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Factorial Composition of the Self-efficacy Teamwork and Entrepreneurship Scale in Mexican University Students

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Abstract: The present study aims to investigate whether the psychometric results proposed by Gastélum, Guedea, Viciana, and Peinado (2012) for the Self-efficacy Teamwork and Entrepreneurship Scale replicate. The total sample was of 2004 subjects; 1139 women and 865 men, students of the degrees offered at the Autonomous University of Chihuahua, with an mean age of 18.67 years (SD = 1.50). The factorial structure of the questionnaire was analyzed by a confirmatory factor analysis. The analysis shows that a two-factor structure is viable and appropriate. The structure of two factors (teamwork and entrepreneurship), based on statistical and substantive criteria, has shown adequate adjustment indicators of reliability and validity. Furthermore, the results of the factor analysis conducted with the subsamples, indicate the existence of strong evidence of the stability of the factor structure. Future research should replicate these findings in larger samples.

Keywords: Self-efficacy, Factorial Structure, Construct Validation, Structural Equation

1. Introduction

People's behavior, according to Bandura [1], can be better predicted by the beliefs that individuals have about their own capabilities, than by what they can really do, since these perceptions contribute to delineate what is that people do with the skills and knowledge they possess [2, 3]. This perception, called self-efficacy, exerts a profound influence on the election of tasks and activities, in the effort and perseverance of people when they face certain challenges and even in the emotional reactions that they experience in difficult situations [4]. In short, self-efficacy beliefs represent a cognitive mechanism that mediates between knowledge and action and determines, along with other variables, the success of the personal actions [5, 6].

For most cases Bandura [1, 7] suggests that the perceived self-efficacy should be conceptualized in a specific way. Perceived self-efficacy refers to people's beliefs about their own abilities to achieve certain results. Therefore, the belief system of efficacy is not a global feature but a group of self-beliefs linked to distinct areas of functioning [7, 8].

As an example of the importance of self-efficacy in the academic sphere, we can say that this reveals why people with the same level of skills and knowledge present behaviors and/or different results, or why people act in dissonance with their skills [9, 10]. This is because the adequate academic performance also depends on the perceived efficacy to successfully manage academic demands. Therefore, self-efficacy beliefs in one's ability are indispensable to master the academic activities; since students that trust in their capabilities are more motivated to achieve their goals [8]. Likewise, people who doubt in their capabilities can believe that things are more difficult than they really are, belief that generates stress, depression and a narrow vision to solve problems [4]. It has been shown that a low level of self-efficacy may be responsible of, not only reduced academic performance and interest in the study, but also inappropriate adjustment behaviors in young people [11], hence the importance that education strengthens the development of academic competence in students and encourage skills that enable them to believe in their own abilities [5, 12].

For all the above, this research is based on the premise that the perceived academic self-efficacy is an important mediating factor in how people feel, think, motivate and behave; so measuring the perception of academic self-efficacy in the learner is extremely important in the study of how to facilitate progress and educational success, as well as

to minimize the risk of leaving school [13, 14].

This paper analyzes the internal consistency and the factor structure of a self-report instrument that allows to identify academic behaviors in the field of teamwork and Entrepreneurship, whose level of perceived self-efficacy in the students represent an opportunity area; in relation to the rest of the students, providing evidence and data that promote the educational intervention within a perspective of attention to diversity in the classroom.

Therefore, the present instrumental study [15] is aimed to provide empirical support for the factorial division proposed by [16] for the Self-efficacy Teamwork and Entrepreneurship Scale; which it is justified by the importance of checking the factorial structure of the instrument and the psychometric equivalence of it in different groups; since in the context of intergroup comparison, it is essential to consider the need to conduct the adaptation of an instrument of psychological measure that would meet all the criteria of equivalence, but above all, consider whether the same factorial structure is applicable to different groups of subjects or, more generically, to different populations [17]. So in the present study, the interest is not only in the structure of the instrument, but also in the psychometric equivalence of it in different groups.

