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ORIGINAL

ANALYSIS OF THE RESILIENCE SCALE IN MOUNTAIN RUNNERS

ANÁLISIS DE LA ESCALA DE RESILIENCIA EN CORREDORES POR MONTAÑA

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ABSTRACT

The objectives of the present study are to analyze the factorial structure of Wagnild and Young's Resilience Scale (1993) and describe the levels of resilience in a Spanish sample of mountain runners. In order to do that, a sample of 400 athletes aged between 20 and 60 (M = 38.70) was used. A cross validation was carried out, creating two subsamples of 200 participants each. According to the data provided by the first subsample after the exploratory factor analysis (EFA), four models were estimated by confirmatory factor analysis (CFA). In addition, the reliability index was calculated by Cronbach's alpha (α = .90) and the possibility of significant differences between men and women was verified. The results showed that 39% of the mountain runners presented a high resilience, being the model of three specific factors the one that obtained better adjustment.

KEYWORDS: resilence; mountain runners; trail running; factorial structure.

RESUMEN

Los objetivos del presente estudio fueron analizar la estructura factorial de la escala de resiliencia de Wagnild y Young (1993) y describir los niveles de resiliencia en una muestra española de corredores por montaña. Para ello, se usó una muestra formada por 400 deportistas con edades comprendidas entre los 20 y los 60 años (*M* = 38.70). Se llevó a cabo una validación cruzada creándose dos submuestras de 200 participantes cada una. Según los datos aportados por la primera submuestra tras en el análisis factorial exploratorio (AFE), se estimaron cuatro modelos mediante análisis factorial confirmatorio (AFC), además se calculó el índice de fiabilidad mediante el alfa de Cronbach (α = .90) y se comprobó si existían diferencias significativas entre hombres y mujeres. Los resultados señalaron que un 39% de los corredores por montaña presentaban una alta resiliencia, siendo el modelo de tres factores específicos aquel que presentó mejor ajuste.

PALABRAS CLAVE: resiliencia; corredores por montaña; trail running; estructura factorial.

INTRODUCTION

The concept of resilience refers to personal skills that allow a healthy functioning in adapting to an adverse context or disruptive event in daily life (Connor and Davidson, 2003). It is conceptualized as the ability of individual adaptation to stress, trauma or unpredictability (Windle, Bennett and Noyes, 2011). The first studies on resilience were conducted with children at risk of schizophrenia or in very adverse situations. The goal of these studies was to know the origin and possible risk of developing some psychopathology (Becoña, 2006). Other studies carried out in the field of resilience have mostly focused on adults, families and communities who have been exposed to stressful circumstances and who have had to react to potentially traumatic events in their lives (García et al., 2014). People with a high level of resilience adapt more successfully to a stressful situation compared to those with lower levels (Becoña, 2006).

While this construct has been extensively researched in a variety of fields such as clinical and general psychology, there has not been as much interest from sports performance professionals, which is striking, as adversity and stress (in acute and chronic forms) are common in this context. Resilience is an important aspect within the sporting context, which however, has not yet been systematically studied in this area (Breton, Zurita and Cepero, 2016). In the field of sport, resilience has been shown to have a positive correlation with sports achievement and psychological well-being (Hosseini and Besharat, 2010). Besides, resilience also relates to variables such as stress-recovery levels of athletes during the competition (García et al., 2014). The study of resilience could mean an advance in the improvement of training planning and organization as well as in the athlete's competitive performance. The most widely used tools for conducting studies on resilience in the field of sport have been the Resilence Scale (RS; Wagnild & Young, 1993) and the Connor-Davidson Resilience Scale (CD-RISC; Connor & Davison, 2003).

Several studies have analyzed the resilient profile in the field of sport through the use of the Resilience Scale (RS; Wagnild and Young, 1993). Thus, it has been used in young football players (Ruiz, de la Vega, Poveda, Rosado and Serpa, 2012), physically disabled athletes (Cardoso and Sacomori, 2013), competition judokas (Reche et al., 2014), fencers (Reche and Ortín, 2013) ex-athletes (Ceva et al., 2012) voleibol players (Trigueros, Aguilar-Parra, Álvarez, Cangas y López-Liria, 2019) and field hockey players (Vallarino and Reche, 2016), being adapted into Spanish with a sample of football players (Ruiz et al., 2012)

