

The Negative Effect of Heavy Work Life during Adolescence on Height Development of Young Males

Bariş Özener and Berna Ertuğrul

¹ Cumhuriyet University, Faculty of Literature, Department of Anthropology, Sivas, Turkey

ABSTRACT

The aim of this study was to determine the physical development level of post-adolescent automotive repair workers who had been employed in heavy work during adolescence, a critical developmental period. Young workers (Group 1, N=106, Mean age=18.33, SD=0.65) employed an average of 6 years in workshops in the capital of Turkey, Ankara. For the control group, two groups of the same age but having a difference in terms of socioeconomic status were chosen. The first one of these was comprised of individuals who had the same socioeconomic status as the laborers (Group 2, N=106, Mean age=18.33, SD=0.65) but were not laborers. The second control group was composed of individuals from the higher socioeconomic levels of society (Group 3, N=100, Mean Age=18.45 SD=0.63). Weight, height and measures were taken from the individuals and the body mass index (kg/m²) was calculated. The results of the analysis show that, although all the variables of the labor group were lower than Group 2, the difference is only significant for the height variable (p<0.05). These findings reveal that, having completed a critical developmental period such as adolescence after being employed in heavy work, the automotive repair youngsters are prone to chronic developmental retardation.

Key words: young laborers, physical growth, socioeconomic status, working conditions

Introduction

Involvement in heavy labor during adolescence of individuals that have not completed their physical development is among the most crucial medico-social problems of underdeveloped and developing countries. The International Labor Organization (ILO) has stated that almost all of the approximately 352 million child laborers aged 5–17 worldwide are employed in poor countries¹.

According to a limited number of findings, in developing countries heavy working conditions generate physical stress on individuals, and in turn, cause growth retardation in terms of height and weight^{2–4}. Studies conducted in countries with intense child and adolescent labor exploitation show that these individuals live in poor conditions and their growth is considerably retarded^{2–5}. An extensive study by Duyar and Özener⁶ indicated that adolescents engaged in heavy industry show differences not only in height and weight, but also in extremity growth and muscle and adipose tissue growth, compared to their non-laborer peers⁶. These differences observed in working adolescents could be defined as adaptive reactions of

their bodies to the difficulties in physically strenuous work environments.

Turkey is one of the countries in which the problem of child and adolescent labor is currently crucial. Although Turkey was one of the first countries to participate in the International Program on the Elimination of Child Labour (IPEC), according to the recent statistics, there are approximately 1 million child laborers in the age range of 6–17⁷. According to limited number of findings in Turkey, heavy work conditions generate physical stress on individuals, and in turn, cause growth retardation/faltering in terms of height and weight^{5,6,8–10}. However, on the one hand, the effects of socio-economic status (SES) have not been explored thoroughly in some of these studies. On the other hand, some studies have examined relatively light duty work. This current study examined the physical development of laborers who were employed in a branch of strenuous labor such as the automotive repair sector, and who had completed their adolescence employed in heavy labor.

Data and Methods

Group 1 was comprised of apprentices (N=106, Mean age=18.33, SD=0.65) enrolled in the last year of an automotive repair program in five apprentice training centers under the Ministry of National Education. The automotive repair sector was chosen because this branch of employment involves heavier and more exhausting labor than the other branches. The last year students were selected because these individuals had worked for longer years, and thus, had been more subject to the negative effects of hard work conditions.

The second group (N=102, Mean age=18.40, SD=0.59) was comprised of last year high school students of two schools in slums who had a similar SES to the first group, whereas Group 3 (N=100, Mean age=18.45, SD=

0.65) was comprised of students of 2 private high schools who mostly come from families with high SES. Increasing the number of the observed groups to three allowed for the differentiation of the effects on physical development from socio-economic conditions; and of the effects on physical development from heavy work circumstances accompanying these conditions. Height and weight measurements were taken in accordance with the standard techniques and body mass index (BMI; kg/m²) was calculated. In all tests P value of <0.05 was considered statistically significant. There was no difference between these three groups in terms of the mean average age (p>0.05).

