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Self-efficacy in Higher Education for Students "over the age of 23": study of a scale

Autoeficácia em Estudantes do Ensino Superior "maiores de 23 anos": estudo de uma escala

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Abstract

Objective
The present study aims to study the psychometric qualities of the Higher Education Self-efficacy Scale, applied to a particular group of students, generically called "over the age of 23".

Method
This scale was administered online to a convenience sample, consisting of 250 Portuguese students.

Results
Confirmatory Factor Analyses revealed an acceptable fit of the original three-factor model and of a proposed second-order model. The results also revealed internal consistency reliability evidence (assessed using Cronbach's alpha, composite reliability and omega coefficients) and measurement invariance across both groups defined by employability as a reason to enroll in higher education.

Conclusion
High correlations between the three first-order factors and lack of discriminant validity evidence (assessed using Average Variance Extracted) between two of them raised questions about subscore utility, with the further analysis pointing to the lack of sufficient evidence that these should be reported instead of just a single total score.

Keywords: Factor analysis; Higher education; Psychometrics; Self efficacy.

Resumo

Objetivo
O presente estudo pretendeu estudar as propriedades psicométricas da Escala de Autoeficácia na Formação Superior aplicada a um grupo de estudantes, genericamente denominados "maiores de 23 anos".

Método
Esta escala foi administrada online a uma amostra de conveniência, constituída por 250 estudantes Portugueses.

Resultados
Análises Fatoriais Confirmatórias revelaram um ajuste aceitável do modelo tri-fatorial original e de um modelo de segunda-ordem proposto. Os resultados também revelaram evidências de consistência interna (avaliada através dos coeficientes alfa de Cronbach, fiabilidade compósita e ómega) e invariância de medida entre dois grupos definidos pela empregabilidade como razão para aceder ao ensino superior.

Conclusão
Elevadas correlações entre os fatores de primeira ordem e falta de evidência de validade discriminante (avaliada através da Variância Extraída Média), entre dois deles, questionaram a utilidade de subscores, com uma posterior análise a apontar para a falta de suficiente evidência de que estes deverão ser reportados em vez de um único score total.

Palavras-chave: *Análise fatorial; Educação Superior; Psicometria; Autoeficácia.*

To promote equal opportunities in the access to higher education, and to attract new audiences, the Program of the XVII Portuguese Constitutional Government established, in 2006, a new opportunity to enroll in higher education, for adults over 23 years of age, with the respective conditions being defined in the Decree Law 64/2006. The enrolment of these adults in higher education involves a decision-making process that encompasses not only factors of macrosocial and structural nature, but also factors of individual nature (Dotta et al., 2020; Dunne, 2019), which include the perception of self-efficacy when facing the tasks and challenges posed during the attendance of a higher education class (Guerreiro-Casanova & Polydoro, 2011b; Polydoro & Guerreiro-Casanova, 2015; Wong & Chiu, 2019).

Formative self-efficacy is the student's belief in his or her own self-regulatory skills and competences during the learning process, constituting a relevant construct in terms of academic experiences (Azzi et al., 2014). It is a construct, rooted in Social Learning Theory, which predicts that the achievements resulting from intellectual and learning aspects are dependent on the individual's capability to organize and execute the necessary actions to achieve his or her goals (Bandura, 1993).

Self-efficacy in higher education is regarded as an essential aspect when addressing the multidimensional development of students, their integration and permanence in higher education, as well as their academic success, in other words, the set of experiences that characterize higher education (Barros et al., 2019; Guerreiro-Casanova & Polydoro, 2011a) and predicts academic satisfaction (Santos et al., 2019). The decision to use the term 'self-efficacy in higher education' rather than 'academic self-efficacy' reflects this need to meet the specificities of the educational context, which has preferentially been used in research in this area (Polydoro & Guerreiro-Casanova, 2010).

Although self-efficacy is not, itself, a guarantee of success, it is a strong predictor of performance in an educational context (Erb & Drysdale, 2017; Kahu & Nelson, 2018; Polydoro & Guerreiro-Casanova, 2010). Indeed, its dynamic and developmental nature presupposes that this belief refers to the individual's life history, with regard to previous learning experiences, to learning situations based on models (or through imitation), to social pressure, when others expect a good performance from the individual, as well as to the individual's physical and emotional state (Guerreiro-Casanova & Polydoro, 2011a, 2011b). Thus, self-efficacy belief interferes with the intentionality and self-regulation of the student's action, with self-reflection, which facilitates self-assessment of one's own actions, and with the construction of cognitive representations about future actions, that is, the anticipation of actions that motivate behavior (Bandura, 1993). In the context of higher education, self-efficacy of students "over the age of 23" has been highlighted

(Barros et al., 2019) and significantly higher levels have been reported when compared to traditional student's self-efficacy levels (Erb & Drysdale, 2017).

