# BODY MASS INDEX, RELATIVE BODY FAT AND PHYSICAL PERFORMANCE OF HUNGARIAN ROMA BOYS

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**Abstract:**

The aim of the present comparison of Roma and non-Roma prepubertal boys was to analyse if there were differences in some anthropometric measures and in running performance to see if Roma children fall behind their non-Roma peers in growth and development, and if so, to what extent. Until now no larger child sample of exclusively Roma ethnicity has been investigated concerning their basic somatic and motor performance attributes. Kinanthropometric data collection was carried out in 1,149 volunteer Roma boys aged between 7 and 14. For a control group exactly the same number of non-Roma subjects was selected randomly from each age group of the same region. Height, body mass, BMI, relative body fat content and the time scores in 30m dash and 1,200m run were compared. The Roma children were found to be significantly shorter and lighter than their non-Roma peers. There were no consistent differences between the BMI means, but relative body fat content was consistently greater in the Roma sample. The running performances were better in the non-Roma boys. The greater relative fat content and also the poorer running scores of the Roma children were attributed to a more hypoactive lifestyle and qualitative and quantitative dietary faults. Since the proportion of GDP that might be used for governmental welfare protection keeps being limited, their necessary integration is getting increasingly difficult. Instead of an educational, social and economic catch-up process further issues of segregation can be predicted.

***Key words:*** *Roma ethnicity, height, body composition, running performance*

## Introduction

Related to the Hungarian non-Roma population the Roma ethnicity now represents approximately 7–9% by the various estimates. Their languages used within their ethnicity, special habits and traditions relate to their origins in India and their assumed paths of migration to Europe (Czeizel, 2003) so represent an interesting and important patch of colour within the Hungarian culture. However, during the centuries a more or less expressed isolation has taken place due to many components of their past and present lifestyle (Vekerdi & Mészáros, 1978). Two major factors can be mentioned in this respect. First, the educational level of the Roma families has been generally low so their general life standard has also been remarkably below the Hungarian average (Babusik, 2002). At present about 20% of the Roma children do not finish the obligatory elementary school. Their representation at the secondary school level is much below their relative frequency within the population, and it is less than 3% in higher education. There is a clear agreement among the investigators that, above all, it is the low level of education of the Roma population that results in their very high unemployment rate (most Roma individuals can only be employed for unskilled work) and in the high rates of crime, alcohol, and drug abuse among the Roma adults (Kemény, 1997; Keresztesi & Kézdi 1998; Babusik, 2002). The latter was found to be closely related to the high number of single-parent households and the very low socio-economic status (SES) of the Roma families in general (Kemény, 1997; Keresztesi & Kézdi 1998; Babusik, 2002). Second, their significantly shorter life expectancy and higher prevalence of various health disorders has also been attributed to their unfavourable socio-economic status and poor education level compared to the non-Roma population means (Tabajdi, 1996).

In addition to the evidenced ethnic, cultural and genetic factors these environmental effects may influence both growth and physical development. The aim of the present comparison of Roma and non-Roma prepubertal boys was therefore to analyse if there were differences in some anthropometric measures and in running performance to

see if Roma children fall behind their non-Roma peers in growth and development, and if so, to what extent. Until now no larger child sample of exclusively Roma ethnicity has been investigated concerning their basic somatic and motor performance attributes.

## Methods

Altogether 1,149 Roma schoolchildren were tested in 2004 and 2005. Exactly the same sample sizes were randomly selected from a greater data-base of peer-aged concurrently investigated non-Roma schoolboys as age-matched comparison groups of the same region. Data collection was carried out in 17 settlements of North-East and East Hungary where the relative occurrence of the Roma population is greater than the national average. Because of the not nationally representative Roma sample there seemed to be no reason to produce centile curves of growth. No special selection methods were employed except for ethnicity. According to the guidelines of the Declaration of Helsinki, exclusively the volunteer children were investigated. We enjoyed the co-operation of the National Roma Minority Authority in the selection of the settlements suitable for study, in the organisation of data collection as well as in the identification of Roma children. According to Hungarian law, only such children qualify as Roma who (or whose parents) declared that they belong to the Roma ethnicity. The form of parental informed consent as well as the declaration of ethnicity (Roma vs. non-Roma) were obtained for all subjects.

