

# Relationship between Body Composition and HRQOL in Primary School Children

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## Abstract

*The dramatic rise in the prevalence of obesity in developed and developing countries has become a major health care concern. There is an increasing recognition of the relationship between health-related quality of life (HRQOL) and obesity in the pediatric population. Subjective experience of one's own health, and how children see their own lives is also very important. Children with an increased amount of body fat have a negative perception of the HRQOL, unlike those who have a normal amount of body fat.*

*A total of 181 children participated in this study (mean age 7.71 ± 0.29 years, 88 girls). For the assessment of the body composition the InBody 230 device was used, while for the assessment of HRQOL the proxy version of KIDSCREEN-27 questionnaire was used. The aim of the study was to explore the relationship between the body composition and the HRQOL in children of primary school age.*

*The analysis of the results showed that the BMI is in significant negative correlation with the two dimensions of HRQOL in boys (Psychological Well-being and School), while in girls there is no statistically significant relationship. The correlation between the Percentage of Body Fat (PBF) and HRQOL is significant and negative in boys in 4 dimensions (Physical Well-being, Psychological Well-being, Social Support & Peers, School), while in girls it is negative and significant only in one dimension (Physical Well-being).*

*The results indicate that there are changes in the body composition of children, such as the increased BMI and BFP, reduced HRQOL, i.e. obesity is in inverse relationship to HRQOL.*

**Key words:** *body composition; HRQOL; primary school children.*

## **Introduction**

According to the World Health Organization (WHO, 2011), one in ten people is obese globally. The prevalence of obesity is high in developed and in developing countries, and occurs even in children. The prevalence of obesity and overweight in childhood has risen sharply over the last decade and it has become a major global public health problem (Haug et al., 2009; Koplan et al., 2005). Both obesity and overweight are associated with numerous health effects including cardiovascular disease, type 2 diabetes, stroke and asthma (WHO, 2004). These effects are not limited only to physical health, but also have an impact on the psychological and social aspects of life of the individual (Williams et al., 2005). Subjective experience of one's own health is also very important, as well as how children see their own lives. Health-related quality of life (HRQOL) is a measure of subjective health of the individual and it can be estimated using the generic or specific questionnaires. Research in connection with HRQOL and obesity is mostly of generic character. Griffiths et al. (2010) suggest that obesity has a strong negative influence on self-esteem, quality of life in children (Keating et al., 2011, Schwimmer et al., 2003; Ravens-Sieberer et al., 2000) and reduces expectations from life (Guo et al., 2000). Paediatricians believe that being obese in childhood or adolescence is a strong predictor of obesity in adulthood (Stettler & Iotova, 2010) and affects the future quality of life (Story et al., 2002).

The aim of the study was to examine the relationship between obesity and HRQOL in Serbian school age children.

## **Method**

The population that participated in the study consisted of children aged 7-8 years, of both sexes, from Subotica. The sample of respondents included second grade pupils randomly selected from five primary schools in the municipality of Subotica, and their parents. A total of 181 pupils, 88 girls and 93 boys, participated in the study. The average age of the pupils was  $7.71 \pm 0.29$  years. All pupils were healthy, with no physical disabilities or developmental disorders at the time of measurement.

Body height and weight, as well as the most representative measures of physical growth and development, were measured for research purposes by means of standard measuring method:

- 1) Body height (cm) – measured with the Martin anthropometer.
- 2) Body weight (0.1 kg) - measured by InBody 230 body structure analyser (Biospace Co., Ltd., Seoul, Korea).

For research purposes, three representative indicators of body composition were chosen:

1. The Body mass index (BMI,  $\text{kg}/\text{m}^2$ ) – determined by using the software InBody 230 body structure analyser. The index was calculated using the formula:  
$$\text{BMI} = \text{body weight (kg)} / \text{body height (m}^2\text{)}$$

- 2) Lean body mass (kg) - measured by InBody 230 body structure analyser (Biospace Co., Ltd., Seoul, Korea).
- 3) Body fat percentage (%) - measured by InBody 230 body structure analyser (Biospace Co., Ltd., Seoul, Korea).

The quality of life of respondents was assessed by using a questionnaire on Health-related quality of life, Kidscreen-27 version for parents (Ravens-Sieberer et al., 2007). We used the version for parents in Serbian language (KIDSCREEN-27/proxy). The questionnaire contained a total of 5 dimensions: 1) Physical activity and health, 2) General mood and feeling, 3) Family and leisure time, 4) Friends and 5) School and learning, on the basis of which children's quality of life was estimated. While filling out the questionnaire the parents responded to the given statements using a five-point Likert scale for expressing their agreement with the given statement. The results were expressed in T-values and percentages, which were obtained by using specific syntax formulated by Kidscreen group, in the SPSS statistical package. A higher score indicates a higher Health-related quality of life.