2. Methods

2.1. Participants

The sample of 2004 subjects, 865 women and 1139 men was obtained by a convenience sample, trying to cover the representation of the different degrees offered at the Autonomous University of Chihuahua. The age of participants ranged between 17 and 26 years, with a mean of 18.67 and a standard deviation of 1.50 years.

The sample was randomly divided into two parts using the Statistical Package for Social Sciences (SPSS) version 18.0; in order to perform parallel studies to corroborate and verify the results (cross validation).

The subsample 1 was composed of 983 subjects. Ages ranging between 17 and 26 years, with a mean of 18.66 and a standard deviation of 1.49 years.

The subsample 2 I was composed of 1021 subjects. Ages ranging between 17 and 26 years, with a mean of 18.67 and a standard deviation of 1.48 years.

2.2. Instrument

The self-efficacy in teamwork and entrepreneurship was measured by the Self-efficacy Teamwork and Entrepreneurship Scale [16]. This questionnaire consists of an 16-item scale with two subscales: teamwork (8 items) and entrepreneurship (8 items). According to previous studies [3, 18], due to the fact that in the Mexican academic context students are commonly assessed by a scale from 0 to 10, in the present study a Likert-type scale from 0 to 10 was chosen. For each domain (item) of the teamwork and entrepreneurship competences (subscales), the participants were asked about how capable they feel, how much interest they have, and if they would make an effort to change how capable they will be to... Therefore, all the participants responded to each of the 16 items of the questionnaire in the three different scenarios: (a) Scenario of perceived ability, responding in the context "how capable I feel to… to manage in each of the domains of the competences above mentioned"; (b) Scenario of interest in being able, responding in the context "how much interest I have in being able to... to manage in each of the domains of the competences above mentioned"; and (c) Scenario of change to be able to, responding into the context "if I would make an effort to change, how much capable I will be able to... to manage in each of the domains of the competences above mentioned".

2.3. Procedure

Students of the degrees offered at the Autonomous University of Chihuahua were invited to participate. Those who agreed to participate signed the consent letter. Then, the instrument described above was applied using a personal computer (administrator module of the instrument of the scales editor of typical execution), in a session of about 30 minutes in the computer labs of the participating faculties.

At the beginning of each session students were given a brief introduction on the importance of the study and how to access the instrument; they were asked the utmost sincerity and they were guaranteed the confidentiality of the data obtained. Instructions on how to respond were in the first screens; before the first instrument item.

At the end of the session they were thanked for their participation. Once the instrument was applied, data was collected by the results generator module of scales editor, version 2.0 [19].

2.4. Data Analysis

The first step in analyzing the psychometric properties of the questionnaire was to calculate the mean, standard deviation, skewness, kurtosis and discrimination indexes of each item. Then remove of the scale those who obtain a kurtosis or extreme asymmetry, or a discrimination index below 35.

Then, were submitted to comparison two models: Model 1 (M1), one-factor model and Model 2 (M2), which responds to a two-factor structure according to the original distribution of the items of the questionnaire.

To conduct the confirmatory factorial analysis, AMOS 21 software was used [20], variances in terms of error were specified as free parameters, in each latent variable (factor) a structural coefficient was set associated to one, so that scale was equal to one of the observable variables (items). The estimated method used was the maximum credibility; following the recommendation of Thompson [21], so when the confirmatory factorial analysis is used, it is necessary to verify not only the adjustment of the theoretical model but it is recommended to compare the fit indices of some

alternative models to select the best.

To evaluate the adjustment model, statistical chi-squared, the Goodness-of-fit index (GFI) adjustment, and the root mean square error of approximation (RMSEA) were used as absolute adjustment measures. Adjusted goodness of fit index (AGFI) the Tucker-Lewis Index (TLI), the comparative fit index (CFI) as measures of increasing adjustment. The chi-squared fit index divided by degrees of freedom (CMIN/GL) and the Akaike Information Criterion (AIC) as adjusting measures of Parsimony [22, 23].

Subsequently, following the recommendations of Abalo et al. [17], was made an analysis of the factorial invariance of the questionnaire for the subsamples, taking as a base the best measurement model obtained in the previous stage.

