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Original empirical article

A COMPARISON OF BODY FAT AND BLOOD PRESSURE BETWEEN PHYSICAL EDUCATION AND NON-PHYSICAL EDUCATION MAJOR MALE STUDENTS

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Hamid Arazi, Rastegar Hoseini, Ayoub Behrozi

Department of Exercise Physiology, Faculty of Physical Education and Sport Science, University of Guilan, Rasht, Iran

Abstract. *In the past few decades, a great deal of attention has been focused on the relationships between body weight, physical activity, hypertension, eating habits and behavior. Recently, obesity and hypertension prevalence has increased significantly. The purpose of this study was to compare body fat and blood pressure between male physical education students and non-physical education major male students of the University of Guilan in Iran. The target population consisted entirely of male students of the University of Guilan. Among them, there were 160 male physical education students and 170 non-physical education major male students, with a mean age of 23.1±3.9 and 22.4±1.1 years, height 175.6±4.3 and 169.4±4.2 cm, weight 67.3±2.4 and 78.3±3.26 kg and body mass index 21.9±1.8 and 27.3±5.7 kg/m2 respectively. The SPSW statistical software (version 18) was used to analyze the descriptive statistics (mean and standard deviation), the t–test and the Pearson correlation coefficient. The results show that the waist-hip ratio (WHR), blood pressure (SBP and DBP) and relative fat among non-physical education major students had higher values than physical education students. In addition, there were significant differences between these two groups of students ($p<0.05$). In the study, the results showed that a low level of physical activity enables the prevalence obesity, overweight, and hypertension in non-physical education major students. Therefore, an increase in the physical activity level and improving nutrition education programs for non-athletes could be an effective way of decreasing obesity, overweight and hypertension in non-physical education students.*

Key words: *obesity, physical education, non-physical education major, hypertension.*

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Corresponding author: Hamid Arazi
Department of Exercise Physiology, Faculty of Physical Education and Sport Science, University of Guilan, Rasht, Iran, P.O. Box: 41635-1438
Tel: + 98 131 6690161 • E-mail: hamidarazi@yahoo.com
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INTRODUCTION

During the past few decades a great deal of attention has been focused on the relationships between body fat, hypertension and physical activity. Excessive body fat and hypertension are an important public health challenge in both economically developing and developed countries (Kearney, Whelton, Reynolds, Whelton, and He, 2004). The control of hypertension varies in different studies from different countries, 41.3% in Germany (Laaser, and Breckenkamp, 2006), 32.8% in Greece (Efstratopoulos, Voyaki, and Baltas, 2006), 11.2% in Portuguese adults (Macedo, Lima, Silva, Alcantara, Ramalhinho, and Carmona, 2005), and 8.1% in Turkey (Altun, Arici, and Nergizoglu, 2005). Many studies have reported a significant relationship between hypertension and risk factors such as age, body mass index, smoking and physical inactivity (Booth, Gordon, Carlson, and Hamilton, 2000). Physical activity has important health benefits for children and young adolescents, and is also associated with more favorable biological cardiovascular disease risk-factor profiles in children and adolescents, such as lower blood pressure, more favorable serum lipid and lipoprotein levels, and decreased adiposity than less active or fit children, enhancing their abilities to perform daily tasks (Hennessy, Hughes, Goldberg, Hyatt, and Economos, 2010). In addition, studies show that more physically active and fit children have lower blood pressure than less active or fit children (Laaser, and Breckenkamp, 2006; Efstratopoulos, Voyaki, and Baltas, 2006). There is good evidence that regular physical activity reduces the risk of cardiovascular diseases (Booth, Gordon, Carlson, and Hamilton, 2000; Hennessy, Hughes, Goldberg, Hyatt, and Economos, 2010, Dubbert, Carithers, Sumner, Barbour, Clark, Hall, and Crook, 2002). Part of this effect is thought to be mediated through reduced blood pressure (BP), improved lipid metabolism, and decreased body weight (Altun, Arici, and Nergizoglu, 2005). A cross-sectional study has indicated that physical activity or aerobic exercise is inversely associated with BP; the evidence of such an association from prospective studies is still scant (Hu, and Tian, 2001; Hu, Qiao, Silventoinen, Eriksson, Jousilahti, Lindstrom, Valle, Nissinen, and Tuomilehto, 2003). Low fitness levels are widespread and associated with increased risk of high BP in middle-aged men and women (Paffenbarger, Wing, Hyde, and Jung, 1983; Blair, Goodyear, Gibbons, and Cooper, 1984). In his comprehensive review, Malina (1980) reports that the absolute amount of total body fat generally increases with age during childhood but manifests itself as a reduced rate of accumulation during adolescence, especially in males (Malina, 1980). Body fat serves three important functions in the human body. It serves as an insulator for conserving body heat; as the source of metabolic fuel energy; and as padding for protection (Andersen, 1996). But excessive body fat leads to obesity and CHD and also hinders performance in many physical activities, thereby lowering one's physical fitness level (Malina, 1980; Andersen, 1996). It has also been observed that an elevated BP is associated with a markedly increased risk for numerous cardiovascular pathologies such as CHD, intermittent claudication, congestive failure and stroke (Efstratopoulos, Voyaki, and Baltas, 2006; Paffenbarger, Wing, Hyde, and Jung, 1983; Blair, Goodyear, Gibbons, and Cooper, 1984). Furthermore, fitness levels are known to correlate with BP in Adolescents and young adults (Malina, 1980; Hagberg, Park, and Brown, 2000; Whelton, Chin, Xin, and He, 2002). Many previous studies have investigated the prevalence of specific CHD risk in selected populations in both developing and developed countries. However, there is relatively little information on the prevalence of specific CHD and excessive body fat risk factors among college students.

