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Health-related anthropometric measures in connection with physical fitness factors

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Abstract: The research goal was to investigate correlation between health-related anthropometric measures, and physical and motor fitness. Queen's College Step Test, Sit-ups Test, Sit & Reach Test and Vertical Jump Test were used to determinate respectively aerobic fitness level, abdominal muscle endurance, flexibility and muscle explosive strength. Finally, the correlation of health-related anthropometric measures, and physical and motor fitness factors was examined. The findings showed that there was a negative significant correlation between BMI and aerobic fitness, abdominal muscle endurance, muscle explosive strength but there was not any significant association between PBF and flexibility. The correlation between PBF and aerobic fitness, abdominal muscle endurance, flexibility, muscle explosive strength was significant and negative. The correlation between WC and aerobic fitness, abdominal muscle endurance, flexibility, muscle explosive strength was inverse and significant. There was not a significant correlation between WHR and aerobic fitness, abdominal muscle endurance, flexibility, muscle explosive strength. There was a negative significant correlation between WSR and aerobic fitness, abdominal muscle endurance, muscle explosive strength but any correlation between WSR and flexibility was not observed. Finally, considering the general goal of the research, it is concluded that there is a negative significant correlation between most health-related anthropometric measures, physical and motor fitness factors. Then we can use these measures to predict function in physical and motor tests.

Keywords: Body Mass Index, Percent of Body Fat, Waist Circumference, Waist to Hip Ratio, Waist to stature Ratio, Physical Fitness Factors

1. Introduction

Anthropometry is a method to measure different parts of body which is presented in a branch of science called as “anthropology”. This term has first been used in the sense of “human natural history” in 1795. Anthropology is derived from “speech” and “human”. Anthropometry attempts to measure carefully and validly human physical characteristics and thereby to designate the functional limitations and advantages due to them. The sport scientists have tried to encourage more and more the application of anthropometric methods through exhaustive research which has conducted in this field so that nowadays, anthropometry in physical education studies have been widely used.

Physical fitness as some aspects of desired life has a closed relationship to physical health, but it has a concept more comprehensive than physical aspects so that, without health, one can not at all gain full physical fitness. The relationship between physical fitness, health and performance expresses by depicting some concepts such as not having any disease, ability to do ideally one's tasks, and skillful completion in special activities. Therefore, the benefits of the interaction between health-related physical and motor fitness programs and health indices are an objective goal of physical education for all the society, particularly the students.

To reach this goal, all university students of Iran need to pass two course of Public Physical Education (PPE) in order to gain physical and motor fitness. What is very important is how to present the courses to

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preserve their health and fitness. It is unknown if the health- related anthropometric measures have any strong relationship with physical and motor fitness factors by which the trainers can reach the objective goal.

Health-related anthropometric measures in this study include Body Mass Index (BMI), Percent of Body Fat (PBF), Waist Circumference (WC), Waist to Hip Ratio (WHR), and Waist to stature Ratio (WSR) and Physical Fitness Factors (PFF) include aerobic fitness, abdominal Muscles endurance, flexibility, and feet muscles explosive strength.

The literature carried out in this area showed that there was a negative significant correlation between BMI and aerobic fitness (r=-0.55) (Chen et al., 2002). There was a negative significant correlation between BMI and results of physical fitness (Chen et al., 2002). A negative significant correlation was observed between percent of body fat and aerobic fitness (Nikbakht, 1991; Hoseini, 1998). The correlation between percent of body fat and abdominal muscle endurance was negative and significant (Afarinesh, 1991). There was a negative significant correlation between percent of body fat and flexibility (Karimi, 1999). The relationship between waist circumference and physical fitness was negative (Delaux et al., 1999). There was a negative significant correlation between weight and aerobic fitness (Nikbakht, 1991; Hosseini, 1998). There was a correlation between weight and sit and reach (Afarinesh, 1991).

The study is designed to find an answer to the above question and to present some propositions to the trainer of the courses how to present them to gain the best results.

2. Hypothesis

- There is a significant correlation between BMI and aerobic fitness.
- There is a significant correlation between BMI and abdominal muscle endurance.
- There is a significant correlation between BMI and flexibility.
- There is a significant correlation between BMI and feet muscles explosive strength.
- There is a significant correlation between PBF and aerobic fitness.
- There is a significant correlation between PBF and abdominal muscle endurance.
- There is a significant correlation between PBF and flexibility.
- There is a significant correlation between PBF and feet muscles explosive strength.
- There is a significant correlation between WC and aerobic fitness.
- There is a significant correlation between WC and abdominal muscle endurance.
- There is a significant correlation between WC and flexibility.
- There is a significant correlation between WC and feet muscles explosive strength.
- There is a significant correlation between WHR and aerobic fitness.
- There is a significant correlation between WHR and abdominal muscle endurance.
- There is a significant correlation between WHR and flexibility.
- There is a significant correlation between WHR and feet muscles explosive strength.
- There is a significant correlation between WSR and aerobic fitness.
- There is a significant correlation between WSR and abdominal muscle endurance.
- There is a significant correlation between WSR and flexibility.
- There is a significant correlation between WSR and feet muscles explosive strength.

