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ARTIGO ORIGINAL

Versão portuguesa da *Firefighter Coping Self-Efficacy Scale*: Estudo da estrutura fatorial e características psicométricas

Portuguese version of the *Firefighter Coping Self-Efficacy Scale*: Factor structure and psychometric characteristics

Soraia Moniz [1]
Ana Galhardo [1,2]

[1] *Instituto Superior Miguel Torga, Coimbra, Portugal*

[2] *Universidade de Coimbra, Centro de Investigação em Neuropsicologia e Intervenção Cognitivo-Comportamental (CINEICC), Faculdade de Psicologia e de Ciências da Educação, Portugal*

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Abstract

Background and Aim: The current study aimed to translate the Firefighter Coping Self-Efficacy Scale (FFCSE) and explore its dimensionality and psychometric characteristics. **Method**: This cross-sectional study was authorised by the National Emergency and Civil Protection Authority and disseminated by firefighters' stations from different districts. A sample of 155 firefighters completed online the following self-report instruments: Firefighter Coping Self-Efficacy Scale, Comprehensive Assessment of Acceptance and Commitment Therapy Processes, World Health Organization Index-5, Perceived Stress Scale and Patients Health Questionnaire-4. An exploratory factor analysis was computed, and reliability and validity studies were conducted. **Results**: The Portuguese version of the FFCSE items revealed, in general, good psychometric characteristics, except for item 10 ("Having dreams about difficult calls"). The factor structure was one-dimensional. The FFCSE showed good internal consistency, and the associations with the other variables were in the expected direction. No differences were found between men and women in the FFCSE mean scores. There was no statistically significant association between the FFCSE and age, years of education or length of service as firefighters. **Conclusions**: The FFCSE proved to be a one-dimensional measure of perceived self-efficacy to deal with the demands inherent to the firefighter activity. The results suggest that it is a valid and reliable measure, useful in research, clinical and training contexts for these professionals.

Keywords: Firefighters; Self-efficacy; Assessment; Factor structure; Psychometric characteristics; Quantitative study.

DI&D | ISMT

rpics@ismt.pt
https://rpics.ismt.pt

Soraia Moniz
Instituto Superior Miguel Torga, Coimbra
Portugal
Tel.+351 912155586
Email: soraia-moniz@live.com.pt

Resumo

Contexto e Objetivo: O presente estudo pretendeu traduzir a *Firefighter Coping Self- Efficacy Scale* (FFCSE) e explorar a sua dimensionalidade e características psicométricas. **Métodos:** O estudo de desenho transversal foi autorizado pela Autoridade Nacional de Emergência e Proteção Civil e disseminado pelas corporações de diversos distritos. Uma amostra de 155 bombeiros completou *online* os seguintes instrumentos de autorresposta: *Firefighter Coping Self-Efficacy Scale*, *Comprehensive Assessment of Acceptance and Commitment Therapy Processes*, *World Health Organization Index-5*, *Perceived Stress Scale* e *Patients Health Questionnaire-4*. Foi realizada uma análise fatorial exploratória e conduzidos estudos de fidedignidade e validade. **Resultados:** Os itens da versão portuguesa da FFCSE revelaram, na globalidade, boas características psicométricas, à exceção do item 10 ("Sonhar com ocorrências difíceis"). A estrutura fatorial apurada foi unidimensional. A FFCSE evidenciou uma boa consistência interna e uma associação com as demais variáveis no sentido esperado. Não foram encontradas diferenças nos valores médios da FFCSE entre bombeiros do sexo masculino e do sexo feminino e não se observou uma associação estatisticamente significativa entre a FFCSE e a idade, anos de escolaridade ou tempo de serviço enquanto bombeiros. **Conclusões:** A FFCSE mostrou ser uma medida unidimensional de perceção de autoeficácia para lidar com as exigências inerentes à atividade de bombeiro. Os resultados sugerem ser um instrumento válido e fidedigno, passível de ser usado em contextos de investigação, de clínica e de formação destes profissionais.

Palavras-Chave: Bombeiros; Autoeficácia; Avaliação; Estrutura fatorial; Características psicométricas; Estudo quantitativo.