For this reason, the purpose of this study was to compare body fat and blood pressure between male physical education students and non-physical education major male students of the University of Guilan in Iran.

THE METHOD

The target population consisted entirely of male students of the University of Guilan in Iran. Among them, 160 male physical education (PE) students and 170 male non-physical education major students (NPE) were randomly selected. The condition of the study was thoroughly explained to all the participants, and written informed consent was subsequently obtained. The study protocol was approved by the Ethics Committee of the University of Guilan. The measurements taken included height, weight, Waist to Hip Ratio (WHR), blood pressure (BP), Thigh, Abdominal and Pectoral (chest) skinfold thickness. The skinfold thickness was measured on the right side of the body with Lange skinfold calipers (Danladi, Badamasi, and Mohamed, 2002). The percent body fat (relative body fat) was estimated using the formula devised by Jackson and Pollock (1978). The BMI was calculated as Weigh/height (kg/m^2). The BMI was used since it is generally used in epidemiological studies as a representative measure of body composition. Based on the BMI, the status of being underweight was determined at a value of 20 or less, normal weight at a value between 20.1 and 25.0, being overweight at a value between 25.1 and 30.0 and obesity at 30.1 and more (Azadbakht, Mirmiran, Shiva, and Azizi, 2005). Central obesity was determined as a WHR of >or 0.86 cm for males in order to determine the association between general and central obesity (Jackson, and Pollock, 1978; Azadbakht, Mirmiran, Shiva, Azizi, 2005). Resting BP was determined by auscultation in the right arm by the same investigator after a 10-minute resting period, using a mercurial and accoson stethoscope. Measurement took place each day between 8.00 a.m. and 10.00 a.m. in accordance with the protocol of the American Heart Association (Kir, Barton, and Epstein, 2009). The cuff was applied evenly and snugly about the bare arm with the lower edge at 2.5 cm above the antecubital fossa. The cuff was inflated rapidly and deflated slowly. The onset of the first tapping sound was taken to indicate systolic blood pressure (SBP), as recommended (Kir, Barton, and Epstein, 2009). The point of complete disappearance of the sound (the 5th diastolic phase) was taken to indicate diastolic blood pressure (DBP). For each participant, two measurements were taken and the average of the two readings was recorded.

Statistical analysis

SPSW statistical software (version 18) was used for the data analysis. Both descriptive (mean and standard deviation) and inferential statistics were used to analyze the data. The t-test was computed to test for any significant differences in body fat, BMI, WHR, BP measurement of the PE students and NPE students. Furthermore, the Pearson correlation coefficient was used for the relationship between BP and the used anthropometric measurements.

RESULTS

The anthropometric data of the participants are presented in table 1.

Obesity and being overweight were assessed in terms of the BMI. The PE students that fell within the normal weight range, but the NPE students were overweight (table 2).

Table 1. Mean and standard deviation of age, height, weight and BMI.