All analyses were performed on a personal computer with the help of statistical package for data analysis (SPSS 20.0 - Statistical Package for Social Sciences - for Windows).

## Results

The basic descriptive statistical data were calculated for each anthropometric variable, body structure variables and Health-related quality of life variables. Distribution normality was tested in all the mentioned variables on a sample of 181 respondents (Table 1).

Table 1  
Basic descriptive statistics and distribution characteristics of the analysed variables

	M	SD	Min	Max	CV%	SEM	KSp
Body height (cm)	128.02	5.80	113.60	149.40	4.53	0.41	0.20
Body weight (0.1 kg)	27.73	5.36	17.60	47.00	19.32	0.37	0.00
Body mass index –BMI (kg/m <sup>2</sup> )	16.87	2.41	12.80	25.30	14.28	0.17	0.00
Body fat percentage –BFP (%)	20.91	7.95	3.00	41.80	38.01	0.56	0.01
Lean body mass – LBM (0.1 kg)	21.61	2.87	15.10	30.60	13.28	0.20	0.20
Physical well-being	55.46	8.93	34.77	71.22	16.11	0.66	0.00
Psychological well-being	55.29	10.02	36.37	76.38	18.12	0.74	0.00
Autonomy and parent relations	52.37	8.96	22.77	79.14	17.11	0.66	0.00
Social support & Peers	55.15	8.78	30.99	70.34	15.92	0.65	0.00
School and learning	57.77	9.57	30.76	70.67	16.56	0.71	0.00

*M* - arithmetic mean; *SD* - standard deviation; *SEM* - standard error of mean; *Min* - minimum result; *Max* - maximum result; *CV%* - coefficient of variation; *KSp* - significance according to the Kolmogorov-Smirnov test

Spearman correlation was used in order to determine the association between the body structure and health-related quality of life.

Table 2

Association between the body structure and HRQOL in boys

Boys	BH	BW	BMI	BFP	LBM
1. Physical well-being	-0.13	-0.20*	-0.18	-0.27**	-0.09
2. Psychological well-being	-0.07	-0.25**	-0.27**	-0.30**	-0.07
3. Autonomy and parent relations	-0.11	-0.18	-0.19	-0.17	-0.11
4. Social support & Peers	-0.23*	-0.24**	-0.19	-0.26**	-0.16
5. School and learning	-0.02	-0.20*	-0.23*	-0.28**	-0.04

BH - Body height; BW - Body weight; BMI - Body Mass Index; BFP - Body Fat Percentage; LBM - Lean Body Mass; \*p≤0.05; \*\*p≤0.01.

Table 3

Association between the body structure and HRQOL in girls

Girls	BH	BW	BMI	BFP	LBM
1. Physical well-being	-0.28**	-0.24*	-0.14	-0.22*	-0.14
2. Psychological well-being	0.02	0.04	0.05	0.06	0.06
3. Autonomy and parent relations	-0.01	0.06	0.08	0.05	0.10
4. Social support & Peers	-0.02	0.11	0.16	0.09	0.10
5. School and learning	0.00	0.03	0.03	-0.01	0.11

BH - Body height; BW - Body weight; BMI - Body Mass Index; BFP - Body Fat Percentage; LBM - Lean Body Mass; \*p≤0.05; \*\*p≤0.01.

## Discussion and Conclusion

Health-related quality of life is a multidimensional construct that includes physical, emotional, mental and social components of well-being and functioning of children. As a subjective concept, HRQOL can be considered through the objective indicators and through qualitative and quantitative assessments (Stevanović, 2014). Technological improvements of the modern society have contributed to a sedentary lifestyle that has changed the phenotype of children compared to the situation of 20 years ago. Today's children are heavier and have a higher body mass index (BMI) than their peers from the previous generation (Ogden et al., 2012). A lack of engagement in physical activities has contributed to a greater prevalence of obesity in children, reduced physical fitness (e.g. flexibility, muscle strength, cardiorespiratory fitness), and a higher risk of diseases (Boreham & Riddoch, 2001; Eisenmann, 2003).

Negative correlations were found for body height (in girls), body mass and body fat percentage (boys and girls). It can be concluded that unfavourable physical structure, in terms of severity of ballast weight, is in negative correlation with physical activity in both sexes.