The calendar age of the subjects ranged between 6.51 and 14.50 years. The age groups were created according to the suggestions of the International Biological Program (Weiner & Lourie, 1969). The organised physical activity of the subjects was only curricular physical education (2 classes a week, each class lasting 45 minutes) for both the Roma and control samples. Subject distribution by chronological age is summarised in Table 1.

Height, body mass and, by using a Lange skinfold calliper, five skinfold thicknesses (biceps, triceps, subscapular, suprailiac and medial calf, on the right side of the body) were measured. Relative body fat content (body fat expressed as a percentage of total body mass) was calculated by the modified technique of Parizkova (1961). Parizkova's original tabular data were replaced by regression formulas (Szmodis, Mészáros, & Szabó, 1976). Running speed and cardio-respiratory endurance were assessed by the time scores of a 30m dash, respectively a 1,200m run.

As the point of interest was merely to make comparisons between the Roma and non-Roma means of the respective age groups – since the anthropometric differences between the age groups were considered trivial and during this period of growth biologically obvious – all measures were subjected to *t*-tests for independent samples. The level of significance was set at a 5% level of random error.

## Results

The results of descriptive and comparative statistics for height and body mass are summarised in Table 1. The Roma children were significantly shorter than their non-Roma peers (the mean differences varied between 2 and 4.3 cm).

For the lower mean stature values of Roma boys one has to refer first to their significantly lower body mass means. The group of the 14-year-old boys whose body mass means did not differ significantly was the only exception in this respect.

Descriptive and comparative statistics for the body mass index and relative body fat content can be seen in Table 2. Mean body mass index (BMI) was statistically greater in the group of the 7- and 8-year-old non-Roma boys. This weight-to-height ratio was even greater in the group of the 14-year-old Roma children.

In spite of the statistically same or larger BMI means of the non-Roma children the estimated rel-

*Table 1. Differences in height and body mass of Roma and non-Roma boys*

| | | Height (cm) | | | | Body mass (kg) | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Roma | | Non-Roma | | Roma | | Non-Roma | |
| Age | n | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 7 | 142 | 122.84 | 6.19 | 126.51* | 5.55 | 22.01 | 6.54 | 24.36* | 6.03 |
| 8 | 144 | 127.56 | 6.86 | 131.88* | 5.87 | 25.56 | 7.14 | 28.98* | 6.41 |
| 9 | 143 | 132.80 | 7.01 | 136.94* | 6.10 | 31.39 | 7.41 | 32.85* | 6.99 |
| 10 | 145 | 138.64 | 7.09 | 142.43* | 6.46 | 35.65 | 10.23 | 36.82* | 8.61 |
| 11 | 142 | 143.72 | 7.12 | 147.49* | 7.19 | 38.68 | 11.58 | 40.24* | 10.16 |
| 12 | 144 | 148.79 | 7.99 | 153.05* | 7.92 | 42.07 | 11.19 | 44.51* | 10.37 |
| 13 | 144 | 156.98 | 8.38 | 159.29* | 8.13 | 47.30 | 12.43 | 49.88* | 11.39 |
| 14 | 145 | 163.70 | 7.66 | 165.73* | 7.95 | 56.83 | 13.15 | 55.76 | 12.58 |

Abbreviations: n = sample size, SD = standard deviation, * = difference between the means is significant.