Mountain running has exponencialy increase in Spain from 2007 (Segui y Farias, 2018). As far as it is known, no other study has analyzed mountain runners resilience, which could condition their performance due to the characteristics of the competitions. It has been recently reported that the high physiological demands of mountain running practice, given the existence of a wide variety of tests lasting from less than an hour (e.g., vertical kilometers) to more than fourteen hours of competition (e.g., ultra-marathons) as different studies have collected (Bjorklund, Swarén, Born and Stöggl, 2019; Clemente-Suarez, 2014; Rodríguez-Marroyo, González-Lázaro, Arribas-Cubero and Villa, 2018). In addition to the orographic difficulties (e.g., height increase and decrease) that participants have to face, participants' performance is affected by environmental conditions such as temperature and altitude that may become very changing throughout the race and between races (Rodríguez-Marroyo et al., 2018). In addition to the orographic difficulties (e.g., gain and loss of height) that participants have to save, their performance is affected by environmental conditions such as temperature and altitude that can become very changing throughout the race and between races (Rodríguez-Marroyo et al., 2018). Under these circumstances, the competition involves a high degree of stress on the participants, due among other causes to accumulating fatigue and muscle damage (Bjorklund et al., 2019; Clemente-Suarez, 2014; Fornasiero et al., 2018; Martinez et al., 2018).

Therefore, the objectives of this study are to analyze the factorial structure of the RS scale proposed by Wagnild y Young (1993) adapted to Spanish (Ruiz et al., 2012) in order to describe the resilience levels in a Spanish sample of mountain runners.

METHOD

Participants

The convenience sample was formed by 400 mountain runners, where 17% were women, participants in official mountain races of the Federation of Mountain Sports, Climbing and Hiking from Castilla and Leon during the 2018 season. Ages ranged from 20 to 60 years old (M = 38.70; DT = 7.40). Features are shown in Table 1.

Table 1. Sample Distribution Regarding Sex and Age

	Frequency	*Valid %*	*Media (Age)*	*Standard Deviation*	*Asymmetry*	*Kurtosis*
Women	67	17%	37.39	7.86	.11	-.34
Men	333	83%	38.97	7.29	-.03	.13
Total	400	100%	38.70	7.40	-.02	.01

Instrument

The RS scale of Wagnild and Young (1993) has been used adapted into Spanish (Ruiz et al., 2012). The scale assesses the degree of individual resilience as a personality feature that would favor their adaptation to adverse situations, moderating the negative effect to stress and encouraging its adaptation. It consists of a total of 25 items written positively, which are valued from 1 (strongly disagreed) to 7 (strongly agreed), ranging from 25 to 175 points. A person is considered to have high resilience from scores equal to or greater than 147. The RS would be structured on two basic factors, one called "personal competence" consisting of 17 items and another factor called "acceptance of self and life" that would comprise the remaining 8 items.

Procedure

Data collection was done by sending all participants an online survey via e-mail. Participation in the study was entirely voluntary, guaranteeing anonymity and confidentiality at all times.

Statistics Analysis

An analysis of the scale’s factorial structure was carried out in a sample of Spanish mountain runners using cross-validation. First, an exploratory factor analysis (EFA) was performed on a 200 participants’ subsample in order to study the correlation of the items and possible existing factors. As several items have been detected to show a bad adjustment in Spanish-speaking or Mediterranean culture (Castilla, Coronel, Bonilla, Mendoza and Barboza, 2016;

Rodríguez et al., 2009; Trigueros, Alvarez, Aguilar-Parra, Alcaraz and Rosado, 2017); from the results of the parallel analysis (Figure 1) it was hypothesized which model could be better adjusted according to data. Subsequently, several factorial models were tested by confirmatory factorial analysis (CFA). The adjustment of four CFA-Unidimensional, CFA models with two correlated factors, CFA with three correlated factors and CFA with four correlated factors were estimated and the degree of adherence of each item to its factor was verified through the configuration matrix. In addition to analyzing the percentage of total variance explained and reliability by using Cronbach's alpha.