Introduction

The distinctive circumstances of firefighters' activity encompass a substantial risk for injury, health problems (e.g., cardiovascular disease, pulmonary disease, cancer) or death. Firefighters are repeatedly exposed to potentially traumatic events, making them vulnerable to high occupational stress and mental health problems such as posttraumatic stress disorder (PTSD), depression, anxiety, substance use disorders, and sleep disorders (Janhnke et al., 2016; Harvey et al., 2016; Sawhney et al., 2018; Wagner & Pasca, 2019). Furthermore, PTSD, even at subclinical levels, has been identified as a risk factor for individuals' burnout (Chiang et al., 2021) and suicide in firefighters (Bing-Canar et al., 2019; Panagioti et al., 2009; Stanley et al., 2015). More recently, it has been highlighted that frontline healthcare workers, such as firefighters, are a specific population group at particular risk of COVID-related psychological distress (Vujanovic et al., 2021; World Health Organization, 2020). Therefore, the need to provide these professionals psychological tools to promote their emotional resilience and respond effectively and safely to their work demands is evident. In fact, a recent scoping review states that there is an urgent need for high-quality studies regarding effective skills firefighters can use to manage their mental health (Sindena et al., 2021).

People's beliefs regarding their capabilities to accomplish goals and deal with situations, even if these are difficult and challenging, are closely linked to the definition of self-efficacy. According to Bandura (1994), individuals presenting high levels of self-efficacy tend to identify themselves as showing the

necessary problem-solving skills. They tend to perceive demanding situations or circumstances as challenges rather than threats, define meaningful purposes and commit to achieving them (Yong, 2010). Self-efficacy is a conviction that one is able to carry out a certain activity and get a successful result (Makara-Studzinska et al., 2019). In the literature, self-efficacy is defined as one's belief in the possibility of achieving an intended goal in a specific life situation (Bandura, 2009). Moreover, self-efficacy is a factor that acts as a defensive and supportive psychological trait against the negative effects of a firefighting job (Sharifi et al., 2021).

With the rationale to provide a tool for researchers and a useful index of progress in therapy, several instruments aimed at measuring a general sense of self-efficacy (not tied to specific situations or behaviours) have been developed. The Self-Efficacy Scale (Sherer et al., 1982), encompassing two dimensions, general self-efficacy (17 items) and social self-efficacy (6 items), is one of the most used instruments to address self-efficacy. Another example is the New General Self-Efficacy Scale (Chen et al., 2001). The New General Self-Efficacy Scale is a unidimensional eight-item scale, showing high reliability, and allowing for the prediction of specific self-efficacy in a variety of tasks and contexts (Chen et al., 2001). This measure also showed to act as a moderator of the influence of previous performance on subsequent specific self-efficacy formation (Chen et al., 2001).

More recently, several instruments to assess self-efficacy in more specific health conditions, such as in type 2 diabetes (Sturt et al., 2010) or infertility (Cousineau et al., 2006), and in different professional groups or settings, such as teachers (De Smul et al., 2018), career decision making (Betz & Luzzo, 1996), and computer programming (Tsai et al., 2019) were developed. Specifically targeting the stressful job demands of firefighters, the Firefighter Coping Self-Efficacy Scale (FFCSE; Lambert et al., 2012) was developed and studied. The FFCSE includes efficacy for managing reminders of difficult calls, coping with feelings connected with witnessing injury or death and dealing with the global stress inherent to firefighters' activities (Lambert et al., 2012). Although the items reflect three theoretical dimensions, the FFCSE revealed a single-factor solution and adequate psychometric characteristics. It is a useful tool for research and training settings among firefighters given that perception of self-efficacy, as measured by the FFCSE, was associated with PTSD symptoms (Chiang et al., 2021). Firefighters presenting the highest levels of PTSD symptoms showed significantly lower mean scores on the FFCSE, when compared to firefighters with the lowest levels of PTSD symptoms (Chiang et al., 2021). Furthermore, women firefighters coping self-efficacy, assessed by the FFCSE, showed to be inversely related to traumatic experiences (Jahnke et al., 2019).

The current study aimed to translate the Firefighter Coping Self-Efficacy Scale (FFCSE; Lambert et al., 2012) to European Portuguese and study its factor structure and psychometric characteristics in a sample of Portuguese firefighters. As in the original version of the FFCSE, it was hypothesised that the FFCSE would capture a global dimension of firefighters' self-efficacy, presenting a single factor structure. It was

also hypothesised that higher self-efficacy scores would be associated with higher psychological flexibility and well-being and lower perceived stress, depression and anxiety symptoms.