	PE males	NPE males
Age (yrs)	23.1 ± 3.9	22.4 ± 1.1
Height(cm)	175.6 ± 4.3	169.4 ± 4.2
Weight (kg)	67.3 ± 2.4	78.3 ± 3.26
BMI (kg/m^2)	21.9 ± 2.1	27.3 ± 5.7

Table 2. Statistical analysis of the characteristics of PE and NPE males.

	PE males (n=140)	NPE males (n=160)	P value
Relative fat (%)	14.1± 1.1	21.1±3.3	0.04*
WHR (cm)	75.5±3.1	88.1±3	0.01*
SBP(mmHg)	117.3±7	126.3±14	0.05*
DBP(mmHg)	76.1±4	86.1±6	0.04*

Significant difference between two groups at p<0.05*

The results show that NPE students scored higher values for WHR, BP (SBP and DBP) and relative fat than PE males. Also, there were significant differences among the PE and NPE males ($p < 0.05$) (table 2). Since obesity and body weight have been identified as important factors in elevated blood pressure in many populations, their effects were examined (19, 20). The effect of percent of body fat on blood pressure was also examined. The relationship between the independent variables and both SBP and DBP (dependent variables) are summarized in table 3.

Table 3. The relationship between BP measurement and anthropometric indices.

Group	SBP		DBP	
	PE males (n=160)	NPE males (n=170)	PE males (n=160)	NPE males (n=170)
Weight (kg)	0.30	0.52**	0.23	0.50*
Relative fat (%)	0.15	0.39*	0.14	0.35*
BMI (kg/m^2)	0.22	0.37**	0.20	0.43**

Significant at p<0.05*
Significant at p<0.01**

All of the independent variables correlate with both SBP and DBP (at a statistically significant level of p<0.05).

DISCUSSION

The aim of the present study was to compare body fat and blood pressure between PE and non-PE major male students at the University of Guilan in Iran. The results show that among NPE major students, higher values were determined for both SBP and DBP than for the PE males. In the current study, BMI and fitness were both independently associated with the risk of hypertension. The BP, weight and BMI data determined in this study show that NPE major males scored significantly higher values than the PE males. Among NPE majors, a strong interaction between fitness and BMI was found, and thus the connection between BMI levels and the risk of hypertension were substantially higher. The WHR, BP (SBP and DBP) and relative fat indicated a significant difference among PE and NPE major males ($p < 0.05$), with NPE males scoring higher than PE males (table 2). Based on previous studies, it was hypothesized that the relationship between fitness and BP was not linear (Azadbakht, Mirmiran, Shiva, and Azizi, 2005; Kir, Barton, Epstein, 2009). The relevant literature demonstrates the benefits of physical exercise (aerobic activity) (Whelton, Chin, Xin, and He, 2002) or strength-training activity (Kelley, and Kelley, 2000), on BP. Physical activity is considered as one of the more important components in the non-pharmacological treatment of hypertension (Lopes, Barreto-Filho, and Riccio, 2003). Stallones, Mueller, and Christensen (1982) found that the weight-to-BP relation was due to the components of body weight other than body fat. But, Shear, Freedman, Burke GL, Harsha, and Berenson (1987) found a positive correlation between BP and body fat among adolescents. Hagberg, Park, and Brown (2000), in their review of 15 studies, supported the recommendation that exercise training is an important initial or adjunctive step that is highly efficient in the treatment of individuals with mild to moderate elevations in BP. Bacon, Sherwood, Hinderliter, and Blumenthal (2004) reported that diet and exercise, alone or combined, were effective in reducing the BP in subjects with mild hypertension, with improvements similar to those occurring as a result of drug therapy in patients with a higher baseline BP level. Dickinson, Mason, and Nicolson (2006) in their systematic review of randomized controlled trials observed blood pressure reductions following weight loss, dietary modification, and increased physical activity. A study among Japanese-Americans in Hawaii emphasized the health benefits of leisure-time physical activity, control of body weight, and reeducation in salt intake in a population-based control of high BP (Liu, Kanda, and Sagara, 2001). Arazi and Hoseini, (2011) found that the waist - hip ratio (WHR), BP (SBP and DBP) and relative fat showed signs of significant differences among physical education major female and non-physical education major female students ($p < 0.05$), with non-physical education major female students scoring higher than the physical education major female students (Arazi and Hoseini, 2011). Vianna et al., (2012), reported that a 4-month program of guided physical activity consisting of three moderate-intensity exercise sessions per week (each of 60 min duration) did not result in changes in BMI or BP of older participants. In another study, after 4 months of walking three times a week at an intensity level of between 55% and 75% of the maximum heart rate, women with hypertension showed improvements in cardio-respiratory fitness as evidenced by a mean of 70.58 m in the final distance walked in the 6-min test (Cunha, Ferreira, Bezerra, Guerra, and Dantas, 2010). Physical activity is considered a natural, inexpensive, feasible, and effective means of control of hypertensions and is a primary lifestyle measure required to lower BP in NPE major male students. Insulin is a hormone with many functions, and the fasting serum level of insulin is