There are several instruments to assess self-efficacy in educational contexts. Scales, which are a common option, evaluate different dimensions of the learning process, of which participation in the school environment is an example. The perceptions students have about their own ability tend to be evaluated by expressions such as "how capable am I of...", written in the present tense, integrating differentiating elements about the intensity and breadth of the student's belief. To put it another way, the perceptions about the levels of difficulty of the various tasks to be performed (Guerreiro-Casanova & Polydoro, 2011b; Polydoro & Guerreiro-Casanova, 2015).

The scarcity of studies on the psychometric qualities of the Multidimensional Scale of Perceived Self-efficacy (MSPSE), presented by Bandura (1990), facilitated the emergence of other scales. In the context of higher education, the Perceived Academic Self-Efficacy Scale (Sá, 2006), comprising 20 items, presents adequate internal consistency and is structured in four factors that explain 58% of the variance (perceived academic self-efficacy to handle tasks that require exposure of intrapersonal academic needs; perceived academic self-efficacy to perform cognitive tasks; perceived academic self-efficacy to handle tasks that require interpersonal exchanges; and perceived academic self-efficacy to perform tasks that entail organizing time and priorities). However, in the present study, the *Escala de Autoeficácia na Formação Superior* (EAFS, Higher Education Self-efficacy Scale), which has already been adapted and subsequently validated for the Portuguese context, was selected. This instrument has been used in different studies, due to its recognized psychometric qualities (Vieira et al., 2017). The original version, developed in Brazil, has an internal consistency of 0.95, organizing its 34 items into five dimensions (academic self-efficacy – 9 items; higher education regulation self-efficacy – 7 items; proactive actions self-efficacy – 7 items; social interaction self-efficacy – 7 items; and academic management self-efficacy – 4 items), which explain 56.7% of the variance of self-efficacy in higher education (Guerreiro-Casanova & Polydoro, 2011a; Polydoro & Guerreiro-Casanova, 2010). The scale validation studies for the Portuguese university population (Vieira et al., 2011; Vieira et al., 2017) resulted in an instrument consisting of 20 items (assessed on a 6-point Likert scale), distributed over 3 dimensions, and the authors confirmed the three-factor model of the scale, based on satisfactory adjustment indices. Despite mentioning the modest predictive potential of the scale as one of the limitations of the EAFS, it is important to emphasize that self-efficacy is not only a very important construct in higher education settings (Guerreiro-Casanova & Polydoro, 2011b; Polydoro & Guerreiro-Casanova, 2010), but also an educational interface for student's engagement (Kahu & Nelson, 2018). This is also true for mature students (Erb & Drysdale, 2017). For this reason, it is important for research to have available instruments that are suitable for new higher education audiences, which include students who enroll through the "over the age of 23" program. Considering both the specificities of these "new" students (Brändle & Ordemann, 2020; Brücknerová et al., 2020; Pearce, 2017), and the responsibility of Higher Education Institutions to meet all student's educational needs (Heagney & Benson, 2017), the present study accepts the suggestion made by Polydoro and Guerreiro-Casanova (2010), to conduct validation studies of the scale, in this case, with "over the age of 23" Portuguese students. This study sought to analyze the psychometric qualities of this scale, in order to find out whether its use with these students is recommendable. One of the sources of evidence proposed in American Educational Research Association et al. (2014), will be evaluated, namely, the validity evidence based on the internal structure, which includes three basic aspects, according to Rios and Wells (2014): dimensionality, measurement invariance and reliability.

Method

Participants

The sample was defined by convenience, according to accessibility, and comprises 250 "over the age of 23" Portuguese students, with ages between 24 and 61 years (*M* = 36.8; *SD* = 9.0). The sample consists mainly of women, with 37.1% being men. Students belong to several public and private higher education Institutions located in the north (50.5%), center (41.8%) and south (7.7%) of Portugal. Courses in the following areas: Law and Economics (26.1%), Management (22.4%), Health (22.0%) and Human and Social Sciences (13.5%) were the most representative. In terms of education levels, 69.6% of the participants enrolled in higher education after completing High School Education and mainly for employability reasons (52.4%).