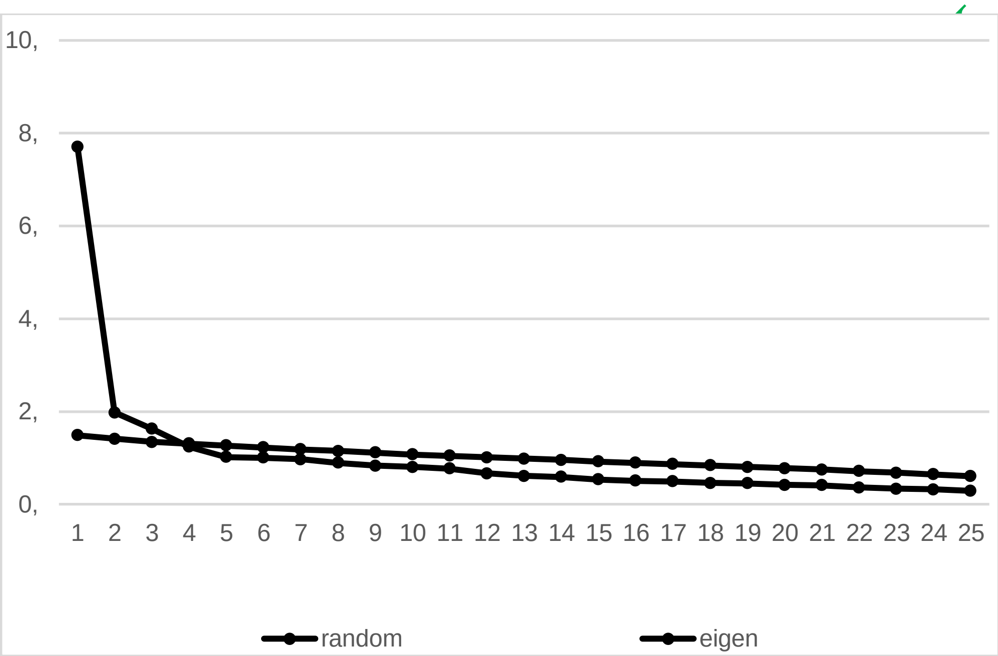

Figure 1. Results parallel analysis

Data analysis was carried out through the FACTOR v.9.2 program (Lorenzo-Seva and Ferrando, 2013). Sample adequacy for factor analysis was evaluated with the Kaiser-Meyer-Olkin Index (KMO) and Bartlett's Test of Sphericity. Polychoric correlations and Classical Parallel Analysis (PA) were used to determine the number of dimensions, allowing the selection of common components or factors that had higher proper values than would be randomly obtained (Horn, 1965). This is a method of estimating parameters where it is not established that observable variables should follow a given distribution, which allows to minimize the sum of the squares of the differences between the observed and reproduced correlation matrices, instead of using the reduced matrix as input, with the estimated communalities on the diagonal (Batista-Foguet and Coenders, 2000; Flora, LaBrish and Chalmers, 2012). Besides, this method was performed with a promax rotation, since it is hypothesized that the factors are correlated. Comparison of the resilience level according to the runners' gender was made using Student's T-Test for independent samples.

RESULTS

Exploratory factorial analysis

In order to determine the psychometric properties of the RS scale in mountain runners, this instrument was studied according to the validation parameters used in the original study (Wagnild and Young, 1993). The data were appropriate for the EFA (KMO .918; Barlett's X2 3187.4; .000). To calculate the possible number of existing factors, the representation of the auto-values of the original correlation matrix extracted using unweighted least squares as well as the Monte Carlo PCA program for Parallel Analysis were used to calculate the parallel value criteria (random value). In this case, three factors were determined as those necessary to explain the factorial model (Figure 1). The results yielded by the EFA showed up to six possible factors. However, the results of this test were discarded as, in some cases, the factorial load of the items was low and correlated with more than one factor, which made it difficult to interpret theoretically. On the other hand, and taking into account Figure 1, an EFA was performed with the model of three correlated factors which was hypothesized to show the best fit. It was observed which variables were worst explained by the model, as is the case with items 8, 11, 20, 22 and 25; which showed a low correlation rate in all factors (below .30), as well as those that showed a high correlation in two different factors (items 3 and 21) (Table 2).

Table 2. EFA Factorial Loads 3 factors

Variable	F1	F2	F3
V1	.018	.647	.016
V2	.091	.020	.561
V3	-.324	.159	.735
V4	.339	.101	.128
V5	-.003	.021	.856
V6	.350	.081	.208
V7	.136	.167	.351
V8	.106	-.004	.027
V9	.071	.034	.715
V10	.574	.041	.119
V11	.114	-.044	.216
V12	-.109	.677	.183
V13	.102	.113	.576
V14	-.035	.761	-.081
V15	.123	.687	-.076
V16	.891	-.081	-.170
V17	.658	-.092	.148
V18	.224	-.058	.445
V19	.266	-.194	.486
V20	-.059	-.196	.128
V21	.759	.200	-.407
V22	-.018	-.021	.277
V23	.044	-.102	.580
V24	.521	.139	.133