increased in participants with a low fitness level as well as in subject with a high BMI. In addition to its effect on glucose transportation, insulin has an anabolic effect on fat storage in the fat cells (Ferrannini, 1999; Dela 1996). Insulin affects appetite regulation through the change in substrates in the blood, and Ferranini (1999) has suggested an effect on BP regulation (Ferrannini, 1999). It is known that insulin sensitivity increases with aerobic training and the effect is local in the trained muscle. In a one-leg training model, Dela (1996) showed an increase in insulin sensitivity in the trained leg, but no change in the untrained leg. Insulin sensitivity may therefore be one of the key mechanisms behind the correlation found between BP, BMI, and fitness. The results of the current study also indicate the significant positive correlation between weight and BP variables on the one hand and between the BMI and BP variables on the other (Balogun et al., 1990). The coefficient of 0.51 between body weight and SBP and 0.41 between body weight and DBP reported by Balogun et al., (1990) has values similar to those found in the current study.

CONCLUSIONS

Based on these finding, we wish to recommend that as part of preventive measures, secondary college NPE major male students in Iran should be provided with the opportunity to engage in regular and appropriate exercise programmed in order to keep their weight and high BP within normal levels. Furthermore, there is a need for appropriate health education, emphasizing the importance of cardiovascular health at this level of education.

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POREĐENJE PROCENATA TELESNE MASTI I KRVNOG PRITISKA IZMEĐU STUDENATA SPORTA I FIZIČKE KULTURE I STUDENATA DRUGIH OBLASTI

Hamid Arazi, Rastegar Hoseini, Ayoub Behrozi

Tokom proteklih nekoliko decenija, dosta je pažnje posvećeno odnosu između telesne težine, fizičke aktivnosti, hipertenzije, navika u ishrani i oblika ponašanja. U skorije vreme, učestalost gojaznosti i hipertenzije je značajno porasla. Cilj ovog istraživanja bio je da se uporedi procenat masnih naslaga i krvnog pritiska između studenata sporta i fizičke kulture i studenata drugih oblasti na Univerzitetu Guilan u Iranu. Ciljna populacija sastojala se isključivo od muških studenata na Univerzitetu Guilan. Među njima, bilo je 160 studenata fizičke kulture i 170 studenata drugih oblasti, sa prosečnom starošću od 23.1±3.9 i 22.4±1.1 god, visinom 175.6±4.3 i 169.4±4.2 cm, težinom 67.3±2.4 i 78.3±3.26 kg i indeksom telesne mase 21.9±1.8 and 27.3±5.7 kg/m2 tim redosledom. SPSW program za obradu statističkih podataka (verzija 18) je korišćen da bi se analizirali faktori deskriptivne statistike (srednja vrednost i standardna devijacija), kao i t–test i Pirsonov koeficijent korelacije. Rezultati pokazuju da su odnos struk-kukovi (WHR), krvni pritisak (SBP i DBP) i relativne količine masnog tkiva među studentima drugih oblasti imali veće vrednosti od onih zabeleženih kod studenata fizičke kulture. Pored toga, došlo je do značajnih razlika između ove dve grupe studenata ($p<0.05$). U ovom istraživanju, rezultati su pokazali da nizak nivo fizičkih aktivnosti dovodi do veće učestalosti gojaznosti, prekomerne težine i hipertenzije kod studenata drugih oblasti. Samim tim, povećanje u nivou fizičke aktivnosti i poboljšanje programa posvećenih zdravoj ishrani za studente koji ne studiraju sport i fizičku kulturu bi mogao biti efikasan način za smanjenje gojaznosti, prekomerne težine i hipertenzije kod studenata koji studiraju fizičku kulturu.

Ključne reči: *gojaznost, fizička kultura, studenti koji ne studiraju sport i fizičku kulturu, hipertenzija.*