Methods

Participants

This study sample encompassed 155 firefighters from several Portuguese fire stations located at the Coimbra, Leiria, Porto, Faro and Beja districts. One hundred and thirteen participants (72.9%) were men and 42 (27.1%) were women, aged between 18 and 57 years old (M = 36.39; SD = 10.24). The majority of participants were married or living with a partner (n = 79; 51%), followed by single (n = 66; 42.6%), and divorced (n = 10; 6.5%). Concerning years of education, participants presented a mean of 10.24 years (SD = 2.43).

Instruments

Firefighter Coping Self-Efficacy Scale (FFCSE)

The FFCSE (Lambert et al., 2012) is a 20-item self-report scale developed to assess firefighters' perceived competence in dealing with stressful and potentially traumatic experiences faced during their work activities. The FFCSE items address handling memories of difficult occurrences (e.g., "Coping with visual reminders of difficult calls."), feelings associated with witnessing injury or death (e.g., "Handling the death of a patient or person I am responding to."), and handling general stress related to firefighters' job demands (e.g., "Managing physical demands of the work."). The items are preceded by the statement: "For each situation described below, please rate how capable you are in successfully dealing with it" and answered on a seven-point Likert scale ranging from *not at all capable* (1) to *totally capable* (7). The FFCSE revealed a single factor solution and Cronbach alpha values of .90 and .92 in its original version study (Lambert et al., 2012).

Comprehensive Assessment of Acceptance and Commitment Therapy Processes (CompACT)

The CompACT (Francis et al., 2016; Portuguese version by Trindade et al., 2021) is a general measure of psychological flexibility. The CompACT includes 18 items and three dimensions of psychological flexibility: (i) behavioural awareness (e.g., "I rush through meaningful activities without being really attentive to them" - reverse item); (ii) valued action (e.g., "I can identify the things that really matter to me in life and pursue them"); and (iii) openness to experience (e.g., "One of my big goals is to be free from painful emotions"). The items are rated on a seven-point scale ranging from *never true* (0) to *always true* (6). Higher scores reveal greater psychological flexibility. In the study using the Portuguese version, the CompACT showed Cronbach's alphas varying between .77 and .88 (Trindade et al., 2021).

World Health Organisation – Five Well-Being Index (WHO-5)

The WHO-5 (World Health Organization [WHO], 1998) is a broadly used brief self-report measure of well-being. The WHO-5 comprises five items (e.g., "I have felt calm and relaxed"), answered in a six-point scale

ranging from at *no time* (0) to *all of the time* (5). The total raw score is multiplied by four to achieve the final score, with zero representing the worst imaginable well-being and 100 representing the best imaginable well-being. The WHO-5 Cronbach alpha was .83 (WHO, 1998). In the current study, a Cronbach alpha of .92 was found.

Perceived Stress Scale (PSS-10)

The PSS-10 (Cohen et al., 1983; Portuguese version by Trigo et al., 2010) is a widely used self-report instrument for the assessment of perceived stress, allowing to determine to what extent life events are perceived as stress triggers (e.g., "In the last month, how often have you found that you could not cope with all the things that you had to do?"). The PSS 10 items are answered using a five-point scale ranging from *never* (0) to *very frequently* (4). Higher scores are indicative of higher perceived stress. The PSS-10 Portuguese version showed a Cronbach alpha of .87 (Trigo et al., 2010). In this study, the Cronbach alfa value was .71.

Patient Health Questionnaire-4 (PHQ-4)

The PHQ-4 (Kroenke et al., 2009) is a brief screening instrument for depression and anxiety symptoms. Two items address depression (e.g., "Over the last 2 weeks, how often have you been bothered by: Feeling down, depressed, or hopeless?") and the other two items focus on anxiety (e.g., "Over the last 2 weeks, how often have you been bothered by: Feeling nervous, anxious, or on edge?"). The response options range from *not at all* (0) to *nearly every day* (3). Higher scores indicate higher severity of depression and anxiety symptoms. As a composite index, the PHQ-4 revealed a Cronbach alpha of .85 (Kroenke et al., 2009). In the current study, a Cronbach alfa value of .78 was found.