Instruments

The EAFS, already adapted and subsequently validated for the Portuguese context (Vieira et al., 2009; Vieira et al., 2011), is an instrument consisting of 20 items, assessed on a 6-point Likert scale, ranging from 1 (Not at all confident) to 6 (Very confident). The items are distributed along three dimensions, all of which exhibit good internal consistency: (i) "Academic self-efficacy" (7 items) – confidence in the ability to learn, demonstrate and apply the content of the course (Cronbach's alpha 0.90); (ii) "Self-efficacy in training regulation" (7 items) – confidence in the ability to set goals, make choices, plan, meet deadlines and self-regulate one's actions in the education process (Cronbach's alpha 0.90); and (iii) "Self-efficacy in social interaction" (6 items) – confidence in the ability to establish relationships with peers and professors, in academic and social terms (Cronbach's alpha 0.86). According to Vieira et al. (2017), although no standards are defined for the scale, scores on the sub-scales equal to or less than 3 indicate low levels of self-efficacy in their size, and scores equal to or greater than 5 correspond to beliefs of robust self-efficacy in the scale dimensions.

Table 1
Descriptive statistics of Higher Education Self-Efficacy Scale's items

Item	min	max	Sk	Ku
Item 1	1	6	- 0.95	1.32
Item 2	2	6	- 0.57	0.01
Item 3	2	6	- 0.67	0.16
Item 4	2	6	- 0.93	0.48
Item 5	2	6	- 0.77	0.28
Item 6	1	6	- 1.01	0.79
Item 7	1	6	- 1.16	0.71
Item 8	2	6	- 0.77	0.38
Item 9	2	6	- 0.95	0.76
Item 10	2	6	- 1.08	0.54
Item 11	1	6	- 1.40	2.17
Item 12	1	6	- 1.16	1.53
Item 13	2	6	- 1.24	1.18
Item 14	2	6	- 1.30	1.22
Item 15	2	6	- 1.12	0.78
Item 16	2	6	- 1.15	0.89
Item 17	2	6	-1.02	0.17
Item 18	2	6	- 1.21	1.38
Item 19	2	6	- 1.16	1.39
Item 20	2	6	- 1.00	0.66

Note: min: minimum; max: maximum, Sk: coefficient of skewness; Ku: coefficient of kurtosis.

Procedure

An online questionnaire containing sociodemographic questions and the EAFS was created using Google Forms. Participant's recruitment was done through members of the board of the selected institutions which contacted students by email. When this study began, it was not required to submit it to an Ethics Committee. Therefore, since all the participants are adults and the scale content does not report to sensible data, the authors chose to safeguard ethical issues with requests for authorization from the maximum management bodies of the selected institutions and with the guarantee of anonymity and individual confidentiality of the data collected.

Data Analysis

Analyses were performed using R software (version 4.1.0). Descriptive analysis was performed using psych package (2.1.6), confirmatory factor analyses, and measurement invariance analyses were performed using *lavaan* package (version 0.6-9), evidence of reliability was assessed using internal consistency measures with *semTools* package (version 0.5-5).

Data was treated as continuous, which is appropriate for ordinal data with at least five response categories (Flora, 2020). The normality of the variables was assessed by the skewness (*Sk*) and kurtosis (*Ku*) coefficients. It was considered that $|Sk| < 3$ and $|Ku| < 7$ were indicative of no severe violations from the normal distribution (Finney & DiStefano, 2013; Marôco, 2014).

In the context of Structural Equation Modeling (SEM), the three-factor model of the EAFS was submitted to Confirmatory Factor Analysis (CFA) and, due to the high correlations between factors, a model with a single second-order factor (Self-efficacy in Higher Education) reflecting on the three first-order dimensions was also considered. All Confirmatory Factor Analyses were carried out using robust Maximum-Likelihood estimator (MLR) to account for deviations from normality (Schmitt, 2011). To assess the goodness-of-fit of the models, the following indices were used: Chi-square statistics (χ^2), Comparative Fit Index (CFI), Tucker-Lewis Index (TLI), Root Mean Square Error of Approximation (RMSEA; IC90%RMSEA) and Standardized Root Mean Squared Residual (SRMR). Values of $\chi^2/df \leq 2$, CFI ≥ 0.95, TLI ≥ 0.95, RMSEA ≤ 0.06 and SRMR ≤ 0.08 were considered good, with CFI ≥ 0.90, TLI ≥ 0.90, RMSEA ≤ 0.08 and SRMR ≤ 0.08 also being acceptable (Hu & Bentler, 1999; Kline, 2005; Marôco, 2014). Modification indices (MI > 11; $p < 0.001$) (Marôco, 2014) were considered to improve model fit, when justified by semantic similarity. Also, in the SEM context, convergent validity was evaluated as proposed by Fornell and Larcker (1981). That is, Average Variance Extracted (AVE) larger than 0.50 by each factor was considered to be indicative of convergent validity (Fornell & Larcker, 1981; Marôco, 2014). Acceptable discriminant validity evidence was assumed when squared correlations between every two factors were smaller than each of the factor's AVE (Fornell & Larcker, 1981; Marôco, 2014) or when Heterotrait-Monotrait racio of correlations (HTMT) was less than 0.90 (Henseler et al., 2015).