Finally was calculated the reliability of each of the dimensions, the measurement models obtained in each subsample, through Cronbach's alpha [24, 25] and Omega coefficient [26, 27].

3. Results

Descriptive analyzes and discrimination indexes

In Table 1 are summarized the results of the descriptive analysis and the discrimination indexes (total-item correlation corrected) of each of the 16 items on the questionnaire in the total sample. The answers to all items reflect mean scores ranging between 7.42 and 8.35, and standard deviation offers, in all cases, higher values than 1.40 (within a response range between 0 and 10). With the exception of the items 3 and 11, all values of skewness and kurtosis are within ± 2.5; so is inferred that the variables are reasonably fit to a normal distribution. Regarding discrimination indexes of all items, they discriminate satisfactorily by discrimination indexes above 0.35 [28].

Confirmatory Factorial Analysis

The global results of the confirmatory factor analysis in the subsample 1 (GFI .788; RMSEA .119; .863 IFC) and the subsample 2 (GFI .784; RMSEA .121; IFC 851) for M1 model corresponds to a unifactorial distribution of the items in the questionnaire, indicate that the measurement model, in both subsamples is not acceptable (Table 2).

The factor of the model M1 explains approximately the 56.12% of the variance in the first sub-sample and the 54.25% of the variance in the second subsample. Furthermore, 4 of the 16 items (items 1, 3, 11 and 12) in the first subsample and 6 of the 16 items (items 1, 3, 5, 11, 13 and 16) in the second subsample saturates below .70 in its dimension provided in both, the first and second subsample.

The overall results of the confirmatory factor analysis in the first (GFI .953; RMSEA .054, CFI .974) and second subsample (957 GFI, RMSEA .052; .974 IFC), of the second model tested (M2) that corresponds to a two-dimensional structure of the questionnaire, indicates that this measurement model is better than the previous model and its setting is optimal (Table 2). The two factors of this model explain altogether, in both sub-samples more than 60% of the variance.

Furthermore according to the results of Table 3 only one of the 16 items, in both subsamples saturates below .70 in its intended dimension. Also was observed moderate intercorrelations among factors, showing a not very adequate discriminant validity between them.

Invariance of the factor structure between subsamples

The fit indexes obtained (Table 4) allow to accept the equivalence of the basic measuring models between the two subsamples. Although the value of Chi-squared exceeds to that required to accept the hypothesis of invariance, the GFI = .955, CFI = .974, RMSEA = .038 and AIC = 901 923 indexes contradict this conclusion allowing us to accept the base model invariance (unrestricted model).

Table 1. *Descriptive Analysis and discrimination indexes of the questionnaire items Self-efficacy Teamwork and Entrepreneurship Scale ". Total sample.*

Item	M	SD	AS	CU	$r_{i\text{-}total}$
Item 1	7.74	1.72	-1.22	2.19	.64
Item 2	7.54	1.73	-1.16	1.95	.72
Item 3	7.94	1.67	-1.43	3.19	.65
Item 4	7.95	1.54	-1.16	2.22	.71
Item 5	7.56	1.68	-.99	1.62	.70
Item 6	7.45	1.77	-1.07	1.62	.71
Item 7	7.98	1.60	-1.17	2.10	.70
Item 8	7.51	1.73	-1.11	1.72	.78
Item 9	7.70	1.72	-1.16	1.94	.73
Item 10	7.65	1.73	-1.20	2.10	.71
Item 11	8.35	1.49	-1.43	3.27	.63
Item 12	7.86	1.67	-1.16	1.97	.70
Item 13	8.09	1.54	-1.17	2.09	.68
Item 14	7.42	1.79	-1.02	1.37	.70
Item 15	7.88	1.52	-1.23	2.44	.76
Item 16	7.55	1.80	-1.12	1.69	.70

Note: M = mean; SD = standard deviation; AS = asymmetry; CU = kurtosis; ri-Total = total-item correlation corrected.