3. Methods

The statistical population included about 1900 female students of Mashhad universities who had selected the PPE (1) course. The randomly stratified sampling method was used to choose the 160 female out of 97 PPE (1) courses from the Ferdowsi and Islamic Azad universities of Mashhad. The research variables were: 1) Health-related anthropometric measures (such as BMI, BF%, WC, WHR, WSR); 2) Physical and motor Fitness factors (such as Aerobic fitness, Abdominal muscle endurance, flexibility and feet muscles explosive strength). The tools used in the study included Queen's College Step, Chronometer, Metronome, flexibility Box, wall or scaled board in centimeter units, gymnastic mat, stadiometer, tab meter, scale, caliper. The subjects were tested in subsequent turns and in three separate sessions of the course. First, a demographic form was accomplished by each subject and then, they were taken the needed anthropometric measures. At

the end physical and motor fitness tests were carried out. After registering anthropometric measures, body composition and students' performance measures, the data were analyzed using SPSS package. The descriptive (such as median, mean, SD, percentiles) and inferential (correlation ratio test) statistical methods was used to analyze the data.

4. Results

To test the relationship of many factors, we conducted a correlation test between some health-related anthropometric measures and physical fitness factors (PFF). The findings showed that there was a negative significance correlation between BMI and some PFF such as aerobic faintness (p=0.001; r=-0.274), abdominal muscles endurance (p=0.01; r=-0.203), feet muscles explosive strength (p=0.005; -0.222); but the correlation between BMI and flexibility (p=0.1; r=-0.131) was not significant. A negative significant correlation was observed between the Percent of Body Fat (PBF) and some PFF such as aerobic fitness (p=0.001; r=-0.268), abdominal muscles endurance (p=0.006; r=-0.217), flexibility p=0.025; r=-0.178), feet muscles explosive strength (p=0.001; r=-0.286). The correlation between WC and aerobic fitness (p=0.004; r=-0.226), abdominal muscles endurance (p=0.007; r=-0.213), flexibility (p=0.018; r=0.187), feet muscles explosive strength (p=0.012; r=0.199) was negative and significant. There was not any significant correlation between WHR and aerobic fitness (p=0.586; r=-0.043), abdominal muscles endurance (p=0.163; r=-0.111), flexibility (p=0.163; r=-0.148), feet muscles explosive strength (p=0.242; r=-0.093). The correlation between WSR and aerobic fitness (p=0.01; r=-0.203), abdominal muscles endurance (p=0.005; r=-0.219), feet muscles explosive strength (p=0.001; r=-0.268) was negative and significant, but any significant correlation was not observed between WSR and flexibility (p=0.149; r=-0.115).

5. Discussion and Conclusion

It seems all PFF, except flexibility, are in correlation with BMI so that any increase in some PFF would lead to some decrease in BMI. Also, it seems PBF as one of health index, may be considered as a predictive factor of physical fitness status in males and females, that is, if the PBF of males and females decreased, their physical fitness would increase and vice versa. There appeared a negative correlation between WC and health-related factors in any age, but the correlation ratio may decrease or increase due to different ages. The hip circumference does not appear to be an effective factor in predicting the female students' PFF. Perhaps, this is because the females' hips are bigger than those of males. WSR, as a health index, appears to be an important predictor of the females' physical fitness status. In general, PBF and WC had a negative significant with aerobic fitness, abdominal muscles endurance, flexibility, and feet muscles explosive strength. These two indices, to this point, account for proper predictors to physical and motor fitness. BMI and WSR had a negative significant correlation with aerobic fitness, abdominal muscles endurance, feet muscles explosive strength, and had not any significant difference with flexibility. So, these two indices are placed after the two other ones, PBF and WC.

Regarding the general goal of the study, that is, examination of anthropometric measures focusing on health indices and female students' physical fitness factors of Mashhad universities, we concluded that there was a negative significant between most of health-related anthropometric measures and physical fitness factors. Thus, one can use these measures as a criterion to predict performance in physical and motor fitness tests.

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