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WORK ABILITY INDEX FOR MILITARY FIREFIGHTERS

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ABSTRACT

Ability to work is a state of readiness that an individual presents in relation to their occupational requirements, their health conditions, physical and mental characteristics. The profession of military firefighter faces high demand of physical and mental commitment during activities. This article aims to estimate the Work Ability Index (WAI) of military firefighters and verify the factors that interfere in this index. This is a sectional study, with quantitative approach and based on primary data from a stratified sample of 192 firefighters. Association of WAI and independent variables was calculated through univariate analysis and adjusted logistic regression. WAI is categorized in Low, Moderate, Good and Great. Firefighters obtained results of respectively 25.5%, 38.0%, 32.8% and 3.7%, reaching an average score as Good. However, it is important to note that Low/Moderate score occurred in larger scale when compared to other studies with military workers. Age was the factor that most significantly interfered with the index. It is possible to conclude that there are professional firefighters who already have a decreased work capacity and that aging affects WAI directly. Thus, the military corporation should implement actions for recovery and maintenance of good health conditions among firefighters.

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INTRODUCTION

The military firefighters, in their daily work, present extreme emotions, from happiness for saving a life to the suffering of a death (OCAMPOS *et al.*, 2017). Work is an activity and has a respectable role in the life of people, because besides being a source of its sustenance, it is where they feel useful, productive and valued. However, when performed under inappropriate conditions, it can cause multiple health hazards (MACIEL, FERNANDES, MEDEIROS, 2006). Knowledge of the relations between work and sickness is part of the life and culture of humanity (SANTANA, 2006). In Brazil, collective and environmental health were incorporated into workers' health only in the 1990s, considering that it is a field of practices and knowledge in which the theoretical/methodological approach seeks to understand and intervene

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in work relations and in the health process (LACAZ, 2007). Motivation and satisfaction of employees in relation to their working conditions are some aspects that permeate productivity and performance at work. Thus, understanding the working conditions is important to avoid functional aging and, therefore, the decrease of the work ability (GASPARY; SELAU; AMARAL, 2008). Work ability refers to the individual's capacity to perform their functions related to occupational requirements, their state of health and physical and mental characteristics. This concept represents a measure of functional aging, and health is considered one of the main determinants of this capacity (BELLUSCI, 1999). This is also understood as the basis of well-being for all workers, however, it is not satisfactory if there is no attention to health care through their lifestyle and work environment (GASPARY, SELAU, AMARAL, 2008). Ilmarinen (2006) defines this capacity as being the relation between human resources and the physical, mental, social, community, management and administration demands, organizational culture and work

environment. The maintenance of this capacity has positive consequences in determining health, well-being and employability of workers, with benefits for organizations and for society, due to its impacts on productivity, absenteeism and the social costs arising from disability pensions and disease care (MARTINEZ, LATORRE, FISCHER, 2010). Health promotion and prevention of occupational diseases are fundamental aspects in this maintenance and can generate profound economic impact by providing favorable working conditions and reducing disability and early retirement. Work ability can be influenced by several factors, such as the conditions under which work is performed, work-related accidents and general situation of the worker's life (BELLUSCI, 1999). The human body is deeply influenced by the natural process of aging, but this process can be altered by straining throughout the productive life. Those changes are often related to excessive work, heavy workloads and work that demands more attention (GASPARY, SELAU, AMARAL, 2008).