Reliability was assessed through the internal consistency measures Cronbach's alpha (α) and through Composite Reliability (CR). Values equal to or higher than 0.70 (for α and CR), were considered adequate (Marôco, 2014). Since alpha has been shown to be adequate only when several assumptions are met, namely, equal factor loadings across all items, omega coefficients (ω) were also calculated (Flora, 2020; Savalei & Reise, 2019).

Measurement invariance of the second-order model by employability as a reason to enroll higher education was evaluated using multi-group analysis. Configural invariance was firstly evaluated, assessing the goodness-of-fit indices for the second-order model when simultaneously adjusted to both groups. Next, increasing constraints were imposed to first-order factor loadings, second-order factor loadings, item intercepts and intercepts of the first-order latent variables between groups (Rudnev et al., 2018). At each level, constrained and free models were compared and $\Delta CFI \leq -0.005$ supplemented by $\Delta RMSEA \geq 0.010$ were used as a criterion for lack of invariance (Chen, 2007).

Due to the high correlations between the three first-order factors and lack of discriminant validity evidence between two of them we assessed sub score utility. For this purpose, omega coefficients and hierarchical omega coefficients (ωh) for each first-order factor were compared (Rodriguez et al., 2016).

Results

There were no missing answers from the 20 items of the EAFS and no indicators of severe violations to the normal distribution (Table 1).

Results of the confirmatory factor analysis did not show an acceptable fit of the original three-factor model of the EAFS: χ^2 (167) = 408.81; $p < 0.001$; CFI = 0.922; TLI = 0.912; RMSEA = 0.092; RMSEA 90% CI =]0.081; 0.103[and SRMR = 0.044. Taking into account the modification indices (MI > 11; $p < 0.001$) and semantic similarity, the residuals of items 2 ("In the evaluation moments demonstrate what I have learnt during the course") and 3 ("Meet the requirements of my course") (from academic self-efficacy factor), of items 11 ("Make efforts in my academic activities") and 12 ("Motivate myself to do the course's activities") and of items 14 ("Complete the course work within the established deadlines") and 15 ("Plan to carry out the activities requested by the course") (from self-efficacy in training regulation factor) were allowed to be correlated. The fit of the modified model is considered acceptable: χ^2 (164) = 280.40; $p < 0.001$; CFI = 0.963; TLI = 0.957; RMSEA = 0.064; RMSEA 90% CI =]0.051; 0.077[and SRMR = 0.040. Figure 1 presents the three-factor model, with correlations between factors and standardized factor loadings for each item. All standardized factor loadings are statistically significant ($p < 0.001$) and higher than 0.50.

Convergent validity evidence was good for all three factors, since AVE is higher than 0.50 for all of them (Table 2).

Table 2 also presents the correlations and the heterotrait-monotrait racio of correlations between factors. Regarding discriminant validity evidence, squared correlations between every two factors are always higher than each of the factor's AVE. However, HTMT value is lower than 0.90, between academic self-efficacy and each one of the other two factors, thus pointing to acceptable evidence of discriminant validity between these factors. The HTMT value between self-efficacy in training regulation and self-efficacy in social interaction is equal to 0.92 which points to the lack of discriminant validity evidence between these two factors. These problems are related to discriminant validity seem to be due to the high correlations between the three latent variables, pointing to a possible higher-order factor.

Results of the confirmatory factor analysis show an acceptable fit of the second-order model of the EAFS, with a single second-order latent factor reflecting on the three first-order dimensions: χ^2 (164) = 280.40; $p < 0.001$; CFI = 0.963; TLI = 0.957; RMSEA = 0.064; RMSEA 90% CI =]0.051; 0.077[and SRMR = 0.040 (which are the same values as those obtained for the first-order model).