The students were examined in their respective schools. Primarily, students were asked to fill out a questionnaire that assessed socioeconomic status. Following completion of the questionnaire individuals were taken in groups of five in an empty classroom for the measurements. Information regarding the socioeconomic features of the three groups is presented in Table 1. Based on this information, the group of laborers and the group with lower SES have similar living conditions (all p>0.05) and the members of the third group, which is composed of individuals with upper SES, have considerably higher living standards (all p<0.001). Individuals in Group 1 had been engaged in work life for 6 years on average (min=3, max=11), and their daily work time had exceeded 10 hours (X=10.3, min=8, max=17). The differences in body measurements between groups were tested by one-way multivariate analysis of variance (MANOVA), and multiple comparisons between pairs of groups were carried out according to the Tukey test. Statistical analysis was performed using the SPSS 13.0 for Windows (Statistical Package for the Social Sciences, version 13.0, SSPs Inc, Chicago, IL, USA).

TABLE 1
FAMILIAL SOCIOECONOMIC AND DEMOGRAPHIC CHARACTERISTICS OF LABOUR AND NON-LABOUR GROUPS

	Group 1	Group 2	Group 3
	N (%)	N (%)	N (%)
Family size	5.2 ^a	5.0 ^a	3.6 ^b
≤3	13.4	11.8	40.6
≥6	30.3	26.8	2.5
Mother's education level	4.1 ^a	4.3 ^a	13.4 ^b
Illiterate	10.1	9.8	0.0
Primary school	88.0	89.2	2.6
High school	1.9	1.0	31.0
University	0.0	0.0	66.4
Father's education level	5.1 ^a	5.6 ^a	18.6 ^b
Illiterate	4.1	4.8	0.0
Primary school	78.6	77.9	1.4
High school	10.0	10.9	28.8
University	2.4	2.8	64.3
Residential status			
Shanty	65.9 ^a	66.7	0.0 ^b
Non-shanty	34.1	33.3	100.0
Number of rooms per house	3.1 ^a	3.3 ^a	4.5 ^b
≤2	11.8	12.6	0.0
≥5	1.9	1.0	33.1

Note: »a« is different from »b« according to χ^2 -test, all p<0.001

Results and Discussion

According to the results of MANOVA, wherein the weight, height and BMI were combined and evaluated, the groups had different physical growth patterns (Wilks' Lambda F=12.61, p<0.0001). Furthermore, the size of these effects was quite large ($\eta_p^2=0.44$). According to Table 2, Group 1 had lower values for all observed variables than the other two groups; however, according to Table 3, which included multiple comparisons, the difference between Group 1 and Group 2 was significant only

TABLE 2
WEIGHT, HEIGHT AND BMI VALUES OF STUDY GROUPS

	Group 1		Group 2		Group 3		F	η_p^2
	X	SD	X	SD	X	SD		
Weight (kg)	63.17	9.52	65.92	10.88	74.24	12.59	22.63***	0.23
Height (cm)	168.97	6.89	171.72	7.03	177.13	5.89	31.71***	0.48
BMI (kg/m ²)	22.06	3.04	22.33	3.21	23.62	3.60	6.54*	0.18

*p<0.05, ***p<0.001, η_p^2 =Partial eta squared, X=mean

TABLE 3
 MULTIPLE COMPARISONS OF WEIGHT, HEIGHT AND BMI
 VALUES BETWEEN STUDY GROUPS ACCORDING TO ANOVA –
 TUKEY

	Groups	Difference	F	Sig.
Weight (kg)	1 vs. 2	-2.75	2.58	0.101
	1 vs. 3	-11.07	34.48	0.001
	2 vs. 3	-8.32	22.63	0.001
Height (cm)	1 vs. 2	-2.75	5.66	0.011
	1 vs. 3	-8.16	61.75	0.001
	2 vs. 3	-5.41	31.71	0.001
BMI (kg/m ²)	1 vs. 2	-0.27	0.09	0.802
	1 vs. 3	-1.56	7.21	0.008
	2 vs. 3	-1.29	6.54	0.011

in terms of the height variable. Group 3 had higher values for all variables than the other two groups.