Methodological procedures

After obtaining permission to translate and use the FFCSE from the authors of the original version, it was translated from English to Portuguese. First, an English native speaker, fluent in Portuguese and working as an English teacher in a language school, translated the original FFCSE items to Portuguese. In a second step, the research team completed a back-translation to English and inspected each item's content correspondence (Erkut, 2010). Minor adaptations were made in the Portuguese version to reflect more frequent expressions used in the Portuguese language but match the content of the original version items. The Portuguese version was then completed by five firefighters who were asked to comment on the instructions and the items' fluency and comprehensibility. No difficulties or inconsistencies were reported.

These procedures were in accordance with the International Test Commission (2017) recommendations. The study received approval from the Ethical Board of the Miguel Torga Higher Education Institute (reference CE-P10-21). Authorisation to contact fire stations was asked to the National Emergency and Civil Protection Authority. Fire stations were contacted via email and solicited whether they would be willing to disseminate the study. All participants were informed about the study aims and the voluntary nature of their participation. Anonymity and confidentiality of the data were guaranteed. An email address was created and provided for

doubts or additional information. Previously to completing online a set of self-report instruments (available at https://bit.ly/3BbKkkl), informed consent was requested and mandatory to proceed. Data collection took place from March to May 2021.

Data analysis

Data analyses were conducted using the IBM SPSS Statistics for Mac (Version 27.0) and the JASP software package version 0.16 software (Team J.A.S.P., 2018). Exploratory Factor Analysis through parallel analysis using the Weighted Least Squares (WLS) as the estimation method and the direct oblimin rotation method were employed to explore the FFCSE factor structure. Skewness and kurtosis values of the items were examined and revealed no severe violations to a normal distribution (*Sk* < |3| and *Ku* < |10|; Kline, 2005). Items local adjustment was analysed by standardised regression weights and communalities. According to Tabachnick and Fidell (2013), standardised regression weights higher than .40 are acceptable. The scree-plot inspection was also used for factor retention. Items' mean, standard deviation, and item-total correlations were computed, as well as Cronbach alpha values if item deleted.

To examine the FFCSE reliability, Cronbach alpha was estimated. According to Field (2013), Cronbach's alphas or CR above .70 indicate good reliability. To explore differences between men and women, independent samples *t*-tests were analysed (effect sizes were measured by Cohen's *d*). Cohen et al. (2003) mention that effect sizes between .20 and .49 are considered small, between .50 and .79 medium and above .80, large.

Associations between the FFCSE and other measures addressing similar and related constructs were calculated through correlation values between .10 and .29 are considered weak, between .30 and .49 moderate, and between .50 and 1, strong (Cohen, 1988).

Results

Dimensionality of the FFCSE

Preliminary Data Analyses

FFCSE items skewness values ranged from -1.20 to 0.26, and kurtosis values varied from -1.26 to 1.21. Kaiser-Meyer-Olkin test (*KMO* = .88) and Bartlett's sphericity test ($\chi^2_{(190)}$ = 1645.50; p < .001) results confirmed the adequacy of the data to conduct an EFA.

Item Analysis

Table 1 displays means, standard deviations, item-total correlations and Cronbach alpha if item removed for the FFCSE items.

Table 1

FFCSE items Descriptives, Psychometric Properties and Results From a Factor Analysis

Items	*M*	*SD*	CIT	CID	*F*	h^2
1. Dealing with combative or hostile people.	5.0	1.4	.65	.90	.69	.53
2. Dealing with injured children.	5.2	1.4	.59	.90	.62	.62
3. Dealing with human dismemberment (loss of limbs, etc.).	5.0	1.6	.67	.90	.70	.51
4. Dealing with blood, vomit or other bodily fluids.	5.8	1.3	.65	.90	.71	.49
5. Dealing with the sounds of people retching as they vomit.	5.7	1.4	.58	.90	.64	.59
6. Handling the death of a patient or person I am responding	5.5	1.3	.67	.90	.71	.50
7. Coping with the death of a child.	3.5	1.8	.41	.90	.43	.81
8. Handling difficult environment working conditions (e.g.,	5.4	1.6	.65	.90	.70	.52
9. Coping with visual reminders of difficult calls.	5.0	1.6	.72	.90	.75	.43
10. Having dreams about difficult calls.	3.5	1.9	.17	.90	.15	.98
11. Not to self-criticize my ability to handle calls.	4.0	1.6	.47	.90	.46	.79
12. Believing I am competent in all aspects of my work.	5.5	1.3	.48	.90	.50	.75
13. Managing physical demands of the work.	5.5	1.2	.60	.90	.65	.58
14. Discussing with others the emotionally upsetting calls.	5.0	1.6	.47	.90	.50	.75
15. Ability to multi-task when doing my job.	5.3	1.2	.55	.90	.60	.65
16. Coping with feelings of guilt.	4.3	1.6	.40	.90	.39	.85
17. Dealing with the meaninglessness of a call.	4.9	1.5	.57	.90	.58	.66
18. Managing my anger.	5.0	1.5	.57	.90	.59	.65
19. Processing what I might encounter en route to a call.	5.8	1.2	.68	.90	.73	.46
20. Handling the humour associate with my job.	5.6	1.1	.66	.90	.70	.51