Figure 1

Three-factor model of the Higher Education Self-Efficacy Scale adjusted to a sample of 250 "over the age of 23" Portuguese students

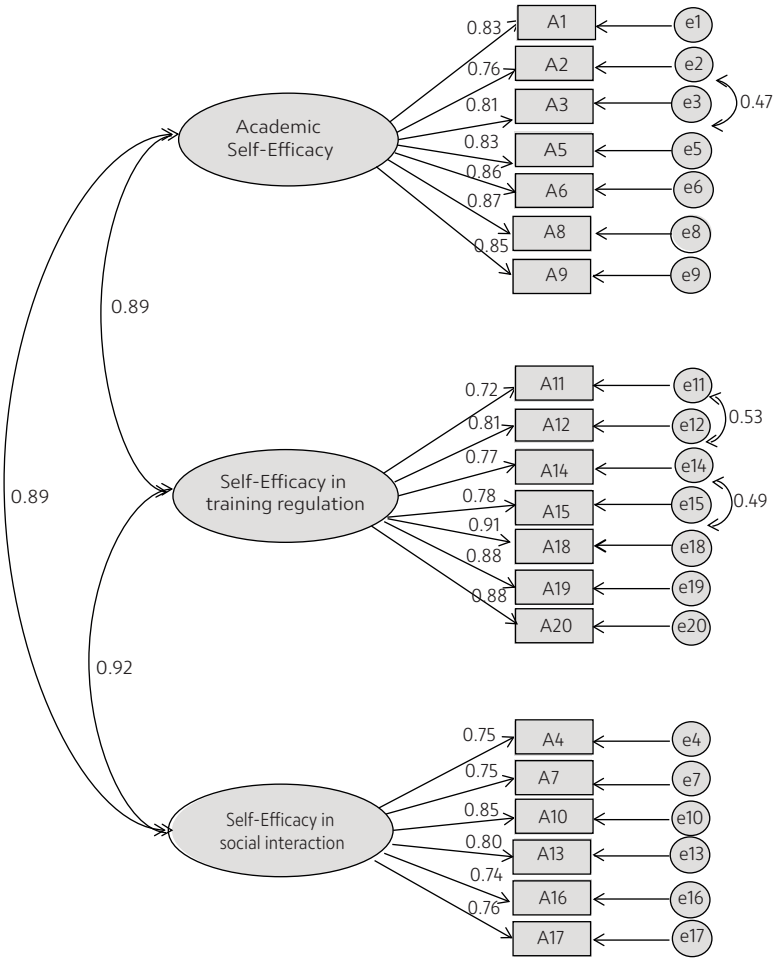


Table 2

Correlations between factors (lower triangular matrix), heterotrait-monotrait racio of correlations between factors (upper triangular matrix), average variance extracted (main diagonal, bold), Cronbach's alpha, composite reliability and omega coefficient for each first-order factor of the Higher Education Self-Efficacy Scale

Factor	AS	STR	SSI	Internal consistency coefficients		
				α	CR	ω
AS Academic Self-efficacy	**0.69**	0.88	0.88	0.94	0.94	0.93
STR Self-efficacy in training regulation	0.89	**0.68**	0.92	0.94	0.94	0.91
SSI Self-efficacy in social interaction	0.89	0.92	**0.60**	0.90	0.90	0.90

