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# The Relationship Between the Levels of Stress and the Age and Years of Service of Military Firefighters From the Fire Rescue Corps of the Metropolitan Area of the State of São Paulo

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**Purpose.** To verify the relationship between stress indicators and the age and years of service of military firefighters from the fire rescue corps of the metropolitan area of the state of São Paulo. **Methods.** Forty military firefighters with the mean age of  $37.9 \pm 5.4$  years, from the 1st, 2nd and 8th fire brigades of the metropolitan area of São Paulo participated in this study. All underwent clinical, physical and psychological evaluations to verify the relationship between the age and years of service with the variables of levels of stress (tension, depression, anger, vigor, fatigue, confusion and total stress) on workdays and on days off. **Results.** On workdays, the mean scores for tension, depression, fatigue and stress were overall higher compared to those on days off. The older the firefighter, the higher the levels of stress, depression, anger and total stress. The more years of service, the greater the depression and anger. **Conclusions.** The levels of stress were high on workdays. Chronological age and years of service influenced the increase in the scores of stress.

burnout   professional   age effect   work hours   firefighters

## 1. INTRODUCTION

Firefighters and police officials are involved in many occurrences of rescue; therefore, they are

more exposed to harmful mental and physical health factors [1]. Musculoskeletal disorders, cardiovascular diseases and mental disorders are the main causes of these professionals' inability to

work [2] as well the development of occupational stress [3].

A study done with 161 American firefighters on the sources of stress experienced at work identified the following major sources of stress: death or injuries suffered by fellow workers during work hours, rescue service provided to young people seriously injured or killed and issues over which there was no control and which continued to exist as no measures were taken by anyone to minimize them [4].

On a long-term basis, occupational noise during the occurrences causes hearing loss in these professionals [5], which becomes worse as they advance in age and years of service [6]. These individuals are also exposed to contaminated blood [3], hepatitis viruses B and C [8], the human immunodeficiency (HIV) virus [9], *bacillus tuberculosis* [10] and also the effects of air pollution on the components of capture, transportation and use of oxygen [11].

Sleep deprivation due to rotating night shifts is a stressor associated with the decrease in the number of cells in the immunological defense system [12].

During real occurrences, heart rate remains elevated, often for a prolonged period, reaching maximum levels predicted for the age, thus, associated with the anxiety of the professional on duty, bearing an elevated work load [13].

At the moment of the alarm, a sound signal goes off within the operational unit indicating the existence of an occurrence and triggering a series of psychophysiological reactions. The elevated heart rates are also related to the vigorous movements of putting on personal equipment and relocating heavy materials and vehicles [14].

A study of 11 firefighters during a simulated fire combat drill showed that the levels of adrenocorticotrophic hormone and cortisol were elevated soon after the end of the occurrence; cortisol levels continued elevated even 90 min into the recovery period [15].

Thus, the objective of this study was to verify the relationship between the levels of stress and the age and years of service of military firefighters from the fire rescue corps of the metropolitan area of the state of São Paulo.

## 2. METHODS

The sample consisted of 40 male military firefighters, clinically healthy, 25–51 years of age, approved in the initial assessments of the fire rescue corps of the metropolitan area of the state of São Paulo; all from the 1st, 2nd and 8th fire brigades. After orientation, each individual signed the statement of consent approved by the Medical Ethics Committee of the Federal University of São Paulo.

The volunteers underwent clinical, physical and psychological evaluations. Inclusion criteria were good health in the initial assessments, being a nonsmoker and living and working in the city of São Paulo. Exclusion criteria were a contraindication such as hypertension, a health issue that limits endurance activities, unfitness detected in the initial assessments, medication, history of cardiorespiratory disease and age under 25 or over 51 years.

### 2.1. Experimental Design

#### 2.1.1. Clinical and physical evaluation

Clinical evaluation involved measuring the levels of heart rate and blood pressure at rest, and testing blood, cholesterol, urine and feces. Well-established physical evaluation tests for firefighters were applied: assessment of strength of the upper limbs (flat bar), abdominal strength, running sprints of 50 m and of 12 min (Cooper method), rope and board climbing, swim tests of 400 m in crawl style, lifting equipment, and preparing and assembling aluminum ladders.

The level of stress was evaluated with Brums (Brunel Mood Scale), an instrument that draws the profile of one's state of mood, which is Brazilian version of the Profile of Mood States (POMS) [16, 17, 18]. The instrument, which takes ~1–2 min, was self-administered by the individual at two distinct moments within the study: (a) at the end of a 24-h work shift (M1) and (b) at home, on a day off, at leisure with the family (M2). A professional in the area of psychology evaluated the responses.