Note. *N* = 155. CIT = Corrected item-total correlations. CID = Cronbach's α if item deleted. *F* = *Factor loadings;* h^2 = communalities.

Item-total correlations ranged from .17 (Item 10) to .72 (Item 9). Cronbach coefficient alpha would not improve with the exclusion of any item.

FFCSE Exploratory Factor Analysis

EFA results pointed to a single-factor solution, explaining 36.8% of the variance. Factor loadings and communalities of the FFCSE items are displayed in Table 1. Factor loadings ranged from .15 (Item 10 – "Having dreams about difficult calls") to .75 (Item 9 – "Coping with visual reminders of difficult calls"). Communalities ranged from .43 (Item 9) to .98 (Item 10). The scree-plot inspection suggested a single-factor solution.

Given that item 10 presented the lower item-total correlation (*r* = .17) and the lower factor loading (.15), the removal of this item was considered for the subsequent analyses. After removing item 10, the remaining FFCSE 19 items accounted for 38.6% of the total variance; factor loadings ranged from

.38 (Item 16 – "Coping with feelings of guilt") to .75 (Item 9 –"Coping with visual reminders of difficult calls"). Communalities ranged from .44 (Item 9) to .85 (Item 16).

Reliability and Associations with other Variables

FFCSE reliability was calculated through the Cronbach alpha, and a value of .91 was found. Concurrent validity was addressed by calculating Pearson correlation coefficients between the FFCSE score and other measures (psychological flexibility, well-being, perceived stress, depression and anxiety). Results are presented in Table 2.

Table 2

Correlations Between the FFCSE and Other Measures and Their Descriptive Statistics

	M	*DP*	1	2	3	4	5
1. FFCSE	101.52	18.11	—				
2. CompACT	65.15	13.24	.33**	—			
3. WHO-5	17.68	4.63	.21*	.38**	—		
4. PSS-10	14.83	5.78	-.35**	-.53**	-.47**	—	
5. PHQ-4	7.22	2.62	-.19*	-.49**	-.49**	.63**	—

Note. CompACT = Comprehensive assessment of Acceptance and Commitment Therapy processes; WHO-5 = World Health Organization – Five Well-Being Index; PSS-10 = Perceived Stress Scale-10; PHQ-4 = Patient Health Questionnaire-4.

*$p < .050$. **$p < .001$.

The FFCSE was positively and moderately correlated with the CompACT scale, positively and weakly correlated with the WHO-5, negatively and moderately correlated with the PSS-10 and negatively and weakly correlated the PHQ-4.

Data Concerning Sex, Age, Years of Education and Time of Service

No significant differences were found when comparing men and women firefighters scores on the FFCSE ($t_{(153)}$ = -0.26, p = .799; men: M = 97.71; SD = 19.31; women: M = 98.52; SD = 12.46). No significant correlations were found between the FFCSE scores and age, years of education or time of service (p > .050).

Discussion

Self-efficacy has been recognised as a relevant construct concerning performance, mental health, and well-being. Being exposed to a wide range of demanding, potentially traumatic experiences, it is crucial that firefighters perceive themselves as capable of managing stress and trauma exposure. Firefighters' self-efficacy includes perceiving themselves as able to deal with difficult occurrences, injury, or death and handle general stress derived from their profession (Lambert et al., 2012). Thus assessing firefighters' self-efficacy is

useful for better understanding its correlates and defining intervention (clinical or training) strategies targeting firefighters.

In this context, several self-report instruments have been developed to assess self-efficacy applied to various populations and settings. For example, in the civil protection sector, and particularly targeting the specificities of firefighters' work demands, Lambert et al. (2012) developed and tested the Firefighter Coping Self-Efficacy Scale (FFCSE). This self-report measure aims to assess the extent to which firefighters perceive themselves as competent to manage memories associated with tough calls, handle painful feelings related to witnessing injury or mortality, and cope with overall stress inherent to their activities as firefighters.