*Table 2. Differences in body mass index and relative body fat content of Roma and non-Roma boys*

| | BMI (kg × cm$^{-2}$) | | | | Relative body fat (%) | | | |
|---|---|---|---|---|---|---|---|---|
| | Roma | | Non-Roma | | Roma | | Non-Roma | |
| Age | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 7 | 14.66 | 4.29 | 15.27* | 3.71 | 18.64 | 6.53 | 17.04* | 5.21 |
| 8 | 15.72 | 4.36 | 16.61* | 3.65 | 19.19 | 6.99 | 17.30* | 5.68 |
| 9 | 17.77 | 4.22 | 17.42 | 3.64 | 19.64 | 7.26 | 17.77* | 5.98 |
| 10 | 18.60 | 5.34 | 18.18 | 4.11 | 21.16 | 7.55 | 19.44* | 6.17 |
| 11 | 18.78 | 5.59 | 18.77 | 4.59 | 21.11 | 7.69 | 19.91* | 6.28 |
| 12 | 19.06 | 5.09 | 19.18 | 4.32 | 20.99 | 7.47 | 19.93* | 6.25 |
| 13 | 19.22 | 5.06 | 19.61 | 4.34 | 20.86 | 6.63 | 19.56* | 6.33 |
| 14 | 21.19 | 4.94 | 20.31* | 4.43 | 21.33 | 6.71 | 19.84* | 6.17 |

Abbreviations as in Table 1.

*Table 3. Differences in running performances of Roma and non-Roma boys*

| | 30m dash (s) | | | | 1,200m run (s) | | | |
|---|---|---|---|---|---|---|---|---|
| | Roma | | Non-Roma | | Roma | | Non-Roma | |
| Age | Mean | SD | Mean | SD | Mean | SD | Mean | SD |
| 7 | 6.52 | 0.64 | 6.28* | 0.55 | 460.00 | 52.53 | 412.33* | 46.51 |
| 8 | 6.38 | 0.64 | 6.19* | 0.52 | 449.98 | 51.63 | 401.01* | 44.20 |
| 9 | 6.25 | 0.60 | 6.01* | 0.51 | 435.30 | 50.39 | 389.78* | 43.02 |
| 10 | 6.15 | 0.66 | 5.89* | 0.64 | 425.68 | 52.68 | 367.95* | 42.96 |
| 11 | 6.00 | 0.59 | 5.74* | 0.61 | 421.45 | 53.50 | 356.66* | 42.51 |
| 12 | 5.81 | 0.74 | 5.56* | 0.65 | 420.92 | 54.86 | 345.27* | 38.05 |
| 13 | 5.47 | 0.53 | 5.27* | 0.57 | 402.75 | 57.03 | 331.74* | 35.99 |
| 14 | 5.27 | 0.59 | 5.14* | 0.51 | 384.44 | 56.17 | 316.59* | 35.52 |

Abbreviations as in Table 1.

ative body fat means of the Roma boys were significantly greater in all the eight age groups compared.

Means and standard deviations of the 30m dash and 1,200m run scores are in Table 3. Both running times were significantly and consistently poorer in the group of Roma children.

## Discussion and conclusions

As for the compared characteristics, it is primarily the consistent difference between the respective height means that can be related to an obvious anthropological (race) difference. Independently from the North Indian origin of the Hungarian Roma population (Czeizel, 2003), and their present definitely low SES status (compared to the country's non-Roma population) the height means of the Hungarian Roma boys were bigger by 1.5-2.0 cm in every age group than those who live in Patiala, North India (Singh et al., 1992). The BMIs or height-related body mass means of the Indian boys were also smaller.

BMI, relative body fat content as well as running performance are equally under the influence of lifestyle. We wish to emphasize particularly that the body composition and physical performances of the present non-Roma sample (this being a control group) have also been affected by the consequences of the generally more hypoactive lifestyle nowadays. Mean relative body fat has become significantly larger than it was 25-30 years ago. Previously the physical performance of the non-Roma children and adolescents was also remarkably better (Szabó, 1977; Mészáros, Mohácsi, Frenkl, Szabó, & Szmodis, 1986; Eiben, Barabás, & Pantó, 1991). We note that the observed kinanthropometric characteristics of these rural Roma boys do not differ significantly from the ones living in the capital (Tatár et al., 2003). The observed significant inter-group differences may therefore be generalized.