Presenting satisfactory indicators of validity as a measure of mood in athletes and nonathletes,

adolescents and adults, Brums is a quick measurement scale with 24 simple indicators of mood with the following factors: tension (*T*), depression (*D*), rage (*R*), vigor (*V*), fatigue (*F*) and mental confusion (*C*).

Respondents indicated how they related to these factors on a 5-point scale, ranging from 0 (*absolutely not*) to 4 (*extremely*). Moreover, a study of complete stress (Brums Total, *BMT*) was applied; it is calculated by subtracting vigor (*V*), a positive variable, from the other variables, which are considered negative:

$$BMT = (T + D + R + F + C) - V.$$

*BMT* shows the individual's rate of mental and emotional health. Individuals in good health have an index under or close to zero [19].

The results were grouped as means and standard deviations. To compare the means of variables of the levels of stress on workdays and on days off, Student's *t* test was used for dependent samples.

For the correlation of the variables of the levels of stress with the variables of the age and years of service, Pearson correlation was used to determine the association between the variables [20].

For all statistical tests,  $p < .05$  was considered significant. Both descriptive and inferential statistics were done with SPSS version 10.0.

### 3. RESULTS

The mean chronological age of the sample was  $37.9 \pm 5.4$  years (range: 25–51), the mean number of years of service in the fire rescue corps was  $11.8 \pm 6.4$  (range 3–26).

Table 1 lists the variables of the levels of stress (*T*, *D*, *R*, *V*, *F*, *C* and *BMT*), which were measured on a workday and on a day off.

**TABLE 1. Levels of Stress in Military Firemen ( $n = 40$ ) of the Rescue Service on Workdays and on Days Off**

| Variables  | Workdays             | Days Off             | <i>p</i> |
|------------|----------------------|----------------------|----------|
|            | <i>M</i> ± <i>SD</i> | <i>M</i> ± <i>SD</i> |          |
| Tension    | 4.7 ± 3.3            | 2.6 ± 2.0            | <.001**  |
| Depression | 2.5 ± 2.6            | 1.5 ± 1.9            | .027*    |
| Rage       | 2.3 ± 2.7            | 1.5 ± 2.1            | .089     |
| Vigor      | 10.3 ± 3.2           | 10.7 ± 3.1           | .367     |
| Fatigue    | 5.1 ± 2.8            | 3.2 ± 2.9            | <.001**  |
| Confusion  | 2.1 ± 2.4            | 1.6 ± 1.9            | .196     |
| BMT        | 6.4 ± 12.1           | -0.1 ± 9.2           | <.001**  |

Notes. \* $p < .05$ , \*\* $p < .01$ ; BMT = Brums (Brunel Mood Scale) Total.

Results showed that for the variables *T*, *D*, *F* and *BMT*, the mean observed scores were statistically significantly higher on a workday than those on a day off.

Table 2 shows the results of the correlation between the variables *T*, *D*, *R* and *BMT* and the variables age and years of service. There was a significant positive association of the variable age with the variables *T*, *D*, *R* and *BMT* on a workday. For the variable years of service, there was a significant positive association with the variables *D* and *R*.

Figures 1–4 show the correlation of the variable age and the variables *T*, *D*, *R* and *BMT*. There was a statistically significant correlation between the variables years of service, *D* and *R* (Figures 5–6).

### 4. DISCUSSION

With a sample of 40 male individuals aged 25–51 years, the objective of this study was to verify the relationship between the levels of stress and the age and years of service of military firefighters

**TABLE 2. Correlation Between the Variables Stress, Depression, Rage and the BMT, and the Variables Age and Time of Service (Workday)**

| Variables                                  | Tension  |          | Depression |          | Rage     |          | BMT      |          |
|--|----------|----------|------------|----------|----------|----------|----------|----------|
|  | <i>r</i> | <i>p</i> | <i>r</i>   | <i>p</i> | <i>r</i> | <i>p</i> | <i>r</i> | <i>p</i> |
| Age (years)                                | .33      | .039*    | .39        | .014*    | .36      | .024*    | .33      | .037*    |
| Time of service in fire department (years) | .19      | .234     | .36        | .022*    | .42      | .008*    | .31      | .054     |

Notes. \* $p < .05$ , \*\* $p < .01$ ; BMT = Brums (Brunel Mood Scale) Total.