The current study aimed to translate and validate the European Portuguese version of the FFCSE in a sample of Portuguese firefighters. The Portuguese version items revealed overall good psychometric properties, except from item 10 ("Having dreams about difficult calls"). This item showed a low item-total correlation and a low factor loading. One may hypothesise that the item content may be interpreted as something uncontrollable, one may not choose our dreams, and one may not remember the dreams' content. Therefore, it might be difficult for firefighters to perceive the need to develop competency in dealing with dreams. Although the item-total correlation results are not displayed in the FFCSE development and validation study, item 10 was the second item presenting the lowest factor loading (Lambert et al., 2012).

Exploratory factor analysis (EFA) of the Portuguese version of the FFCSE revealed a single-factor solution. It is worth noting that in the current study, a parallel analysis was used as well as a more robust estimator for ordinal items (WLS) in the EFA, according to Sellbom and Tellegen's recommendations (2019). In the original version (Lambert et al., 2012), a four-factor solution was found. Still, three factors accounted for small variance percentages, and the scree plot examination indicated a single factor solution. The current study results might suggest that using more robust methods in factor analysis may allow higher parsimony in factor extraction, avoiding irrelevant factors to be extracted. To our best knowledge, no other language versions of the FFCSE are available, and this limits the comparison and discussion of the present study results. Nevertheless, it seems that it is viable to measure specific firefighters' self-efficacy as a global construct encompassing a sense of being competent to deal with job requests. These job demands may be related to memories of calls, emotions and feelings derived from observing injury and death, and general stress linked to being a firefighter.

Concerning reliability, the item-total correlations further established the adequacy of the items. As a specific measure of perceived self-efficacy within the firefighters' work setting, it revealed good internal consistency (Field, 2013), similar to that found for the original (Lambert et al., 2012).

In general, correlation results between the FFCSE and measures of psychological flexibility, well-being, perceived stress and psychopathological symptoms of depression and anxiety were in the expected direction. Higher scores in self-efficacy were associated with higher psychological flexibility and well-being and lower levels of perceived stress, depression and anxiety symptoms. However, once more, the absence of other FFCSE validation studies hinders a more in-depth discussion of these results.

No significant differences in the FFCSE scores were found between men and women, and the FFCSE was not significantly correlated with age, years of education and time of service. These results suggest that the FFCSE

may be used among firefighters independently from gender, age, education, and length of time they have been acting as firefighters.

Some limitations should be noted regarding the Portuguese FFCSE version study. The firefighters' recruitment procedure (online survey) comprises some limitations, such as sampling bias, self-selection concerns, or under-representation of the population (Wright, 2005). However, an online survey was the only available option, given that data collection occurred during the pandemic lockdown. Furthermore, online surveys are cost-effective and allow collecting data in a short period (Nayak & Narayan, 2019). It is also worth noting that ethical issues of privacy, anonymity and confidentiality were assured, and these may be challenging topics in online surveys. Future studies should inspect the FFCSE factor structure through confirmatory factor analysis in larger and size equivalent samples of men and women. Moreover, as mentioned earlier, data collection occurred during the Covid-19 pandemic, and it is uncertain whether this may have influenced the results. The Covid-19 unprecedented circumstances have required an unparalleled response from firefighters and remain to change how they operate. It involved changes in several firefighters' domains (e.g., resources, fire department policy and practice, types of calls, fire personnel behavioural health, finances/budget) (Graham et al., 2021). Furthermore, medical leave and absenteeism increased among these first responders (Lima et al., 2020; Prezant et al., 2020). Although previously defined in the study design, the analysis of test-retest reliability was not addressed due to impediments in sample recruitment (a small percentage of firefighters answered the invitation to participate and given the Covid-19 difficult times, no reminders were sent) and should be studied in future studies.

Conclusion

Despite the aforementioned limitations, the FFCSE showed to be a unidimensional, valid and reliable measure of firefighters' perception of their abilities to face the demands of their job. Therefore, the FFCSE may be a relevant contribution to identify areas to be targeted in psychological interventions designed for this specific professional group. Lastly, to our knowledge, the current study is the first to contribute to the availability of a FFCSE version in a different language, which may promote cross-cultural research, and it is worth noting that Portuguese is spoken all around the world, by about 279 million people (World Population Review, 2021).

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