Table 2. *Absolute, incremental and Parsimony fit indexes for the generated models. Subsamples 1 and 2.*

	Absolute indexes			Incremental Indexes			Parsimony Idexes	
Model	χ^2	GFI	RMSEA	AGFI	TLI	CFI	CMIN/DF	AIC
First factor solution (subsample 1)								
M1	1554.459*	.788	.119	.722	.842	.863	14.947	1618.459
M2	377.030*	.953	.054	.935	.968	.974	3.847	453.030
Second factor solution (subsample 2)								
M1	1654.421*	.784	.121	.718	.828	.851	15.908	1718.421
M2	372.893*	.957	.052	.940	.968	.974	3.805	448.893

Note: * p < .05; GFI = goodness of fit index; RMSEA = root mean square error of approximation; AGFI = adjusted goodness of fit index; TLI = Tucker-Lewis index; CFI = comparative fit index; CMIN/DF = chi-squared fit index divided by degrees of freedom; AIC = Akaike information criterion

Table 3. *Standardized solutions confirmatory factor analysis for the M2 Model. Subsample 1 and 2.*

	Subsample 1		Subsample 2	
Item	**F1**	**F2**	**F1**	**F2**
Factor weights				
1 Participate in the development and implementation of plans and projects through teamwork	.74		.70	
3 Comply and ensure compliance of the rules and laws in a social context	.68		.68	
5 Interact in multidisciplinary groups	.77		.74	
7 Identify leadership skills and potential group development	.77		.77	
9 Develop and encourage a culture of teamwork towards a common goal	.80		.80	
11 Show respect, tolerance, responsibility and openness to confrontation and plurality in the group work	.70		.70	
13 Respect tolerate and be flexible to divergent thinking to reach agreement by consensus.	.73		.70	
15 Identify the diversity and contribute in the conformation and personal and group development	.83		.81	
2 Demonstrate capacity to generate employment and self-employment		.80		.77
4 Optimal use of existing resources		.75		.76
6 Using the principles of strategic management in the development of projects		.75		.75
8 Apply methods to promote, implement and evaluate the impact of a project		.81		.83
10 Link the academic environment with the work environment		.76		.77
12 Create and innovate		.72		.78
14 Generate and adapt new technologies in my area		.73		.75
16 Use procedures in the operation of basic technology equipment		.76		.70
Correlations between factors				
F1	-		-	
F2	.86	-	.82	-

Note: F1 = teamwork; F2 = entrepreneurship

Adding to the base model restrictions on factorial loads the metric invariance was characterized. The values shown in Table 4 allow accepting this level of invariance. The goodness of fit index (GFI 0.954) and root mean square error of approximation (RMSEA .037) continue to provide convergent information in this direction. Also, the Akaike Information Criterion (AIC 894 938) and Bentler comparative fit index (IFC 973) do not suffer large variations over the previous model. Using the criteria for the evaluation of the nested models proposed by [29], who suggest that if the calculation of the difference of the CFI of both nested models diminish in .01 or less, the restricted model is taken for granted therefore the compliance of the factorial invariance. The difference of the CFIs obtained allows accepting the metrical invariance model. We can conclude up to this point that factorial charges are equivalent in the two subsamples.

Having demonstrated the metric invariance between the subsamples, we evaluate the equivalence between intercepts (strong factorial invariance). The Indices (Table 4) show a good adjustment of this model, evaluated independent as well as analyzed toward nesting with the metric invariance model. The difference between the two comparative indices of Bentler is .001; and the general adjustment index is .954 and the root mean square error of approximation is .036. Accepted then the strong invariance, the two evaluated models are equivalent toward the factorial coefficients and the intercepts.

The factors obtained in the confirmatory factor analysis, mostly all reached values above 75 of internal consistency in both samples; demonstrating adequate internal consistency for these type of subscales, particularly if it is considered the small number of items (Table 5).