The work carried out by the military firefighters generates health risk. Their work is wearing, since, in order to perform activities with excellence, the military firefighters institution adopts rigorous organizational models that can, as a consequence, affect the health conditions of the professionals in service, mainly due to the overload demanded by long working hours and sometimes lacked teams (CARDOSO, 2004; CREMASCO, CONSTANTINIDIS, SILVA, 2008). This profession causes health burnout, because work is performed under pressure and without taking precipitate actions (CARDOSO, 2004; CREMASCO, CONSTANTINIDIS, SILVA, 2008). The overload resulting from the dynamic joint between elements of the work process and the worker's body is presented as a cause of damage to health (NEVES, 2004). Firefighters' performance requires an excellent physical and mental condition. As a result, the profession can be strongly influenced by age and presence of diseases (MARTIN *et al.*, 2013). They are professionals who take responsibility for responding to stressful situations and the work environment can represent risk to their health (VARA, QUEIRÓS, 2009). The word "firefighter" is most often associated with heroism and salvation in the social imagery. Their tasks are linked to rescue in land and aquatic accidents, firefighting and rescue, first aid, searches, animal capture, tree cutting, fire surveys, preventive lectures and even emergency deliveries (MONTEIRO *et al.*, 2007).

According to a study from Brazilian Institute of Public Opinion and Statistics - IBOPE, the Fire Brigade is made up of professionals considered the most reliable among the people of São Paulo and also ranked first in Brazilian Social Confidence Index (IBOPE, 2013a, IBOPE, 2013b). In an international study, the results of a three year consecutive survey by the company Growth for Knowledge showed that firefighters are considered the most reliable professionals by 94% of the population in the world and by 97% in Brazil (IBOPE, 2013b). The present study aims at determining the work capacity rate of firefighters in the capital of the State of Mato Grosso do Sul, in order to evaluate and analyze whether this labor capability is influenced by sociodemographic, labor and health aspects. The results contribute for data information and health maintenance of these workers. Therefore, the goal of this study is to estimate the Work Ability Index (WAI) of military firefighters and to examine the factors that interfere in this index.

MATERIALS AND METHODS

This paper presents a sectional study, with quantitative approach, based on primary data. The survey was carried out with a sample of professional firefighters from the operational and management service, extracted from all Fire Brigade Groups belonging to the city of Campo Grande, Mato Grosso do Sul, between March and June of 2014. The sample of 192 professionals was calculated estimating proportions from the finite population of 380 military firefighters, using the 95% confidence interval, 5% margin of error and an expected proportion of 50% (AGRANONIK, HIRAKATA, 2011). Inclusion criteria were professional military firefighters active in the corporation, with a minimum of two years of service, with the authorization of superiors and without any hierarchical military restrictions on participating in the research. Exclusion criteria were professionals who were absent during the period of data collection, on vacation or medical leave. In order to evaluate the independent variables, we used a form with social, demographic, labor and health aspects. The resulting data were categorized in a dichotomized manner in age, sex, job position, time of service, work function, health aspects - as weight and height to calculate the Body Mass Index (BMI) and blood pressure (BP) with its proper classification, using the recommended standards and parameters (ASSOCIAÇÃO BRASILEIRA PARA O ESTUDO DA OBESIDADE E DA SÍNDROME METABÓLICA, 2009; SOCIEDADE BRASILEIRA DE HIPERTENSÃO, 2010).

Age groups were categorized in ages from 20 to 30, 31 to 40, 41 to 50, 51 to 60, ≥ 61 years of age. Job positions were divided into: soldier, corporal, sergeant, lieutenant, captain, major, lieutenant colonel and colonel. In the classification of sergeant, its three classes (1st, 2nd and 3rd sergeant) were considered. Time of service was categorized in years in the corporation: 3 to 8, 9 to 14, 15 to 20, 21 to 25, more than 25 years. Work function was divided into administrative and operational, considering administrative service represents only the day shift, while operational service covers both daytime and nighttime shifts. Regarding health aspects, weight was registered by using a digital home scale, height was self-reported and BP was measured with analogical sphygmomanometer and stethoscope. BMI was classified as: <17 (very underweight), 17 to 18.4 (underweight), 18.5 to 24.9 (normal weight), 25 to 29.9 (overweight), 30 to 34.9 (obesity I), 35 to 39.9 (obesity II), above 40 (obesity III) (BRAZILIAN ASSOCIATION FOR THE STUDY OF OBESITY AND METABOLIC SYNDROME, 2009). As there were no very underweight or underweight participants, the following dichotomization was used for analysis: Normal and Overweight - covering overweight, obesity I, II, III in the Overweight category. BP was classified as: $<120 \times <80$ (optimal), $<130 \times <85$ (normal), $130-139 \times 85-89$ (borderline), $140-159 \times 90-99$ (hypertension I - mild), $160-179 \times 100-109$ (hypertension II - moderate), $\geq 180 \times \geq 110$ (hypertension III - severe), $\geq 140 \times <90$ (isolated systolic hypertension). For analysis, the following dichotomization was performed: Normal (optimal, normal, borderline) and Hypertension (Hypertension I, II, III) (SOCIEDADE BRASILEIRA DE HIPERTENSÃO, 2010). In order to analyze the dependent variable, the validated Work Ability Index (WAI) instrument was used (TUOMI *et al.*, 2005). In this aspect, firefighters' work was considered with both requirements - physical and mental. Participants answered in printed forms, indicating their