Another point of this comparison may concern the possible effects of the very low socio-economic conditions. Mészáros and associates (2006) evidenced by a longitudinal investigation that the mean stature and the rate of height increase were smaller in a great sample of low SES non-Roma children. Their lower height was also associated with a greater BMI and relative body fat content, and significantly poorer cardio-respiratory endurance. Since in the present comparison the observed differences were

even larger, a similar train of thought has led us to suppose the joint effects of relative malnutrition (high carbohydrate and fat consumption associated with low essential protein, vitamin and mineral intake) and a markedly hypoactive lifestyle. By these observations the factor of malnutrition cannot be ruled out in interpreting the significantly shorter stature of the Roma boys.

It is noted that the socio-economic status of the non-Roma boys in this region is also below the national average. For instance, the average monthly income of the non-Roma families is €350, their unemployment rate is 19% while the national average is 7.13% (Central Office of Statistic, 2005). The same is above 50% in the Roma families, and their income consists mainly of unemployment benefit, municipal social and family support, and income from odd jobs. This means that there are substantial differences of SES even between these two strata of the local population in poverty. The observed kinanthropometric differences seem to be proportionate.

By the observed data alone one cannot clearly discern between the possible explanations for the differences. We want to stress that the present generation of Roma children have no real chance to become healthier adults than their parents now are. Since a) birth rates in Roma families are remarkably higher than in non-Roma ones (Babusik, 2002), the proportion of Roma ethnicity is continuously increasing – according to the prediction of Kertesi and Kézdi (1998) their ratio will be over 10% by 2010 – and b) the proportion of GDP that might be used for governmental welfare protection is limited, their necessary integration is getting increasingly difficult. Instead of an educational, social and economic catch-up process further issues of segregation can be predicted. It seems that a larger part of the untoward growth and development can be attributed to social rather than genetic factors. In order to resolve the problem complex intervention is mandatory.

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# INDEKS TJELESNE MASE, RELATIVNA TJELESNA MAST I REZULTATI MOTORIČKIH TESTOVA MAĐARSKIH ROMSKIH DJEČAKA


## Sažetak

### Uvod

Nekadašnji tradicionalni, ali i današnji, način života, kao i druge kulturološke karakteristike romske etničke skupine (nesklonost integriranju, niska razina obrazovanosti zbog neuključivanja u obrazovni sustav, upadljivo niži opći društveno-ekonomski uvjeti te, posljedično, viša stopa kriminala, zlouporabe droga i alkohola) rezultirali su njihovom manje ili više izraženom segregacijom od ne-romske populacije. Povrh dokazanih etničkih i genetskih čimbenika, ovi okolišni učinci također mogu utjecati na rast i tjelesni razvoj. Stoga je cilj ove usporedbe romskih i neromskih dječaka pretpubertetske dobi bio analizirati ima li razlika u nekim antropometrijskim obilježjima i u rezultatima u trčanju da bi se utvrdilo postoji li kod romske djece zaostajanje u rastu i razvoju te, ako postoji, do koje je mjere izraženo. Do sada se još nisu ispitivale osnovne somatske značajke ni karakteristike motoričkog statusa većih uzoraka djece isključivo romske etničke skupine.

### Metode

Prikupljanje kinantropometrijskih podataka provedeno je na uzorku od 1.149 dobrovoljnih ispitanika, romskih dječaka u dobi između 7 i 14 godina. Za kontrolnu skupinu je metodom slučajnog odabira izabran potpuno jednak broj ne-romskih ispitanika za svaku dobnu skupinu. Ispitanici kontrolne skupine odabrani su iz većeg uzorka dječaka koji žive na istom području, a mjerenja su provedena istovremeno u obje skupine. Uspoređene su visina, tjelesna masa, indeks tjelesne mase, relativna količina tjelesne masti i rezultati (vremena) u sprintu na 30m i trčanju na 1200m.

### Rezultati

Utvrđeno je da su romska djeca značajno niža i manje mase od njihovih ne-romskih vršnjaka. Nije bilo dosljednih razlika između srednjih vrijednosti indeksa tjelesne mase, dok je relativna količina tjelesne masti bila dosljedno veća u uzorku romskih dječaka. Ne-romski dječaci su postigli bolje rezultate u trčanju. Veća relativna količina tjelesne masti i slabiji rezultati u trčanju utvrđeni kod romske djece pripisani su manje aktivnom načinu života te kvalitativnim i kvantitativnim nedostacima u prehrani (relativna malnutricija).