Table 4. *Goodness of fit indices of each of the models testedin the factorial invariance.*

Model	**Fit Indexes**						
	χ^2	**gl**	**GFI**	**NFI**	**CFI**	**RMSEA**	**AIC**
Model without restrictions	749.923	196	955	.965	.974	.038	901.923
Metric Invariance	770.938	210	.954	.964	.973	.037	894.938
Strong factor invariance	775.319	213	.954	.964	.972	.036	893.319

Note: * p < .05; GFI = goodness of fit index; NFI = normed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; AIC = Akaike information criterion

Table 5. *Coefficient omega and alpha for the factors obtained in exploratory factor analysis subsamples 1 and 2.*

	Subsample 1		Subsample 2	
Factor	**Ω**	**α**	**Ω**	**α**
teamwork	.913	.914	.906	.920
entrepreneurship	.781	.903	.788	.922

4. Discussion and Conclusions

The main objective of the study was to investigate whether or not the psychometric results proposed by Gastélum et al. are replicate [16] for the Self-efficacy Teamwork and Entrepreneurship Scale through a sample of university

students using confirmatory factor analysis (CFA). The confirmatory factor analysis conducted in each subsample separately, supports the factorial structure of two factors: teamwork and entrepreneurship obtained by [16] to demonstrate an adequate internal consistency, particularly considering the small number of items in each; at the same time that the factors obtained present in general suitable standardized factor saturations, which correspond to those found in the study of Gastélum et al. [16]. Suggesting also the existence of strong evidence of cross-validation of the measure and therefore the stability of the structure until the contrary is proved.

In summary, the analysis of the psychometric properties of the Self-efficacy Teamwork and Entrepreneurship Scale, have shown, in this study as in the performed by [16], a two-factor structure is viable and appropriate in accordance with established psychometric requirements when informants are the students themselves. The structure of two factors, based on statistical and substantive criteria, has shown adequate indicators of adjustment, reliability and validity. However, the scope of these results is limited, and it is necessary further research to confirm the structure obtained, which will allow to comonterount with a more robust evidence regarding the factorial structure of the scale. Specifically, it must be demonstrated if the invariance of the structure of the scale is accomplished by gender, age, between students from different degrees, among others; so that, considering that more studies are needed in order to confirm or refute the data obtained in investigations carried out so far.

It is also essential to check if the scale is useful to study the relationship between academic self-efficacy and learning.

References

[1] A. Bandura, *Self-efficacy: The exercise of control*, Freeman, New York, 1997.

[2] D.A. Adeyemo, Moderating influence of emotional intelligence on the link between academic self-efficacy and achievement of university students, *Psychology Developing Societies*, Vol. 19, pp. 199-213, 2007.

[3] H. Blanco, M. Martínez, M.d.C. Zueck, G. Gastélum, Análisis psicométrico de la escala autoeficacia en conductas académicas en universitarios de primer ingreso, *Actualidades Investigativas en Educación*, Vol. 11, pp. 1-27, 2011.

[4] M. Vera, M. Salanova, B. Martín-del-Río, Self-efficacy among university faculty: How to develop an adjusted scale, *Anales de Psicología*, Vol. 27, pp. 800-807, 2011.

[5] M.Á. Carbonero, E. Merino, Autoeficacia y madurez vocacional, *Psicothema*, Vol. 16, pp. 229-234, 2008.

[6] M. Ornelas, H. Blanco, G. Gastélum, A. Chávez, Autoeficacia percibida en la conducta académica de estudiantes universitarias, *Formación Universitaria*, Vol. 5, pp. 17-26, 2012.

[7] A. Bandura, Guide for constructing self-efficacy scales, in: F. Pajares, T.C. Urdan (Eds.) *Self-efficacy beliefs of adolescents*, Age Publishing, Inc., Greenwich, 2006, pp. 307-337.

[8] Á. Blanco, Creencias de autoeficacia de estudiantes universitarios: Un estudio empírico sobre la especificidad del constructo, *RELIEVE*, Vol. 16, pp. 1-28, 2010.

[9] A. Bandura, Self-efficacy mechanism inhuman agency, *American Psychologist*, Vol. 37, pp. 122-147, 1982.

[10] E. Pérez, C. Lescano, D. Heredia, P. Zalazar, L. Furlám, M. Martínez, Desarrollo y análisis psicométricos de un inventario de autoeficacia para inteligencias múltiples en niños argentinos *Psicoperspectivas*, Vol. 10, pp. 169-189, 2011.

