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ORIGINAL

PSYCHOMETRIC PROPERTIES OF THE SPANISH VERSION OF THE SHORT GRIT SCALE-RUNNING (GRIT-SR)

PROPIEDADES PSICOMÉTRICAS DE LA VERSIÓN ESPAÑOLA DE LA *SHORT GRIT SCALE-RUNNING (GRIT-SR)*

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ABSTRACT

Grit is defined as the tendency to pursue long-term goals with perseverance and effort, despite adversities or failures. In the context of sports, its effect has been studied using the original *Short Grit Scale (Grit-S)* without any adaptation. The aim of this study was to analyse the psychometric properties of *Grit-S* and

to adapt to a sample of amateur runners. The sample consisted of 514 middle- and long-distance amateur runners. The results of a confirmatory analysis showed minimally acceptable validity and reliability values for the scale (α=.764), and for each factor ($\alpha_{perseverance}$=.806; $\alpha_{interest}$=.731). Therefore, the psychometric properties of the Spanish version of the *Short Grit Scale-Running (Grit-SR*) are sufficient to encourage us to continue developing this scale.

KEYWORDS: Grit, running, psychometric properties, adaptation

RESUMEN

Grit se define como la tendencia para perseguir objetivos a largo plazo con perseverancia y esfuerzo, a pesar de las adversidades o los fracasos. Su efecto en el deporte ha sido estudiado utilizando las escalas originales no adaptadas a este contexto. El objetivo principal de este estudio fue analizar las propiedades psicométricas y adaptar la *Short Grit Scale* (*Grit-S*) a una muestra de personas que practican la carrera a pie. La muestra estuvo compuesta por 514 corredores populares de media y larga distancia. Los resultados del análisis confirmatorio presentaron valores de validez y confiabilidad aceptables para la escala (α=.764), y para cada factor ($\alpha_{perseverancia}$=.806; $\alpha_{interés}$=.731). Por lo tanto, consideramos que la versión española adaptada al running de la *Short Grit Scale (Grit-SR)* presenta adecuadas propiedades psicométricas, que animan a seguir profundizar en este constructo.

PALABRAS CLAVE*:* Grit, running, propiedades psicométricas, adaptación.

INTRODUCTION

The search for excellence has become one of the main goals of society, and of course, the same is true for sports. This has led to increased efforts in Sports Sciences to analyse the traits and qualities that inspire people in any sport to high performance, while considering related risks (Andreu, 2022; Babí Lladós et al., 2018; Restrepo et al. 2021). The result has been the development and adaptation of specific assessment tools to many sports contexts (Olmo Extremera et al., 2017; Puigarnau et al., 2021).

An analysis of recent research suggests that the concept of *grit* could be useful in understanding how athletes achieve maximum performance. Duckworth has defined *grit* as the combination of passion and perseverance applied toward long-term goals, and it is sometimes characterized the winner's trait (Duckworth, 2016; Duckworth et al., 2007). *Passion* should be understood as the result of hours and hours of practice or study to achieve greater skill and knowledge, and *perseverance* as the ability to endure and overcome a large number of obstacles (Dumas & Smith, 2018; Mills, 2017).

From this definition, we can establish two dimensions or factors for this personality trait: *consistency of interest*, which is the maintenance of objectives

over a long period; and *perseverance of effort*, defined as the ability to persist in an effort for a long time (Duckworth & Quinn, 2009).

Recently *grit* has attracted interest as a personality trait that can be useful for predicting success and well-being, regardless of the field of study (Griffin et al., 2016; Schimschal et al., 2020). Research indicates that *grittier* people are characterized by an unwavering, sustained and passionate search for a certain interest or goal, despite setbacks and distractions (Dam et al., 2019; Dugan et al., 2019). Likewise, it has been considered a trait broadly related to leadership (Caza & Posner, 2019; Schimschal & Lomas, 2019).

The findings suggest that *grit* can be associated with people who show a greater capacity to persist in monotonous or tedious tasks, or individuals who show great determination to complete those tasks, despite the lack of immediate feedback or recognition (Larkin et al., 2016).