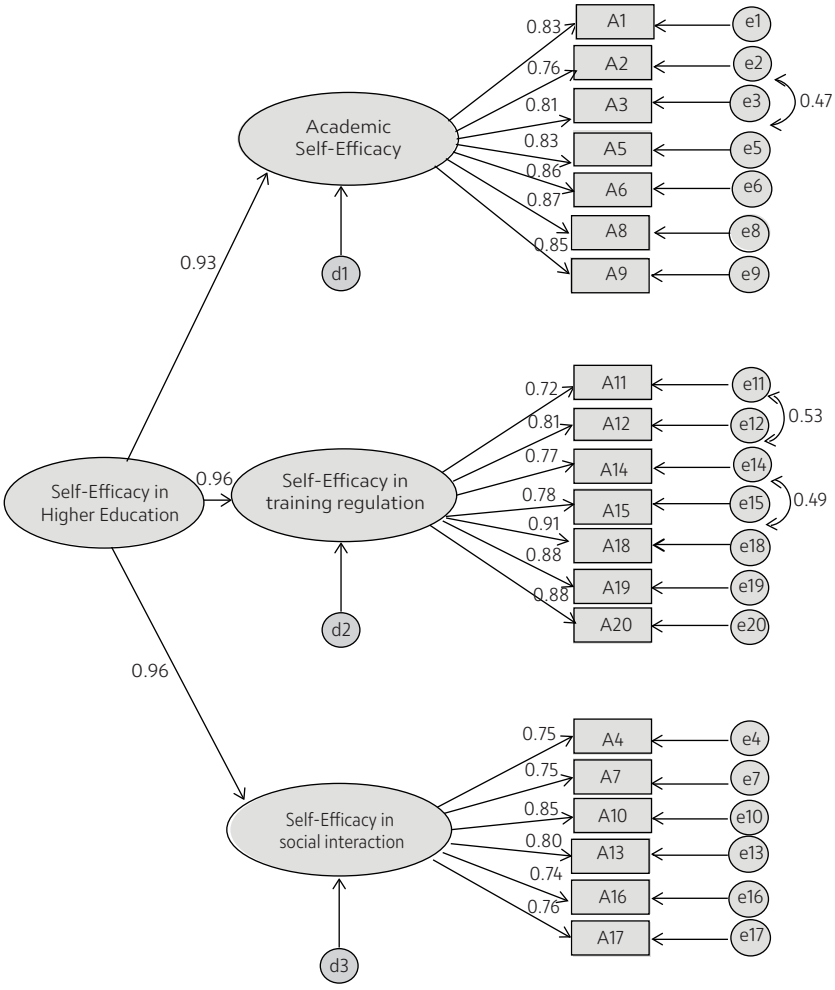
Note: AS: Academic Self-efficacy; STR: Self-efficacy in training regulation; SSI: Self-efficacy in social interaction; α: Cronbach's alfa; CR: Composite Reliabilit; ω: omega coefficient. Bold values correspond to the average variance extracted.

The AVE value for the second-order factor is 0.90 and the structural weights for the second-order model are all statistically significant ($p < 0.001$) and ranging between 0.93 and 0.96, which seems to suggest that, for "over the age of 23" students, self-efficacy in higher education reflects equally on academic self-efficacy, self-efficacy in training regulation and self-efficacy in social interaction. Figure 2 presents the second-order model, with structural weights and standardized factor loadings for each item.

Cronbach's alpha, composite reliability and omega coefficient values were all equal or higher than 0.90 for all three EAFS first-order factors (Table 2). Additionally, CR = 0.96 and ω = 0.93 for the second-order factor. These results provide evidence of good internal consistency reliability.

Figure 2

Second-order model of the Higher Education Self-Efficacy Scale adjusted to a sample of 250 "over the age of 23" Portuguese students



The second-order model was simultaneously adjusted to both groups defined by employability as a reason to enroll higher education and results of the confirmatory factor analysis show an acceptable fit (configural invariance) (Table 3). Furthermore, ΔCFI and ΔRMSEA values presented in Table 3 allow us to conclude that the invariance of the first-order factor loadings, second-order factor loadings, item intercepts and intercepts of the first-order latent variables is supported by both criteria. Thus, measurement invariance was found across these two groups.

Although the loadings between the higher-order and first-order factors were very high, thus justifying reporting an overall score, the high correlations between the first-order factors and the lack of discriminant validity evidence between two of those factors raised concern about the utility

Table 3

Higher Education Self-Efficacy Scale model's comparison for measurement invariance by employability as a reason to enroll higher education

Model	χ^2	*df*	*p*	CFI	TLI	RMSEA	SRMR	ΔCFI	ΔRMSEA
Configural	514.97	328	< 0.001	0.946	0.938	0.078	0.047	-	-
1st order factor loadings	532.76	345	< 0.001	0.947	0.942	0.076	0.056	0.001	-0.002
2nd order factor loadings	534.00	347	< 0.001	0.947	0.942	0.075	0.057	0.000	0.000
Item intercepts	554.47	364	< 0.001	0.947	0.945	0.074	0.058	0.000	-0.001
1st order latent variables intercepts	555.89	366	< 0.001	0.947	0.945	0.073	0.058	0.000	0.000

Note: χ^2: Chi-square statistics; df: degrees of freedom; *p*: *p*-value; CFI: Comparative Fit Index; TLI: Tucker-Lewis Index; RMSEA: Root Mean Square Error of Approximation; SRMR: Standardized Root Mean Squared Residual; ΔCFI: difference in CFI value,comparing to the previous model; ΔRMSEA: difference in RMSEA value,comparing to the previous model.

of reporting subscores (Dunn & McCray, 2020). As can be seen in Table 2, ω = 0.93 (for academic self-efficacy), ω = 0.91 (for self-efficacy in training regulation) and ω = 0.90 (for self-efficacy in social interaction). However, with respect to hierarchical omega coefficients, ωh = 0.15, ωh = 0.04 and ωh = 0.06, respectively, which are must lower than the correspondent omega coefficients, thus suggesting that most of the reliable variance of the EAFS sub-scales are attributable to the general factor self-efficacy in higher education, rather than to specific constructs that are independent from that general factor thus having ambiguous interpretations (Flora, 2020; Reise, 2012; Rodriguez et al., 2016).