[11] B. Zimmerman, A. Kitsantas, Homework practice and academic achievement. The mediating role of self-efficacy and perceived responsibility beliefs, *Contemporary Educational Psychology*, Vol. 30, pp. 397-417, 2005.

[12] M. Ornelas, H. Blanco, J.M. Rodríguez, F.J. Flores, Análisis psicométrico de la escala autoeficacia en conductas de cuidado de la salud física en universitarios de primer ingreso, *Formación Universitaria*, Vol. 4, pp. 21-34, 2011.

[13] A.A. Peguero, K.A. Shaffer, Academic self-efficacy, dropping out, and the significance of inequality, *Sociological Spectrum*, Vol. 35, pp. 46-46, 2015.

[14] R. Shkullaku, The relationship between self – efficacy and academic performance in the context of gender among albanian students, *European Academic Research*, Vol. 1, pp. 467-478, 2013.

[15] I. Montero, O. León, Sistema de clasificación del método en los informes de investigación en psicología, *International Journal of Clinical and Health Psychology*, Vol. 5, pp. 115-127, 2005.

[16] G. Gastélum, J.C. Guedea, J. Viciana, J.E. Peinado, Composición factorial de una escala de autoeficacia en el ámbito del trabajo en equipo y liderazgo en universitarios de ciencias de la salud, *Formación Universitaria*, Vol. 5, pp. 49-60, 2012.

[17] J. Abalo, J. Lévy, A. Rial, J. Varela, Invarianza factorial con muestras múltiples, in: J. Lévy (Ed.) *Modelización con estructuras de covarianzas en ciencias sociales* Netbiblo, Madrid, 2006, pp. 259-278.

[18] J. Viciana, E.M. Cervelló, J. Ramírez, Effects of manipulating positive and negative feedback on goal orientation, perceived motivational climate, satisfaction, task choice, perception of ability, and attitude to physical education lessons, *Perceptual and motor skills*, Vol. 105, pp. 67-82, 2007.

[19] H. Blanco, M. Ornelas, J.L. Tristán, A. Cocca, D. Mayorga-Vega, J. López-Walle, J. Viciana, Editor for creating and applying computerise surveys, *Procedia Social and Behavioral Sciences*, Vol. 106, pp. 935-940, 2013.

[20] J.R. Arbuckle, *Amos users guide version 21.0*, Marketing Department, SPSS Incorporated, Chicago, IL, 2012.

[21] B. Thompson, *Exploratory and confirmatory factor analysis. Understanding concepts and applications.*, American Psychological Association, Washington, D C, 2004.

[22] E. Gelabert, L. García-Esteve, R. Martín-Santos, F. Gutiérrez, A. Torres, S. Subirà, Psychometric properties of the spanish version of the frost multidimensional perfectionism scale in women, *Psicothema*, Vol. 23, pp. 133-139, 2011.

[23] B.M. Byrne, *Structural equation modeling with amos: Basic concepts, applications, and programming*, Routledge, New York, NY, 2010.

[24] P. Elosua, B.D. Zumbo, Coeficientes de fiabilidad para escalas de respuesta categórica ordenadas, *Psicothema*, Vol. 20, pp. 896-901, 2008.

[25] J.C. Nunnally, I.H. Bernstein, *Teoría psicométrica*, McGraw-Hill, México, 1995.

[26] W. Revelle, R.E. Zinbarg, Coefficients alpha, beta, omega and the glb: Comments on sijtsma, *Psychometrika*, Vol. 74, pp. 145-154, 2009.

[27] K. Sijtsma, On the use, the misuse, and the very limited usefulness of cronbach's alpha, *Psychometrika*, Vol. 74, pp. 107-120, 2009.

[28] P. Brzoska, O. Razum, *Validity issues in quantitative migrant health research: The example of illness perceptions*, Peter Lang International Academic Publishers, New York, NY, 2010.

[29] G.W. Cheung, R.B. Rensvold, Evaluating goodness-of-fit indexes for testing measurement invariance, *Structural Equation Modeling*, Vol. 9, pp. 233-255, 2002.