0.60	2.24±0.43	0.8251

The experimental and control group possessed the same body composition before the intervention, as none of the body composition components differed significantly from each other ($p > 0.05$). After the intervention programme a decreasing tendency was seen in all anthropometrical components of the experimental group and the decrease in waist circumference, upper arm circumference and body fat percentage showed statistical and practical significance. In contrast, all the anthropometrical components of the control group showed an increasing tendency, although the increase was not significant ($p > 0.05$). No significant differences were found during the pre-test between the groups, while the groups differed significantly from each other with regard to BMI, waist circumference, upper arm circumference and body fat percentage during the post-test.

Table 6 indicates the results of the self-perception values for the various subcomponents of both the groups before and after the intervention, as well as the significance of the differences within and between the groups. The subcomponents of the self-perception of the experimental group increased significantly ($p < 0.05$) after participation in the intervention. The mean physical self-perception of the experimental group exhibited a large improvement (from 1.92 to 3.80), followed by global self-perception and athletic self-perception. In contrast the mean values of all subcomponents of the control group were lower during the post-test, while social self-perception decreased significantly (from 1.97 to 1.55).

Table 5. Descriptive anthropometric data of the 9 to 12 year old overweight and obese children of the experimental (N = 20) and control (N = 18) groups

Variable	M Pre	sd Pre	M Post	sd Post	Difference	df	t	p	ES
Experimental:									
Body mass (kg)	62.00	13.17	59.12	12.79	2.88	38	0.70	0.4871	
BMI (kg/m ²)	27.52	4.05	25.52	4.06	2.00	38	1.56	0.1282	
Waist circumference (cm)	89.38	11.64	82.13	10.02	7.25	38	2.11	0.0414*	0.6
Upper arm circumference (cm)	28.86	3.44	25.65	3.34	3.21	38	3.00	0.0048*	0.9
Fat %	44.16	8.88	38.45	8.38	5.71	38	2.09	0.0429*	0.6
Control:									
Body mass (kg)	64.11	12.28	66.40	12.65	2.29	34	-0.55	0.5853	
BMI (kg/m ²)	27.82	4.49	28.42♣	4.56	0.60	34	-0.40	0.6925	
Waist circumference (cm)	91.05	15.13	94.03♣	15.67	2.98	34	-0.58	0.5657	
Upper arm circumference (cm)	27.82	3.28	29.57♣	3.33	1.75	34	-1.59	0.1214	
Fat %	51.18	13.49	55.32♣	14.37	4.14	34	-0.89	0.3800	

M - mean; sd – standard deviation; df – degrees of freedom; t – t-value; p – significance; ES – effect size; BMI – Body mass index; % - percentage; ♣p-value < 0.05:between group difference; *p-value < 0.05:within group difference Pre-Test

The differences between the experimental and control group during the post-test were also significant with regard to all the subcomponents ($p < 0.05$), although this was not the case during the pre-test ($p > 0.05$).

Discussion

The aim of this study was to analyse the self-perception of overweight and obese boys and girls and to determine whether a physical activity, diet and behaviour intervention of 13 weeks would significantly improve the self-perception, especially the physical and athletic self-perception of 9 to 12 year old overweight and obese children.

Table 6. Self-perception values of subcomponents before and after the intervention and significance of differences (N = 20)

Subcomponent	Variables		Experimental			Control		Significance of between group differences		
	M	sd	Difference	M	sd	Difference	df	t	p	ES
Scholastic: Pre-T	2.69	0.70		2.44	0.44		36	1.31	0.1994	
Scholastic: Post-T	3.38	0.63	0.69♣	2.36	0.46	-0.08	36	5.64	0.0000*	1.62
Social: Pre-T	2.21	0.61		1.97	0.56		36	1.25	0.2192	
Social: Post-T	3.36	0.36	1.15♣	1.55	0.44	-0.42♣	36	13.86	0.0000*	4.11
Athletic: Pre-T	1.73	0.45		1.80	0.38		36	-1.05	0.6103	
Athletic: Post-T	2.96	0.44	1.23♣	1.60	0.32	-0.20	36	10.72	0.0000*	1.36
Physical: Pre-T	1.92	0.60		1.77	0.49		36	0.79	0.4323	
Physical: Post-T	3.80	0.26	1.88♣	1.60	0.37	-0.17	36	21.18	0.0000*	5.95
Behaviour: Pre-T	2.85	0.54		2.56	0.42		36	1.82	0.0766	
Behaviour: Post-T	3.57	0.39	0.72♣	2.43	0.48	-0.13	36	8.10	0.0000*	2.38
Global: Pre-T	2.32	0.53		2.14	0.42		36	1.08	0.2858	
Global: Post-T	3.93	0.13	1.61♣	1.89	0.40	-0.25	36	21.37	0.0000*	5.10

Pre-T - Pre-test; Post-T - Post test; M - mean; sd - standard deviations; df - degrees of freedom; t - t-value; p - significance; ♣p-value < 0.05: within Pre-T-Post-T-difference in experimental and control group; *p-value < 0.05: between group difference; ES - effect size.