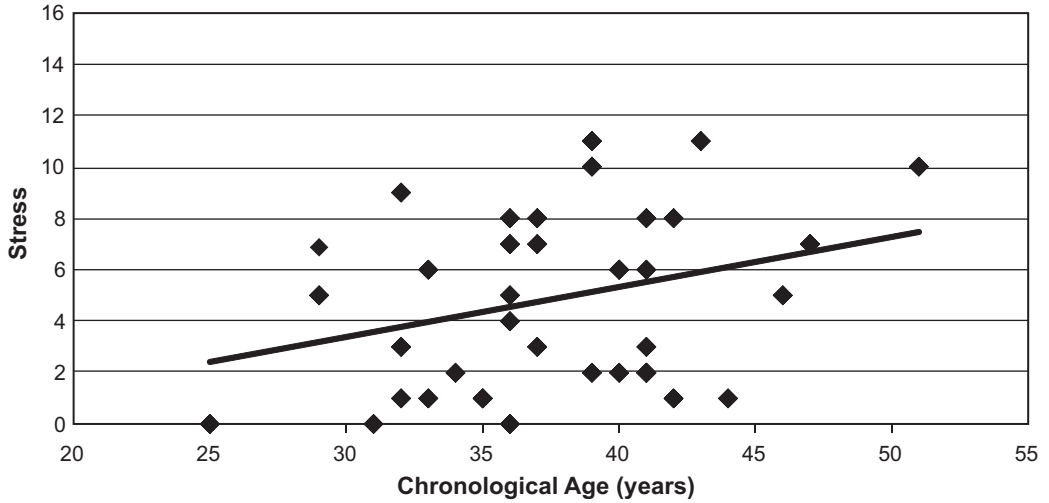


Figure 1. The relationship between stress and chronological age of the military fire rescue corps. Notes.  $r = .33$ ,  $p = .039$ .

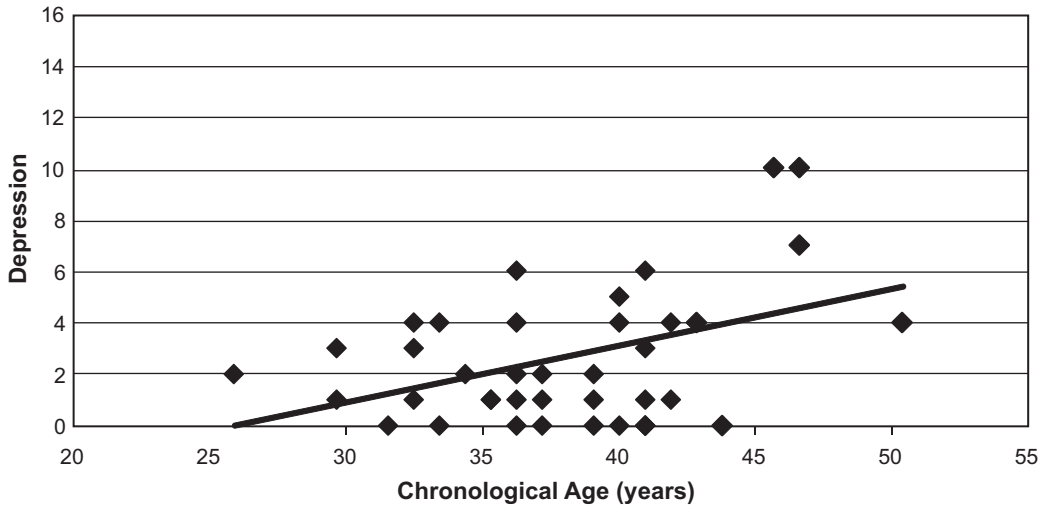


Figure 2. The relationship between depression and chronological age of the military fire rescue corps. Notes.  $r = .39$ ,  $p = .014$ .