To measure *grit,* Duckworth et al. (2007) developed the 12-item *Grit Scale (Grit-O)*, which had poor psychometric properties (Datu, et al., 2016). To address these limitations, Duckworth and Quinn (2009) developed the 8-item *Short Grit Scale (Grit-S),* which has shown higher internal consistency, convergent and discriminant validity, as well as test-retest stability. *Grit-S* also confirmed the structure of two predicted factors with a moderate correlation between both (Duckworth & Eskreis-Winkler, 2015).

Sports requires high dedication, many hours of training, and significant effort to develop specific skills required for each modality, as well as to maintain or improve physical condition and performance (Gilchrist et al., 2017; González-Lázaro et al., 2021).

The achievement of goals and results in long-distance modalities requires extensive training periods, high levels of effort and a high capacity or ability to overcome difficulties (Credé et al., 2017). According to Duckworth (2016), consistency in effort is everything for long-distance and middle-distance runners, suggesting that they are likely to have higher levels of *grit* (Raglin, 2007; Shipway & Holloway, 2010; 2016).

Cormier et al. (2019) have adapted *Grit-O* to a sports context by modifying the terminology of some of the items. Most of the research carried out in this environment has used generic instruments, according to Cormier et al. (2021) review (Table 1).

Table 1. Research focus on *grit* with a sample of athletes.

Author (year)	*Sample*	*Scale*
Cazayoux et al. (2018)	Crossfitters	*Grit-O*
Cormier et al. (2019)	Students	*Grit-O*
Drury (2019)	Runners	*Grit-O*
Elumaro (2016)	Multisport	*Grit-O*
Gilchrist et al. (2017)	Runners	*Grit-S*
González-Hernández et al. (2019)	Runners and crossfitters	*Grit-S*
Gupta & Sudhesh (2019)	Soccer	*Grit-S*
Larkin et al. (2016)	Soccer	*Grit-S*
Martin et al. (2015)	Wheelchair basketballers	*Grit-S*
Moles et al. (2017)	Soccer	*Grit-S*
Reed et al. (2013)	Multisport	*Grit-S*
Tedesqui & Young (2017)	Multisport	*Grit-O*
Tedesqui & Young (2018)	Multisport	*Grit-O*
Ueno et al. (2018)	Students	*Grit-S*

Research suggests that athletes with higher *grit* scores -athletes who are *grittier*- are more likely to invest more time in sport-specific activities (Larkin et al., 2016), and therefore evidence a greater commitment to sports (Martin et al., 2015; Tedesqui & Young, 2017). In samples of long-distance runners, Gilchrist et al. (2017) discovered that a sense of pride was a significant predictor of the ability to persist and show interest in a task.

Previous scholarship indicates that *grit* is a measurable trait that can be understood either as a domain-specific or general construct (Cormier et al. 2019). For example, runners who run distances greater than 40 miles per week show higher levels of *grit* and responsibility (Drury, 2019), though these trait levels can vary depending on the context (From et al., 2020). González-Hernández et al. (2019) found that *perseverance of effort* could be a trigger for addictive behaviours, though another study found that *consistency of interest* can be a regulator of this behaviour associated with competitive levels of endurance sports (Ueno et al., 2018).

The aims of the present study were to analyse the psychometric properties and to verify the factorial structure of an adaptation of the *Short Grit Scale* (*Grit-S*; Duckworth & Quinn, 2009) on a sample of amateur runners (*Grit-SR)*, following up on recommendations in previous research (Domínguez-Alonso et al., 2018; Leyton et al., 2019; Menéndez Santurio & Fernández-Río, 2018; Nogueira et

al., 2018; Raymondi et al., 2016; Schmidt et al., 2017; Trigueros et al., 2017). This study seeks to be the first step in determining the value of *grit* as either a general-domain or specific-domain trait in the sports context. In other words, this study seeks to determine whether the original scale is adequate for general use in the sports context or if it is preferable to adapt the scale specifically for use with runners (Cormier et al., 2019; Hagger & Hamilton, 2019).

MATERIAL AND METHOD

Participants

The sample consisted of 514 amateur Spanish middle- and long-distance runners between 18 and 64 years of age (M=38.29, SD=8.75); 20.8% were women and 79.2% men (Table 2).