This study enabled the separate observation of the effects of SES and heavy work conditions on physical development. The fact that Group 1 and 2, which both came from poor areas of Ankara and shared an almost identical socio-economic structure, had a remarkably lower development level than Group 3 illustrates that urban poverty, as expected, has a high negative effect on physical development.

Studies held in countries with intense child and adolescent labor exploitation show that these individuals live in poor conditions and their growth is considerably retarded, especially in terms of height, an indication of chronic undernourishment^{2-4,11-12}. An extensive study by Duyar and Özener⁶ indicated that adolescent laborers in heavy industry show differences not only in height and weight, but also in extremity growth and muscle and adipose tissue growth and body composition compared to their non-laborer peers^{6,8,10}. In a recent study Özener^{13,14} examined level of body asymmetry of the laborer group. This study revealed that, biomechanical stresses due to physically strenuous working conditions cause an increase in body bilateral asymmetry. The results related to directional asymmetry indicate that work history plays a role, especially among the upper extremities in augmenting the asymmetry; that is, the asymmetry observed among the upper extremities of the laborer group increases correspondingly to the work history (year)¹³. These differences observed in working adolescents could be defined as adaptive reactions of their bodies to the difficulties in physically strenuous work environments.

In this study the observed difference between Group 1 and Group 2 mostly reflects the effect of work conditions on physical development of the working youngsters. In a similar study by Özener et al.¹⁰ conducted with the same age group, the working and non-working groups with

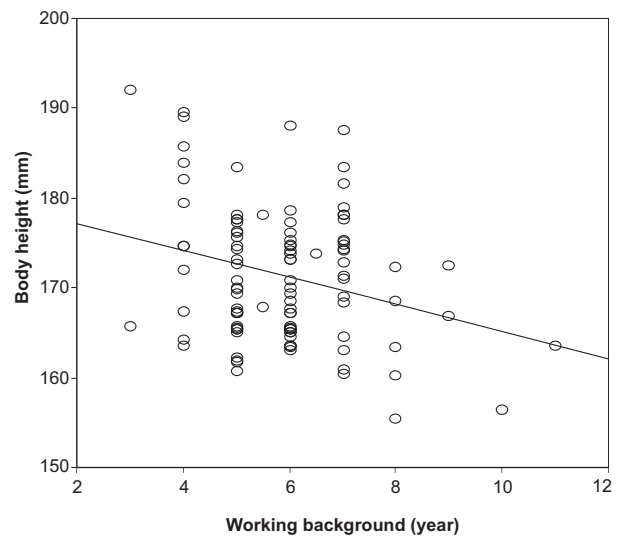


Fig. 1. Relationship between working background (year) and body height (mm).

similar SES do not display any difference in terms of the observed anthropometric variables. Taking into account the relatively light duty work could be the main reason for the kind of pattern observed in that study. In this current study on solely automotive repair workers, the laborer group had lower values than the group with lower SES in terms of height and BMI. This difference was not statistically significant however. It was striking that the laborer group was shorter. Height is a sign of chronic stresses on development structure. It was expected that the height development would be lower for the laborers who worked for more than 10 hours a day, on average for 6 years. Although the cross-sectional data does not allow depicting the mentioned relationship perfectly; there is a significant negative relationship between work history (years) and body height in laborer group ($R^2=0.060$, $p<0.05$, age and SES were controlled). This result could imply that there is a decreasing trend in the mean values of height with the increase in the time spent in work life (Figure 1).

Previous studies have also evinced that the younger the laborers are when they start working, the higher is the retardation in their physical development. A study conducted in Japan determined that those who started working before they were 14 years old were, on average, 4 cm shorter than those who started working after their 18th birthday¹⁵. This current study has particularly demonstrated that heavy work life during adolescence has a negative effect on physical development. In conclusion, the young laborers of automotive repair workshops who completed such a critical period as adolescence under heavy work conditions are more subject to the threat of chronic developmental retardation. It has also been determined that heavy work conditions accompanying negative socio-economic circumstances increase this retardation.