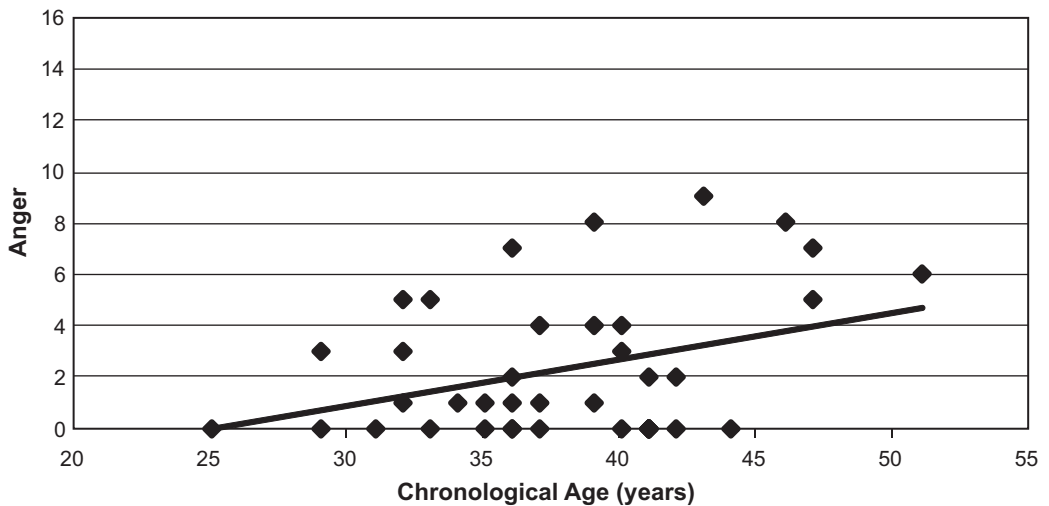


Figure 3. The relationship between anger and depression in the military fire rescue corps. Notes.  $r = .36$ ,  $p = .024$ .

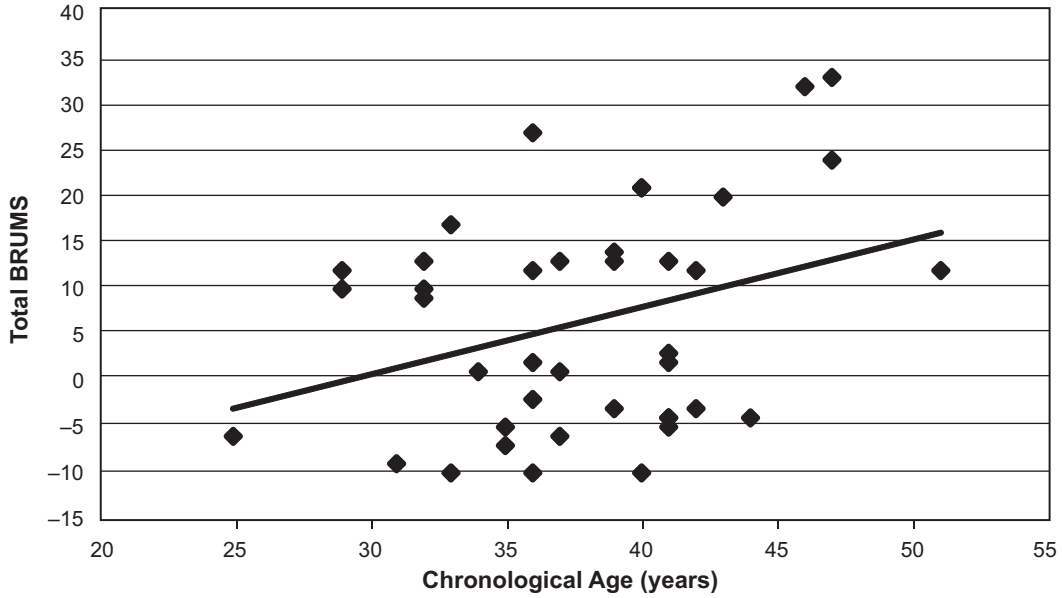


Figure 4. The relationship between chronological age and total BRUMS in the military fire rescue corps. Notes. BRUMS = Brunel Mood Scale;  $r = .33$ ,  $p = .037$ .

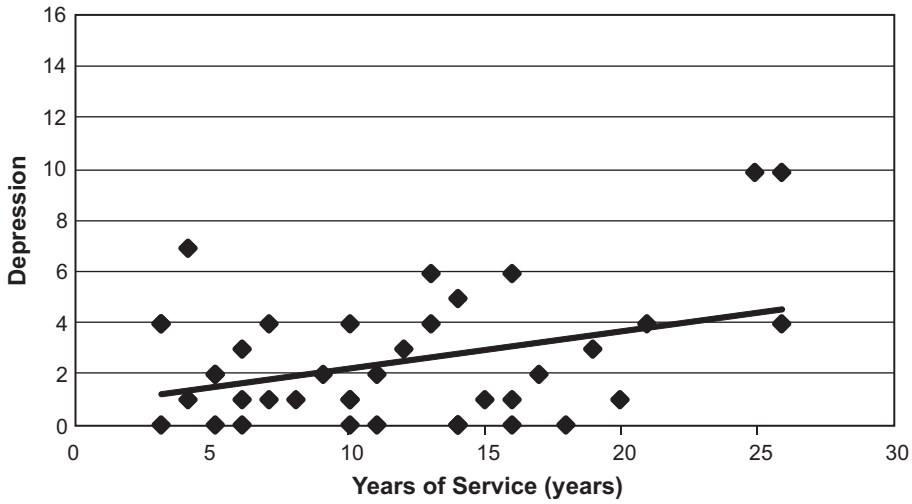


Figure 5. The relationship between depression and years of service in the military fire rescue corps. Notes.  $r = .36$ ,  $p = .022$ .