opinion about their current work capacity on a numerical scale from 0 to 10, followed by questions of physical and mental demands that received an increasing classification of 1 to 5, being 1 very low and 5 very good. Then, they answered questions regarding injuries or diseases, both of their own opinion and of medical diagnosis, that were categorized by corporal systems. Finally, they answered about current impediments to work, absenteeism, current feelings and opinions of future capabilities, which were also pointed out on a numerical scale. The final classification of the instrument was made by the sum of the numbers indicated in the answers and described as Low (7 to 27 points), Moderate (28 to 36 points), Good (37 to 43) and Great (44 to 49 points). The data collected were tabulated and Statistical Package for the Social Sciences (SPSS) version 21 was used for statistical analysis by means of absolute and relative frequency, arithmetic mean and standard deviation. To check the association of the control variables with the response variable, in order to identify the main factors that alter the WAI, univariate analytic approach was initially used. In this case, logistic regression model was applied separately for each control variable in relation to the response variable. To perform this analysis, the response variable (WAI) was redefined in two categories: Low/Moderate (7 to 36 points) and Good/Great (37 to 49 points). Subsequently, in order to obtain the overall analysis, adjusted logistic regression technique ($p < 0.05$) was applied, allowing all factors to be evaluated at the same time. In order to process this analysis, all the variables that showed $p < 0.25$ in the univariate analysis were included in the regression model (HOSMER, LEMESHOW, 2000). Odds ratio had a proper 95% confidence interval. The logistic regression model used was the Backward Stepwise method to estimate prevalence ratios and to apply the likelihood ratio test to obtain statistical significance (HAIR *et al.*, 2009). Considering that this research was developed with human beings at the Federal University of Mato Grosso do Sul (UFMS) Master's Program in Nursing, this project met all the prerogatives of the National Health Council Resolution No. 466/2012 and submitted to UFMS' Research Ethics Committee (CEP/UFMS), which was approved under the opinion n° 559.543 of 3/18/2014. The consent form was elaborated explaining all the steps of this research. There was no conflict of interest.

RESULTS

The WAI values obtained in this research were distributed separately in Low, Moderate, Good and Great in Table 1 and categorized in Low/Moderate and Good/Great in Table 2. The arithmetic mean result obtained for the WAI score of 38.7, characterizing a Good average, with a standard deviation of 5.76. The predominant age group of firefighters in the sample was between 31 and 40 years old, with a mean of 38.9 years and the standard deviation of 7.5 years. Male participants accounted for 83.3%. In relation to the job positions, there was greater participation of sergeants, with 51.1%. Time of service stood out from 15 to 20 years in the corporation in 43.2%. Distribution of the WAI in relation to the intervening factors, that is, the independent sociodemographic, labor and health variables, are presented in Table 3. When analyzing the two categories of the military firefighters' WAI with the indicators studied, there was a significant association of the variable age ($p = 0.018$). The other variables did not present significant differences. The WAI analysis was performed in relation to the control variables, initially including all the variables of table 1 that presented a $p < 0.25$.