Discussion

In the Portuguese context, although Decree Law 64/2006 provides special conditions to access higher education for students over 23 years of age, it is necessary to assess the factors that contribute to these student's decision to enroll in higher education and to avoid subsequent dropouts. One of these factors is the self-efficacy, which, in higher education, proves to be decisive for academic performance and experiences (Erb & Drysdale, 2017; Guerreiro-Casanova & Polydoro, 2011b; Kahu & Nelson, 2018; Polydoro & Guerreiro-Casanova, 2010; Wong & Chiu, 2019). The scale analyzed in this article, the EAFS (Vieira et al., 2017), is one of the instruments used to assess self-efficacy in higher education. In our study, focused on students "over the age of 23", a Confirmatory Factor Analysis was used to analyze the goodness-of-fit of the original three-factor model (academic self-efficacy, self-efficacy in training regulation and self-efficacy in social interaction). Based on the modification indices, the residuals of items 2 and 3, items 11 and 12 and of items 14 and 15 were allowed to be correlated and the adjusted model's fit was good. Since the need to correlate these residuals was not found in other studies (to our knowledge) and, from a theoretical point of view, the necessity to add those correlations seems to be due to similar item content, it is possible that "over the age of 23" students interpreted the aforementioned items as having the mentioned similar content. Indeed, (i) students over 23 years of age associate more clearly the requirements of the course with the moments of evaluation that attest to the success in the different curricular units by the greater responsibility and maturity intrinsic to adulthood (items 2 and 3); (ii) the understanding of the motivation for academic activities is specifically articulated with the effort invested in them (items 11 and 12); and (iii) the planning of the performance of academic activities is particularly related to the completion of the work within the established deadlines, by the conciliation required with other life activities, namely in professional, parental and family domains (items 14 and 15).

Convergent validity was evaluated as proposed by Fornell and Larcker (1981) and its evidence was good for all three factors. However, there were problems regarding discriminant validity (evaluated with a combination of the method proposed by the aforementioned authors and HTMT criterion), since there was lack of discriminant validity evidence between self-efficacy in training regulation and self-efficacy in social interaction. These problems seemed to be due to high correlations between factors, something that also occurred in Vieira et al. (2011) with another sample (correlations ranging from 0.68 to 0.82). In our study, those correlations were even higher, which seems to justify the lack of discriminant validity evidence. We notice that the literature focused on the contents of the three-factor model (academic self-efficacy, self-efficacy in training regulation and self-efficacy in social interaction) is not always consensual (Duarte et al., 2018; Lin & Wang, 2018). For example, on the one hand, mature students seem to feel more isolated from school community, have a lower sense of belonging and seem to struggle with school engagement,

when compared to younger students (Erb & Drysdale, 2017). On the other hand, this pattern of mature student's academic integration is questionable, if we take into consideration the teaching-learning strategies often adopted in Higher Education, such as collaborative learning, flexible learning pathways, metacognitive strategies for self-regulation of learning, peer mentoring and the establishment of social networks (Goeman & Deschacht, 2018; Lin & Wang, 2018; Muhisn et al., 2019). In fact, the social and emotional components are more and more valued in the learning processes, independently of the face-to-face, online or blended learning modalities, and increases social ties between students, school and peers (Duarte et al., 2018; Jiang & Koo, 2020). This means that self-efficacy in social interaction is required for the investment in learning activities, in line with mature student's tendency to have a sense of control and an ability to learning regulation (or, in other words, to be effective in training regulation). In this scenario, academic self-efficacy is also closer to self-efficacy in social interaction, because mature students are prompted to share knowledge with their peers through socialization process, an important aspect for knowledge management and self-efficacy in training regulation (Muhisn et al., 2019).

The high correlations between first-order factors (academic self-efficacy, self-efficacy in training regulation and self-efficacy in social interaction) led us to test a second-order model with a second-order latent factor (Self-efficacy in Higher Education) reflecting on the three first-order dimensions of self-efficacy evaluated by EAFS. The higher-order construct was also considered in Casanova et al. (2018), but with a sample of first-year students from a public Portuguese university. Moreover, that study aimed to analyze the impact of several variables in the intention of leaving higher education studies, considering the mediating effect of self-efficacy and, for that purpose, the authors considered self-efficacy in higher education as a second-order latent-factor reflecting on the three first-order dimensions. However, no analysis was presented to justify this option. Therefore, the presented analyses, involving a second-order latent factor are, to our knowledge, a novelty of our study.