V25	.225	-.020	.149

Extraction method: unweighted least squares. Rotation Method: Promax

Confirmatory factorial analysis

Once the EFA data were observed and the saturation table (Table 2) taken into account, it was decided to delete the five items that showed a correlation of less than .30 when performing the CFA. This was the case with items 8, 11, 20, 22 and 25. Based on the results of the parallel analysis (Figure 1), for the subsample analyzed by EFA, a model of three correlated factors, such as the one that best suits the data representation, would be required. Therefore, to verify this assumption, four models were tested: uni, bi, tri and four-dimensional using CFA in the other subsample. The three-dimensional is the one that showed the best fit, as expected (Table 3). In this model, the factors were well defined, although it is worth taking into account the possible cross-loads by which two items could interfere with more than one dimension: the V3 variable (belonging to F2) which correlated negatively with F1 and the V21 variable (belonging to F1) which also charged in F3, according to the data described above by the EFA. The three-factor solution could be considered to more appropriately reflect the factorial structure of the scale in this mountain-runners sample.

Table 3. Tested models

Model	Type	Structure	Chi-sq	Gl FD	RMSEA	CFI	TLI	SRMR
M1	CFA	Only factor	526.33	170	.072	.966	.962	.085
M2	CFA	Two factors	331.02	151	.055	.983	.979	.062
M3	CFA	Three factors	213.30	132	.040	.992	.990	.050
M4	CFA	Four factors	177.16	116	.036	.990	.989	.045

Note: RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; FD = Freedom Degrees; SRMR = Standarized Root Mean Square Residual

Based on the results of this factorial analysis, 55.56% of the variance was explained. Table 4 shows a list of self-values of the variance-covariance matrix and the percentages of variance represented in each of them. Self-values indicate the amount of total variance that is explained by each factor and the percentages explained by the variance associated with each factor.

Table 4. Total Variance Explained

	Initial Auto-values			Sum of the saturations squared from the extraction		
Components	Total	Variance %	Accumulated %	Total	Variance %	Accumulated %
1	7.345	36.724	36.724	7.947	39.730	39.730
2	1.598	7.990	44.715	1.810	9.050	48.780
3	1.453	7.263	51.977	1.356	6.780	55.560

Extraction Method: Unweighed Lead Squares

Thus, Factor 1 (F1) would consist of seven items (4, 6, 10, 16, 17, 21, 24), explaining the 39.73% variation. Factor 2 (F2) would consist of four items (1, 12, 14, 15) that would explain 9.05% and finally, Factor 3 (F3) would consist of nine items (2, 3, 5, 7, 9, 13, 18, 19, 23), being responsible for 6.78% of the total variance explained. The factorial correlation was equal to .577 between F1 and F2; .662 between F1 and F3 and .473 between F2 and F3.

Besides, the RS internal consistency was evaluated based on Cronbach's alpha index, which yielded a value of .906 for the total scale. Cronbach's alpha was .826 for Factor 1; .735 for Factor 2 and .836 for Factor 3 (Table 5). Factors 1 and 2 are observed to have an acceptable Cronbach's alpha while factor 3 shows less internal consistency. Therefore, the confidence intervals of internal consistency analysis would indicate that the RS with 20 items and three correlated factors would have a high reliability, according to the procedure used, and it would be appropriate to the data provided by the selected sample as seen in Table 5.

Table 5. Internal consistency

	Cronbach's Alpha	*No. of Elements*
Factor 1	.826	7
Factor 2	.735	4
Factor 3	.836	9
Total	.906	20

Finally, Table 6 shows the resilience rates analyzed in the overall sample of 400 participants, where female runners are seen to obtain a slightly higher percentage of high resilience, although no significant differences were found between the sexes.

Table 6. Distribution with high and low resilience

	Resilience		TOTAL
	Low	*High*	
Female runners	41 (61%)	26 (39%)	67 (100%)
Male runners	215 (65%)	118 (35%)	333 (100%)
Total both	256 (64%)	144 (36%)	400 (100%)

Note: High resilience ≥ 147; Low resilience < 147.

DISCUSSION

This study analyzed the factorial structure and psychometric properties of the RS (Wagnild and Young, 1993) in a sample of mountain runners. To this end, the validation parameters and criteria used by these authors were followed in the original study of the instrument, in addition to those of Trigueros et al. (2017). With regard to the factorial validity of the instrument, up to six possible dimensions were first identified, but given the distribution of the items as well as Figure 1, the existence of three correlated factors from the statistical and theoretical point of view was finally considered. The results of the analysis of bivariate correlations did not show very high scores between the two factors, supporting the discriminating validity between the different subscales.