The results showed that the self-perception of the group of overweight and obese children was predominantly low and it appeared that self-perception is influenced by overweight and obesity, although the self-perception of overweight and obese children does not differ significantly from each other. The low self-perception values are confirmed by other studies involving overweight children (Israel & Ivanova, 2002; Young-Hyman *et al.*, 2006). The lowest mean values in this study were obtained in athletic and physical self-perception. The poor athletic self-perception could be due to the fact that the children might felt unhappy about their poor motor skills, sporting skills and abilities before the intervention. The poor physical self-perception values can be ascribed to the dissatisfaction that the children felt due to the way they perceived themselves with regard to weight before the intervention programme. A study by Franklin *et*

al. (2006) on obese children and children of normal weight supports these findings in that they found a poorer self-perception with regard to athletic ability, physical appearance and general self-worth in obese children. These researchers ascribe their findings to the fact that obese children possess weaker locomotor skills and the negative reactions they receive from teachers as a result of their inability to move sufficiently due to their larger body size. They also indicated that dissatisfaction with their bodies and the social rejection by their peers also contributes to their poorer self-perception (Franklin *et al.*, 2006).

The results further revealed that boys and girls also obtained the lowest mean values separately in athletic and physical self-perception. The self-perception of both the sexes is, however, affected differently. The boys and girls differed significantly from each other with regard to certain subcomponents of self-perception ($p < 0.05$), where girls obtained significantly higher values in scholastic and behaviour self-perception, where in contrast the boys obtained significantly higher values in athletic self-perception. A possible reason for the boy's better perception of their athletic abilities can be attributed due to their better mean values in social self-perception. It's more likely that they are more involved in games with friends and as a result possess better motor skills than girls. The better mean values in scholastic self-perception in girls can perhaps be ascribed to the fact that they are less socially active, spend more time with academic activities and as a result perform better academically.

The intervention programme did have had an effect on the body composition of the children. Compared to the control group, the intervention programme had a positive effect on the body composition of the children in the experimental group. Waist and upper arm circumferences, as well as fat percentages of the experimental group decreased significantly. In contrast all the body composition components of the control group showed a tendency to increase. The positive change in the experimental group's body composition can resultantly contribute to the group's significant improvement in physical self-perception.

Analysis of self-perception during the pre-test showed that the overweight and obese children did not significantly differ from each other with regard to self-perception. The experimental and control groups also did not separately differ significantly, although both groups exhibited low self-perception values. After participating in the multidisciplinary intervention programme the results showed

a significant improvement in all the subcomponents of self-perception, especially in the athletic, physical and global self-perception of the experimental group ($p < 0.05$). In contrast the self-perception of the control group did not improve, except in the social self-perception where the improvement was significant ($p < 0.05$). These results concur with a study by Sacher, Chadwick, Wells, Williams, Cole and Lawson (2005) that was performed on 7 to 11 year old obese children where the self-perception of the group also improved significantly after participation in a multidisciplinary intervention of 3 months. A study by Cliff, Wilson, Okely, Mickle and Steele (2007), which consisted of a 10 week physical activity intervention programme for the same age group of overweight and obese children, showed that only the athletic and global self-perception of the children improved significantly in contrast to the other subcomponents which did not improve. The researchers ascribe this improvement to the programme in which the motor skills of the children improved and which led the children to feeling better about themselves as a whole. The researchers further state that the physical self-perception of the children did not improve due to the children still exhibiting an increase in body mass after participation in the intervention (Cliff *et al.*, 2007). However, this study did not make use of a control group.

The results confirm the effect of the programme on self-perception. The intervention programme included activities that focused on the building of self-perception as well as motivation and positive feedback to the children. The behaviour component of the intervention programme contained lessons that were specifically aimed at improving self-perception and acceptance of each child as an individual. The small groups and the group activities that promoted cooperation between the children improved social self-perception. In the programme attention was focused on their athletic abilities by means of activities that improved their motor and sport skills and in doing so improved their athletic abilities that improved their athletic self-perception. All the positive effects of the programme further contributed as a whole to the significant improvement of the global self-perception.

In conclusion, overweight and obese children between the ages of 9 – 12 years do suffer from a poor self-perception, especially with regard to athletic and physical self-perception. The results showed that the self-perception of children of different sexes is affected differently by overweight and obesity, although athletic and physical self-perception in both sexes is affected the most. It also

showed that intervention based on physical activity, diet and behaviour modification has value for these children. The results of this study must, however, be judged in the light of the relatively small number of subjects on which the results are based. Regardless of this, the study provides valuable insight into the value of such an intervention programme on the self-perception and body composition of overweight and obese children. It is, however, recommended that future studies should study the influence of similar interventions in boys and girls separately due to the gender differences that were found in this study with regard to self-perception.

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