REFERENCES

1. ILO: Every child counts, new global estimates on child labour (International Labour Office, Geneva, 2002). — 2. AMBADEKAR NN, WAHAB SN, ZODPEY SP, KHANDAIT DW, Public Health, 113 (1999) 303. — 3. HAWAMBDEH H, SPENCER N, Arch Dis Child, 84 (2001) 311. — 4. RAY SK, MISHRA R, BISWAS R, KUMAR S, HALDER A, CHATTERJEE T, Indian J Public Health, 43 (1999) 49. — 5. DUYAR İ, ÖZENER B, Am J Phys Anthropol, 128 (2005) 693. — 6. DUYAR İ, ÖZENER B, Çocuk işçiler: çarpık gelişen bedenler [in Turkish] (Ütopya Yayınevi, 2003). — 7. TSI: Çocuk işgücü araştırması [in Turkish] (Turkish Statistical Institute, Ankara, 2006). — 8. DUYAR İ, Coll Antropol, 32 (2008) 403. — 9. FIRAT M, On beş yaş altı çalışan çocuklar ile aynı yaş grubundaki okuyan çocukların sağlık ve sosyal yönden karşılaştırılması [in Turkish] (Unpublished Phd thesis, Marmara University Medical School, Istanbul, 1998). — 10. ÖZENER B, DUYAR İ, ATAMTÜRK D, Coll Antropol, 31 (2007) 949. — 11. RAINA V, BHAN VK, BHAT NA, Br J Ind Med, 47 (1990) 501. — 12. SINGH MB, HALDIYA KR, YADAV SP, LAKSHMINARAYANA L, MATTHUR ML, SACHDEVA R, BENIWALI VK, Indian J Med Res, 103 (1996) 304. — 13. ÖZENER B, Coll Antropol, 31 (2007) 315. — 14. ÖZENER B, Ağır çalışma koşullarının ve sosyoekonomik etmenlerin vücut simetrisi üzerine etkisi [in Turkish] (Unpublished PHd Thesis, Hacettepe University, Institute of Social Sciences, Ankara, 2008). — 15. SHAH PM, Child Abuse & Neglect, 8 (1984) 541.

Barış Özener

*Cumhuriyet University, Faculty of Literature, Department of Anthropology, 58140 Sivas, Turkey
e-mail: barisozener@yahoo.com*

NEGATIVNI UTJECAJ TEŠKOG RADA TIJEKOM ADOLESCENCIJE NA RAZVOJ VISINE U MLADIH MUŠKARACA

SAŽETAK

Cilj studije bio je odrediti stupanj fizičkog razvoja post-adolescenata zaposlenih kao automehaničara koji su obavljali težak fizički posao tijekom adolescencije, kritičnog perioda razvoja. Mladi radnici (Grupa 1, N=106, Prosjek godina=18,33, SD=0,65) radili su u prosjeku 6 godina u radionicama glavnog grada Turske, Ankari. U dvije kontrolne grupe nalazile su se osobe iste dobne skupine ali s različitim socioekonomskim statusom. U prvoj kontrolnoj grupi nalazili su se pojedinci koji su imali jednak socioekonomski status poput radnika iz glavne grupe, ali nisu izvršavali težak fizički posao (Grupa 2, N=106, Prosjek godina=18,33, SD=0,65). Druga kontrolna grupa sastavljena je od pojedinaca višeg socioekonomskog statusa (Grupa 3, N=100, Prosjek godina=18,45, SD=0,63). Težina, visina i mjere izmjerene su svakom pojedincu, te im je izračunat indeks tjelesne mase (kg/m²). Rezultati analize pokazuju da iakosu sve varijable radničke grupe bile niže od Grupe 2, razlika je jedino značajna za varijablu visine (p<0,05). Ovi rezultati otkrivaju da, nakon završetka kritičnog perioda razvoja, poput adolescencije ispunjene teškim fizičkim radom, adolescenti zaposleni kao automehaničari skloni su razvoju kroničnih retardacija.