However, as noted above, there were five items that showed a low factorial load (<.30). This is the case for items 8, 11, 22 and 25 whose factorial input would be linked to F2 and item 20 corresponding to F1 of the original Wagnild and Young scale (1993). This fact is probably due to the items containing a non-literal Spanish translation of the original, which may have resulted in an interpretation of the primal meaning of the variable, leading to a complex understanding that can be confusing, which is why those items produce a low relationship with the factor. However, in the Portuguese version (Pesce et al., 2005) the content of three items was also modified to facilitate their understanding. In the case of the Argentinian version (Rodríguez et al., 2009) there were four, these items did not coincide in both studies.

On the other hand, Heilemann, Lee, and Kury (2003) analyzed the psychometric properties of the Spanish version of the RS in a sample of 315 women. According to the original scale, two factors were found in this version and internal consistency yielded a .93 Cronbach's alpha. However, they identified two complex items: item 11 ("I rarely wonder about the purpose of things") and item 25 ("I feel comfortable if there are people I don't like"). Both items were discarded in this study because of their low rating. These authors found a negative correlation between resilience and depressive symptoms. Pesce et al. (2005) performed the Portuguese validation of the instrument by applying it to a heterogeneous sample of students. These researchers made the translation and adaptation of the original RS into the language, modifying it to facilitate their understanding of the content of items 7, 11, and 12. As in the present study, three factors were found in the factor analysis. Cronbach's alpha for the total sample was .85; lower than in this case. Besides, they found a positive and significant correlation between resilience's capacity and self-esteem (Rodríguez et al., 2009).

With regard to this work, when reviewing the state of the art of the results of the RS's application, it was observed that the best-adjusted version comprised 20 items, discarding items 8, 11, 20, 22 and 25. In the case of variables 8, 20 and 25 they had already had problems in previous studies (Rodríguez et al., 2009; Rua and Andreu, 2011), which would question the permanence of these items on the scale. Failure to match results for items 11 and 22 may suggest that possible cultural factors interfere with the studied populations by explaining this divergence. It is important to highlight that while complex items emerge in the two Spanish versions of the RS, this is not the case in the English and Portuguese versions of the scale. This could be partly interpreted by the items' translation, which may involve certain modifications in their understanding.

When performing the factorial analysis of the scale, the results obtained were similar to those found by Pesce et al. (2005) and Rodríguez et al. (2009) as regards to the three emerging factors. The original RS distinguishes two factors (Wagnild and Young, 1993), as does the Spanish version of Trigueros et al. (2017). In contrast, five factors were extracted in the Swedish version of the scale, while three factors emerged in the Argentinian and Portuguese versions of the scale. For all this, it would be likely that the influence of cultural components would be conditioning the results of the application of the instrument. While the psychometric study that was carried out leads us to eliminate five items and although the conclusions of this work are not entirely convergent with previous studies, the scale is considered to be an appropriate instrument for its application in the Spanish population. However, a detailed study should be appropriate through the Item Response Theory (IRT) to consider the exclusion of those discordant variables.

Finally, no significant differences were found between the resilience values analyzed based on the runners' sex, which coincides with the results obtained in previous studies (Lundman, Strandberg, Eisemann, Gustafson and Brulin, 2007). The mean value analyzed in the subjects of this study was 142.1, being higher than the values previously obtained in other studies(136.8 – 131.4), (Cardoso and Sacomori, 2013; Reche and Ortín, 2013).

When we compare our results with those of other researches that have analyzed the resilient profile in the field of sport using the same scale, we observe how our sample's study yields the highest percentages of high resilience (39%). This result was similar to that analyzed in competition judokas showing a 38% (Reche and Ortín, 2013) and higher than those observed in physically disabled athletes with a 32% (Cardoso and Sacomori, 2013), to the one showed by football players and fencers with a 20% (Ruiz et al., 2012;

Reche and Ortín, 2013) or that of field hockey players with an 8% (Vallarino and Reche, 2016).

CONCLUSIONS

The results of this study show a high percentage of variance explained, 55.56%; possibly, the highest so far and a high internal consistency in both the overall resilience dimension (a.903), as in the specific factors F1 (A.826), F2 (A.735), F3 (.836). These two facts would indicate a high goodness of fit with respect to the analyzed sample, removing the five discordant items and maintaining the three correlated factors model.

The results indicate that 39% of mountain runners from the sample showed a high resilience.

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