Confirmatory Factor Analysis revealed an acceptable fit of the second-order model. Furthermore, the analysis of the second-order factor loadings seems to suggest that, for "over the age of 23" students, self-efficacy in higher education reflects equally on academic self-efficacy, training regulation and social interaction.

Internal consistency reliability, as evaluated by Cronbach's alpha, composite reliability and omega coefficients was good for all three first-order factors, similarly to what was obtained in other studies with other samples (Vieira et al., 2009; Vieira et al., 2011). However, in these studies, omega coefficients were not used. Thus, our study adds to the literature by providing more appropriate evidence of reliability (e.g., omega coefficient). Composite reliability and omega coefficient values for the second-order factor also provided evidence of good internal consistency reliability.

Measurement invariance of the second-order model was found across both groups defined by employability as a reason to enroll higher education, which allows mean scores to be compared between the group of students that indicate employability as a reason to enroll higher education and the group of students that do not. These findings are another novelty of our study and will enable the future use of the EAFS scale in comparative studies of self-efficacy in higher education between the considered groups.

Our study is, to our knowledge, the first study of the psychometric qualities of the EAFS applied to "over the age of 23" Portuguese students. Overall, the results indicate that, when applied to "over the age of 23" students, EAFS seems to be an instrument with adequate psychometric

characteristics, allowing mean scores comparisons between both groups defined by employability as a reason to enroll higher education. However, the high correlations between first-order factors and the lack of discriminant validity evidence between two of those raised concern about the utility of reporting subscores. Indeed, to report subscores separately, "each subscore should require a sufficiently distinct aspect of ability from the other subscales" (Dunn & McCray, 2020, p. 2). The comparison of omega coefficients and hierarchical omega coefficients for each first-order factors led to the conclusion that, with our sample of "over the age of 23" students, sub-scale scores did not reflect reliable variance independent from the general factor, thus having ambiguous interpretations (Rodriguez et al., 2016). This seems to suggest only reporting an overall score, when using EAFS to access self-efficacy in higher education among "over the age of 23" students.

It should be noted that the use of a convenience sample is a limitation of our study. Similar studies of validation of the scale, with independent and larger samples of "over the age of 23" Portuguese students are suggested. This study was a preliminary exercise that lacks future studies, namely, regarding validity evidence based on relations to other variables (American Educational Research Association et al., 2014), which could also allow to gather additional information about convergent and discriminant validity evidence. Because there were less than 100 men in our sample, measurement invariance across gender was not tested, following the guidelines of Angell (2019). Thus, future studies with samples of at least 100 males and 100 females "over the age of 23" students are suggested, to test measurement invariance across gender. Further analyses related to the dimensionality of the scale are also suggested. Considering that reducing drop-out rates is an important goal in Portuguese Higher Education, our recommendation of further studies focused on this self-efficacy scale in students "over the age of 23" becomes relevant. The evaluation of dispositional barriers through appropriate tools, such as the lack of self-efficacy or motivation (Novotný et al., 2019), is the first step for intervention planning in the context of Higher Education Institutions In addition, knowledge production, through research focused on these students, supported on valid instruments is welcomed. This is one of the paths to the democratization process in the Portuguese Higher Education Institutions, in line with the Lifelong Learning and Sustainability policies (Akther, 2020).

Conclusion

When applied to "over the age of 23" Portuguese students, EAFS revealed a three-factor structure that appears to be indicative of a higher-order construct (Self-efficacy in Higher Education). We are in line with previous studies not particularly focused on mature students, therefore we recommend, for now, its use. The overall results suggest that, when applied to these students, EAFS seems to be an instrument with adequate psychometric characteristics that also can be used to compare the group of students that indicate employability as a reason to enroll higher education and the group of students that do not, which could suggest its use in future studies of self-efficacy in higher education with "over the age of 23" students. However, due to the high correlations between factors and the lack of discriminant validity evidence between two of them, the utility of reporting subscores is questioned and further analysis seems to suggest only reporting and interpreting the total score, when using EAFS to access self-efficacy in higher education among "over the age of 23" Portuguese students. Therefore, further studies on the dimensionality of the scale should be conducted, namely by exploring a bi-factor model.

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