Table 1. Military firefighters' Work Ability Index (WAI). Campo Grande – MS, 2015 (n=192)

Variable	No.	%
WAI		
Low	07	3,7
Moderate	63	32,8
Good	73	38,0
Great	49	25,5

Table 2. Military firefighters' Work Ability Index (WAI), according to categorization in Low/Moderate and Good/Great. Campo Grande – MS, 2015 (n=192)

Variable	No.	%
OCI		
Low/Moderate	70	36,5
Good/Great	122	63,5

Table 3. Distribution of the variables age, sex, time of service, job position, BMI and BP related to WAI. Campo Grande - MS, 2015 (n=192)

	WAI		Total n(%)	Univariate analysis	
	Low/Moderate n(%)	Good/Great n(%)		OR (IC95%)	P
Age					
20 – 40 years old	32 (29,6)	76 (70,4)	108 (56,2)	1	
41 – 60 years old	38 (45,2)	46 (54,8)	84 (43,8)	1,962 (1,08;3,56)	0,01 8
Sex					
Male	60 (37,5)	100 (62,5)	160 (83,3)	1	
Female	10 (31,2)	22 (68,8)	32 (16,7)	0,575 (0,33;1,71)	0,50 3
Time of service					
03 – 14 years	23 (29,5)	55 (70,5)	78 (40,6)	1	
15 years or more	47 (41,2)	67 (58,8)	114 (59,4)	1,677 (0,91;3,10)	0,09 8
Work function					
Administrative	09 (30,0)	21 (70,0)	30 (15,6)	1	
Operational	61 (37,7)	101 (62,3)	162 (84,4)	1,341 (0,55;3,27)	0,51 8
BMI					
Normal	49 (72,1)	19 (27,9)	68 (35,4)	1	
Overweight ^I	73 (58,9)	51 (41,1)	124 (64,6)	1,802 (0,95;3,41)	0,07 1
BP					
Normal ^{II}	65 (36,5)	113 (63,5)	178 (92,7)	1	
Hypertension ^{III}	05 (35,7)	09 (64,3)	14 (07,3)	0,966 (0,31;3,01)	0,95 2

Note: The following associations were considered for BMI and BP categorization

^I Overweight and Obesity I, II, III.

^{II} Optimal, normal, borderline.

^{III} Hypertension I, II, III.

Table 4. Results of the logistic regression model adjusted for the WAI. Campo Grande - MS, 2015

Variables	Categories	OR (IC95%)	P
Age (years)	20 a 40	1	
	41 a 60	1,962 (1,08;3,56)	0,027

Estimates: Likelihood ratio of log = 246,94; R^2 de Nagelkerke = 0,035.

Model adjustment. $\chi^2_{(2)} = 4,96$; $p = 0,026$.

Global correct rating percentage = 63,5%.

Those are age group, time of service and BMI. Table 4 presents the results of the logistic regression model adjusted for the WAI after submitting the variables to the Backward Stepwise method (HAIR *et al.*, 2009). It is observed that only

the variable age remained in the adjusted model. That is, it significantly interfered with the variation of the firefighters' WAI. Thus, with this result, it can be concluded that the chance of a firefighter over 40 years of age presenting low capacity for work is approximately 1.9 times the same chance of a firefighter under 40 years of age.

DISCUSSION

Through the analysis of other studies with Work Ability Index involving military personnel, it is observed that these professionals maintain the Good/Great WAI classification in 80% more (GASPARY, SELAU, AMARAL, 2008; MARTIN *et al.*, 2013; SOUZA *et al.*, 2012; KISS *et al.*, 2002; BERRIA, DARONCO, BEVILACQUA, 2011). The firefighters in this study are below this percentage, presenting a Good/Great WAI in only 63.5%. When assessing the Moderate/Low classification, the index is 36.5%, which indicates that about 1/3 of the professionals are harmed, since in every 100 firefighters, approximately 36 of them already have a diminished work ability. This result shows that military personnel must take action to restore and improve their capabilities for work. Since absentee professionals were not part of the research, it is considered that these results were based on active military and favorable health conditions. However, even with this barrier of participation, the results presented a Moderate/Low index above the ones presented by previous studies. In addition, it is possible to confirm the relation between the decrease in WAI and the increase in age, a variable that is also significant in other studies involving military personnel (GASPARY, SELAU, AMARAL, 2008; KISS *et al.*, 2002; POHJONEN, 2001). Higher age and reduced WAI may also be strongly linked to workload, functional aging and diagnosed diseases (GASPARY, SELAU, AMARAL, 2008; KISS *et al.*, 2002; POHJONEN, 2001).