Dimension *Friends* reveals social relations with peers, the quality of interaction and mutual support. It is assumed that negative correlation indicates that boys who are taller have a lower score in the dimension *Social support & Peers*, they feel excluded and unaccepted by their peers, while boys with lower body height feel they have greater support among peers. The body weight is also in relation with variable Social Support

& Peers, association is statistically significant, implying that as body weight increases, the results are lower in the dimensions of health-related quality of life in boys. Increased body weight negatively affects physical activity, relationship with peers (Pinhas-Hamiel et al., 2006; Shoup et al., 2008), the general mood and school success (Li et al., 2008) in comparison with children with normal body mass.

Based on the results obtained, it is assumed that the girls (Table 3) who have a higher body height feel a lack of energy and are less physically active due to the clumsiness of movements and lower control over their body. Shorter children had a higher score than the European average, as found by Kidscreen generic questionnaire in the survey by Silva et al. (2013). A German study using Kidscreen-52 questionnaire showed the opposite; that is, shorter children had lower scores in dimensions *Physical well-being*, *Psychological well-being* and *Social support & Peers* (Quittmann et al., 2012).

It is assumed that those girls who have a higher body mass feel physically worse (Table 3), have less energy than others, and do not have good physical fitness. Ottova et al. (2012) obtained similar results in their study, which showed that children who had greater weight had lower HRQOL scores. Low results were obtained in the dimensions *Physical well-being* and *Psychological well-being*. In the research by Keating et al. (2011), the identified HRQOL score was significantly lower for children who were overweight and even lower for obese children. Obese girls showed lower results than obese boys.

Direct measurement of body fat as a percentage of the total weight, provides a better adiposity and health risk index in relation to BMI (Zeng et al., 2012), which is not precise enough due to variations of the lean body mass compared to the height. In previous studies, it was found that an increased body fat percentage negatively affects school achievement (Carter et al., 2010; Mo-Suwan et al., 1999), that there is an inverse relationship between the body mass and interactions with peers, that obese children are more often exposed to violence and feel unaccepted by their peers (Dwyer et al., 2001). This negative correlation between these two variables suggests that high BFP levels are accompanied by low levels of physical activity and lower health status. Modern trends reduce the time children spend in movement and play and increase the time spent in sedentary activities. The prevalence of overweight and obesity among children has been increasing in many countries, even in Serbia. It is believed that one of the two most important reasons for this increase is insufficient physical activity of children (Doak et al., 2006). A lack of physical activity has led to reduced number of children that meet the recommended 60 minutes of moderate to intense physical activity a day (Macintosh et al., 2011). Regular engagement in physical activity as early as lower grades of primary school contributes to the prevention of non-communicable diseases, which are the leading cause of death and morbidity in developed countries and countries in transition. Physical inactivity in preschool children reflects a certain deviation from the normal state, indicating physical or mental developmental problems or poor social adaptation (Đorđić & Bala, 2006).

Emphasized body volume accompanied by increased BFP had a negative impact on health-related quality of life in the children from Subotica.

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# Odnos između sastava tijela i HRQOL kod djece u osnovnoj školi

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## Sažetak

*Dinamičan porast prevalencije pretilosti u razvijenim zemljama i onima u razvoju postao je glavna briga zdravstvene zaštite. Postoji veća značajnost odnosa između kvalitete života u vezi sa zdravljem (HRQOL) i pretilosti pedijatrijske populacije. Subjektivan dojam i dojam vlastitog zdravlja i dječjeg viđenja vlastitog života također su vrlo važni. Djeca s povećanom količinom masne mase imaju negativnu percepciju o HRQOL za razliku od djece koja imaju normalnu količinu tjelesne masti.*

*U ovom istraživanju sudjelovalo je 181 dijete (prosječne dobi 7.71 (0.29) godina, 88 djevojčica). Za procjenu sastava tijela koristio se InBody 230 uređaj, a za procjenu HRQOL koristila se proxy verzija KIDSCREEN-27 upitnika. Cilj studije bio je istražiti odnose između sastava tijela i HRQOL na djecu u osnovnoškolskoj dobi.*

*Analiza rezultata je pokazala kako je ITM u značajnoj negativnoj korelaciji s dvije dimenzije HRQOL kod dječaka (psihološka dobrobit i škola), a da kod djevojčica ne postoji statistička veza. Korelacije između postotaka masnog tkiva (PMT) i HRQOL značajne su i negativne kod dječaka u 4 dimenzije (tjelesno blagostanje, psihičko blagostanje, socijalna podrška i vršnjaci, škola), a kod djevojčica je negativan i značajan samo u jednoj dimenziji (tjelesno blagostanje).*

*Rezultati pokazuju da postoje promjene u sastavu tijela djece, kao što su ITM i PMT smanjene HRQOL, odnosno da je pretilost u obrnuto proporcionalnom inverznom odnosu s HRQOL-om.*

**Ključne riječi:** HRQOL; osnovnoškolska djeca; tjelesna kompozicija.