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ANTHROPOMETRY, SOMATOTYPES AND CARDIORESPIRATORY FITNESS OF BRAZILIAN MILITARY

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ABSTRACT

The aim of the study was to evaluate the anthropometric, somatotypes and cardio respiratory fitness characteristics of Brazilian military. One hundred and ten healthy male soldiers of the Brazilian army, aged between 18 and 26 (mean 19) years took part in the research. They belonged to a Combat Engineering Battalion located in Midwest region, Brazil. It was shown that there was a noticeable presence of obese individuals in the group, seemingly leading to the impairment of their cardio respiratory fitness. Thus a rigorous body weight control is strongly recommended.

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INTRODUCTION

The performance of army tasks requires a good physical condition to be executed, so the anthropometric characteristics, somatotypes and cardio respiratory capacity of these individuals can be considered as determining factors for the development of their activities. (Silva et al., 2012; Araújo et al., 2017). Therefore, the evaluation of these variables throughout the military career can guarantee the maximization of operational efficiency (Ferreira et al., 2003). Anthropometric parameters include measurements of human body sizes and proportions (Wang et al., 2000), while the somatotype is the description of the morphological conformation of the organism, given by a set of three scores ranging from 1 to 7.

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The first is referred to endomorphy (body adiposity), the second to mesomorphy (muscle development) and the latter to ectomorphy (linearity / thinness) (Carter and Heath, 1990). At the same time, cardiorespiratory capacity or physical fitness is a physiological component related to the performance and health status of the individuals (Tanasescu et al., 2000; Lee et al., 2010). The main technique to evaluate the latter parameter is measuring maximum oxygen consumption-VO₂ max. (Bouchard et al., 1994; Duncan et al., 2005). The aim of this study was to evaluate the anthropometric, somatotypic and cardio respiratory fitness characteristics of Brazilian military in order to fill the gap existing in the literature on this topic.

MATERIALS AND METHODS

This is a cross-sectional observational analytic study with a quantitative approach. It was approved by the Ethics Committee on Human Research of the Federal University of Mato Grosso do Sul (CAAE: 61369316.6.0000.0021). Written informed consent was obtained from all participants.

They were also advised of their right to withdraw from the investigation at any time. One hundred and ten healthy male soldiers of the Brazilian army, at the age between 18 and 26 years took part in the research. They belonged to a Combat Engineering Battalion located in Midwest region, Brazil. The research was carried out during September 2016, when daily outdoor temperatures range from 20 to 35°C, with an average of 26°C, according to local weather bureau communication. The anthropometric data were collected as described by Petroski (2011), the somatotype was obtained by the Heath and Carter model according to Pitanga (2007), while the cardiorespiratory fitness was evaluated by the 12-minute run test as proposed by Marins and Giannichi (2003). As for statistical analysis, means, standard deviation (SD), minimum and maximum values were calculated. The analyses was carried out after confirming the parametric character of the data obtained by Shapiro-Wilks's test. The value p adopted for the calculations was ≤ 0.05 . Data were processed using BioEstat 5.0 software

RESULTS AND DISCUSSION

The group studied was formed by young adults, according to the qualifications required in the compulsory military service of the Brazilian army. The soldiers mean age was 19 ± 0.09 years ranging from 18 to 26 years. The average anthropometric measurements (mean \pm SD, min and max) have rendered the following results: height 1.73 ± 0.06 (1.60 – 1.93) m; weight 71.56 ± 0.99 (51 – 109.6) kg; body mass index (BMI) 23.71 ± 0.29 (17.3 – 33.8) kg/m^2 ; and fat percentage 12.13 ± 0.53 (2.5 – 26.6) %. Such amplitude in physical data may result in insufficient physical performance, also impairing the health of a significant portion of individuals whose upper limits of BMI would attain obesity levels (Hales et al., 2017). In any case Brazilian soldiers showed the BMI lower than those from the Lithuania and the United States, with 24.6 e 25.2 kg/m^2 , respectively (Dregval and Vaicaitiene, 2006; Rexrode, 1998). The percentage of fat of the military evaluated in the present study also had maximum levels approximating to the upper limit of the data as a result, the somatotype of the group studied (Figure 1) was defined as endomesomorphic with mean somatotype of 3.8 - 3.1 - 2.2. Undoubtedly, this suggests a net predominance of the adipose component over the muscle.

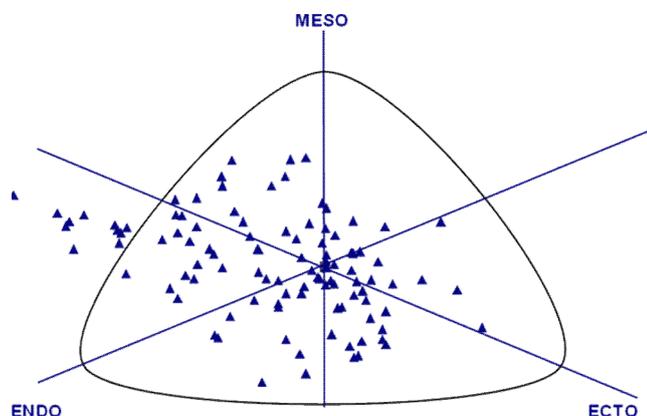


Figure 1. Somatotype distribution of the participants evaluated (n=110)

This result is similar to the data obtained for soldiers from other battalions of the Brazilian army (Di Gesu, 2002; Sampaio and Fernandes Filho, 2002), however, in contrast to other Brazilian fonts (Santos and Fernandes Filho, 2004; Santos and Fernandes Filho, 2007; Silveira et al., 2010).

In our opinion, these inconsistencies are due to the lack of rigorous standardization in the initial evaluation of the participants and their physical checkup. Thus, it is evident the need for greater control of the body weight of the soldiers in relation to the morphological conformation of the organism. The cardio respiratory fitness of the soldiers evaluated had an average of $\text{VO}_2 \text{ max. } 45.95 \pm 0.72 \text{ mL(Kg.min)}$. This is below the average found for a larger contingent of the Brazilian army, where more than 50.000 soldiers were evaluated, showing an average value of $\text{VO}_2 \text{ max. } 52.9 \pm 6.2 \text{ mL(Kg.min)}$ (Oliveira and Anjos, 2008). These data should draw the attention of military authorities and physicians because of an inverse correlation of cardio respiratory fitness with the amount of body fat (Ross and Katzmarzyk, 2003; Janssen et al., 2004; Oliveira and Anjos, 2008). In our study, the lowest limit of this parameter was 34.30 mL (Kg.min), indicating a poorer cardio respiratory condition of the participants.

Conclusion

The mean values of the analyzed variables were considered adequate, however there was a large variation in the components related to the amount of body fat of the soldiers. The upper limits of BMI and percentage of fat confirmed the presence of obesity in the individuals of the group. This may be the reason for further impaired cardio respiratory fitness. Thus the detailed somatotypic distribution is to be taken into account by military authorities and medical officers.

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