### Rasprava i zaključak

Što se tiče uspoređenih karakteristika, dosljedna se razlika između odgovarajućih srednjih vrijednosti visine može povezati s očitom antropološkom (rasnom) razlikom. Neovisno o sjevernoindijskom podrijetlu mađarske populacije Roma (Czeizel, 2003), kao i o njihovom današnjem svakako niskom društveno-ekonomskom statusu (u usporedbi s ne-romskom populacijom Mađarske), srednje vrijednosti visine mađarskih romskih dječaka bile su 1,5-2,0 cm više u svakoj dobnoj skupini u odnosu na romske dječake koji žive u području Patiala, Sjeverna Indija (Singh et al., 1992). Indeksi tjelesne mase ili srednje vrijednosti tjelesne mase u odnosu na visinu indijskih dječaka bili su također manjih vrijednosti.

Indeks tjelesne mase, relativna količina tjelesne masti, kao i rezultati u trčanju podjednako su izloženi pritisku načina života. Osobito želimo naglasiti da su sastav tijela i tjelesna motorička sposobnost ne-romskog dijela uzorka (kontrolna skupina) također pod utjecajem današnjeg hipoaktivnog načina života. Utvrđeno je da je srednja vrijednost relativne tjelesne masti značajno porasla u odnosu na vrijednosti od prije 25-30 godina, kada su i rezultati testiranja motoričkih sposobnosti ne-romske djece i adolescenata bili izrazito bolji (Szabó, 1977; Mészáros et al., 1986; Eiben et al., 1991). Napominjemo da se promatrane kinantropometrijske karakteristike ovih romskih dječaka sa sela ne razlikuju značajno od dječaka koji žive u glavnom gradu (Tatár et al., 2003). S obzirom na to, opažene značajne razlike među skupinama mogu se generalizirati.

Još je jedna točka ove usporedbe pod mogućim utjecajem vrlo niskih društveno-ekonomskih uvjeta. Mészáros i suradnici (2006) su longitudinalnim istraživanjem dokazali da su srednja vrijednost visine i stopa porasta visine bili manji u velikom uzorku ne-romske djece niskog društveno-ekonomskog statusa. Njihova manja visina je također bila povezana s većim indeksom tjelesne mase i relativnom količinom tjelesne masti, kao i značajno slabijom kardiorespiratornom izdržljivošću. Kako su u našoj usporedbi opažene razlike bile još i veće, sličan slijed razmišljanja doveo nas je do pretpostavke o zajedničkim učincima relativne malnutricije (velika razina potrošnje ugljikohidrata i masti, povezana s niskim unosom esencijalnih proteina, vitamina i minerala) i izrazito hipoaktivnog načina života. Prema tim opažanjima, čimbenik malnutricije ne može se izostaviti kod interpretiranja značajno manje visine romskih dječaka.

Promatraju li se samo dobiveni podaci, ne mogu se jasno razabrati moguća objašnjenja opaženih razlika. Želimo naglasiti da sadašnja generacija romske djece nema prave šanse izrasti u odrasle osobe koje bi bile zdravije no što su to njihovi roditelji danas. S obzirom na to da je a) natalitet u romskim obiteljima znatno veći nego u ne-romskim (Babusik 2002), udio romske etničke skupine je u stalnom porastu – prema predviđanjima (Kertesi i Kézdi 1998), taj će udio do 2010.godine iznositi više od 10% te da je b) postotak bruto društvenog proizvoda koji vlada može koristiti za socijalnu skrb i zaštitu ograničen, nužna integracija romske etničke skupine postaje sve teža. Umjesto procesa smanjivanja razlika između romske i ne-romske populacije na obrazovnom, društvenom i ekonomskom planu, mogu se predvidjeti daljnji segregacijski problemi.