Although this variable is significant and important, it accounts for less than 10% of the total variation (3.5%). For further studies, deeper investigation of other factors that may interfere in the work capacity of professional firefighters is recommended. As the decrease in work ability with age is expected in an empirical way, labor support measures must be implemented to maintain health conditions - this is the main issue related to WAI (BELLUSCI, 1999). Such measures should be based on specific characteristics of each profession, but always aiming at the concept of health in its entirety and completeness: physical, social and mental well-being (SEGRE, FERRAZ, 1997). With the use of WAI, it is possible to predict disability retirement and also death. A study in Finland that was the pioneer of this research field presented workers with low capacity for work out of which 62.2% retired due to disability, 11, 6% died and only 2.4% continued to work full-time over the course of 10 years (GASPARY, SELAU, AMARAL, 2008). Male participants represented 83.3% in this study, meeting the results of most or all of the previous studies (OCAMPOS *et al.*, 2017; MARTIN *et al.*, 2013; MONTEIRO *et al.*, 2007; SOUZA *et al.*, 2010; BERRIA, DARONCO, BEVILACQUA, 2011; BARBOSA, SOARES, CAMBOIM, 2014; FIORIN, 2013; CONTRERA-MORENO *et al.*, 2012; ROCHA, ATHERINO, FROTA, 2010; CANBARRO, ROMBALDI, 2010). Although in this study, BMI was not significantly related to WAI, the presented data of this variable also suggest important questions for discussion. Results show that the participants are mostly overweight, which is corroborated in other studies involving the military class

(BERRIA, DARONCO, BEVILACQUA, 2011; CONTRERA-MORENO *et al.*, 2012; CANABARRO, ROMBALDI, 2010; OLIVEIRA, OLIVEIRA, 2007). Overweight and obesity can lead to risks of chronic and degenerative diseases (CANABARRO, ROMBALDI, 2010), leading to debilitated health conditions and consequently influencing work ability. With the increasing age combined with fragile health, WAI may decline even more. However, one of the factors that may justify the high BMI indexes in the military classes is the advanced proportion of muscle mass. Muscle has a higher density than fat mass, leading to high BMI results when in fact these professionals have larger rates of muscle hypertrophy than fat (CANABARRO, ROMBALDI, 2010; OLIVEIRA, OLIVEIRA, 2007). It is suggested that further studies explore this variable in depth. In conclusion to the statistical analysis, it was possible to identify that the age group over 40 years old has a higher risk to decreasing work ability among military firefighters. This age is set as a majority in the studied population, which was also shown by a survey conducted in the same city. There is predominance of the age group from 40 to 49 years old in firefighters and more than ten years of service rendered to the corporation (OCAMPOS *et al.*, 2017). Therefore, the health condition of these professionals may be compromised if no action is taken within the corporation towards maintenance and recovery. Those actions must be in line with health promotion in the occupational field, with special attention to good nutrition, physical exercise, quality sleep and rest conditions, reduction of work overload as stressors, as well as assessment of risk situations that are found in the work environment. This research brings important contribution to studies concerning worker health, by identifying the Work Ability Index of a group of military professionals working in the capital of the State of Mato Grosso do Sul, Brazil. Also, it reinforces the need for attention to this population with effective measures of health promotion and prevention of aggravations in the area of collective health.

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