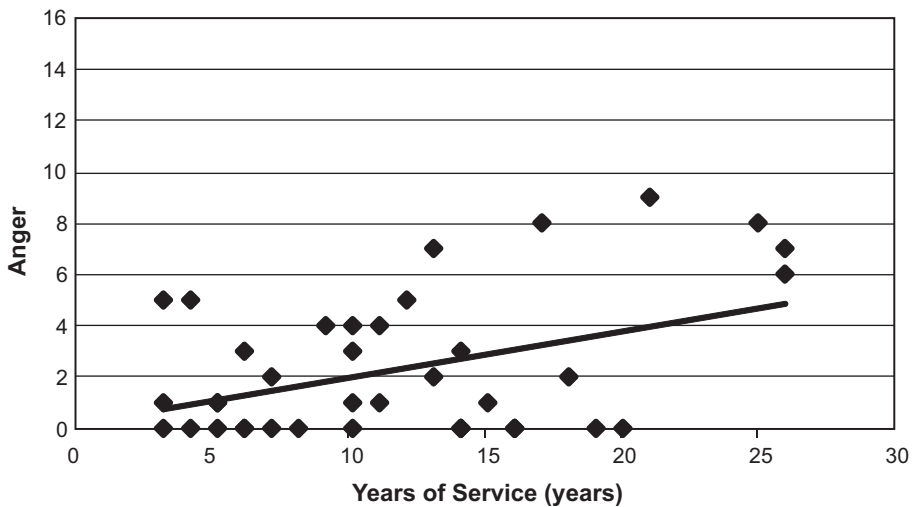


Figure 6. The relationship between anger and years of service in the military fire rescue corps. Notes.  $r = .42$ ,  $p = .008$ .

from the fire rescue corps of the metropolitan area of the state of São Paulo.

Some professions are known to be highly stressful as their routine is highly demanding, with rotating work shifts and constant contact with the public [21]. Firefighters and other professionals in emergency services are likely to develop occupational stress; hence, they require stress management programs [3].

A study to diagnose stress in 3193 military police officers in the city of Natal, Brazil, found that 47.4% of the sample showed symptoms. It was suggested that preventive action be taken by the Military Police Institution, which could include the implementation of a program of diagnosis, guidance and control of stress [22].

An elevated number of occurrences during a 24-h work shift can prevent professionals from getting proper physical training and adequate sleep. Palma, Tiba, Machado, et al. showed that sleep deprivation was a stressor associated with a decrease in the number of cells of the immune defense system [12].

On their way from the fire station to the place of occurrence, these professionals are exposed to considerable stress of traffic, abrupt movements of the fire truck, rapid increase and decrease in speed, sound emitted by the sirens and the brightness of the lights, all of which combined cause stress overload and increased physiological variables related to the various stress stimuli.

In this research, it was observed that the *T*, *D*, *F* and *BMT* scores were statistically significantly higher on workdays than on days off. The higher the chronological age of the military firefighters, the higher the scores of *T*, *D*, *R* and *BMT*. Additionally, the longer the service in the fire rescue corps, the higher the *D* and *R* scores.

Research conducted with male nurses in the state of Minas Gerais, Brazil, to determine the risk factors in hospital work showed that the higher the chronological age of these professionals, the greater the risk of stress [23].

The occurrence of stress is more common among older professionals [24]. Moreover, stress is cumulative [25, 26].

Finally, many of these professionals do extra work on their days off, which results in excessive

strain and double workdays. This could probably create a disruption to the biological rhythms of the states of sleep and alert, reduced family time, interference in social and private life, lack of training and decreased physical capacity [27].

These negative aspects can lead individuals towards a sedentary lifestyle, or to cardiovascular or chronic degenerative diseases as well as a loss of excellence in attending the occurrences. This would lead to temporary or permanent removal from the operational service of the fire department.

## 5. CONCLUSION

The levels of stress are high on workdays, with the chronological age and years of service affecting the increase in the scores of stress.

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