Table 2. Sociodemographic and training characteristics of the sample (n=514).

	n	%
Sex		
Men	407	79.2
Women	107	20.8
Mean Age (Sd)	38.29 (8.75)	
Age		
< 26	57	11.1
27-36	128	24.9
37-45	229	44.6
46-55	78	15.2
> 56	22	4.3
Km/Week		
< 20	87	16.9
21-85	405	78.8
86-118	18	3.5
> 119	4	.8
Days/Week		
< 3	219	42.6
4-6	286	55.6
7	9	1.8
Usual distance		
< 10 km	66	12.8
10 km	156	30.4
Half Marathon	196	38.1
Marathon	96	18.7

Instruments

An *ad hoc* 23-item sociodemographic questionnaire was developed to collect personal and sports data, and additional information about training and performance habits.

The scale used to measure *grit* was the *Short Grit Scale* (Grit-S), composed of eight items (Duckworth & Quinn, 2009) that produced an oblique two-factor

structure: *consistency of interests* (i.e., "*New ideas and projects sometimes distract me from previous ones*"); and *perseverance of effort* (i.e., "*I am diligent*") (Duckworth & Eskreis-Winkler, 2015; Von Culin et al., 2014).

Grit-S has shown moderate internal consistency across different samples, with *Cronbach's alphas* ranging from .73 to .83 for the total scale, from .73 to .79 for the *consistency of interest* subscale, and from .60 to .78 for the *perseverance of effort* subscale (Duckworth & Quinn, 2009). Both factors were strongly correlated (r=.59, p<.001), and they have a test-retest reliability between .61 and .68 in samples of students (Duckworth & Quinn, 2009; Griffin et al., 2016; Hill et al., 2016). Items of the scale were measured using a *5-point Likert* scale, from 1 ("*Not quite like me*") to 5 ("*Totally like me*"). The *Grit-S* score was the mean of the items, with highest scores corresponding to highest levels of *grit* (Larkin et al., 2016).

Procedure

Grit-S (Duckworth & Quinn, 2009) was translated from English to Spanish following a cultural adaptation process that guaranteed its linguistic equivalence, through a conceptual and metric back-translation process (Beaton et al., 2000; Muniz et al., 2013). In that process, items 1, 2, 3, 5, 6 and 8 were conceptually adapted to a sports context (Table 3) was carried out as previously performed by López-Walle et al. (2011), Cormier et al. (2019), Ramos et al., (2018) or Clark and Malecki (2019).

The adapted items were independently examined by different experts (judges) in the field of sports and psychology, to guarantee their inter-judge reliability and validity (Sneiderman, 2011). Next, a pilot study was carried out with 204 runners to identify possible comprehension problems. Based on that study, item 8 ("*Soy diligente*") was modified adding the adjective "*perseverante*" ("*Soy diligente, perseverante*") to give it greater strength. As with the original version, responses were measured using a 5-point *Likert-type* scale (Duckworth & Quinn, 2009).

Finally, data collection process was carried out both by attending different sports events, and through two *ad hoc* web tools. All participants were informed about confidentiality and anonymity of the process, and they signed the informed consent statements about their participation in the study (Lloret-Segura et al., 2014). The ethical guidelines of the University of León, and the World Medical Association and the Declaration of Helsinki were followed. (World Medical Association, 2013).

Table 3. *Short Grit Scale (Grit-S)* and *Short Grit Scale-Running (Grit- SR)* items.

	Grit-S	*Grit-SR*
Consistency of interest	*1. New ideas and projects sometimes distract me from previous ones.*	G1. Algunas veces nuevos objetivos deportivos me distraen de los que había elegido inicialmente.
	3. I have been obsessed with a certain idea or project for a short time but later lost interest.	G2. He estado obsesionado con un objetivo deportivo durante un periodo corto de tiempo, pero después perdí el interés.
	5. I often set a goal but later choose to pursue a different one.	G4. A menudo establezco unos objetivos deportivos, pero después los cambio por otros.
	6. I have difficulty maintaining my focus on projects that take more than a few months to complete.	G5. Tengo dificultades para mantener mi atención en objetivos deportivos que me lleven más de varios meses finalizarlos.
Perseverance of effort	*2. Setbacks don't discourage me.*	
	4. I am a hard worker.	G3. Soy muy trabajador/a.
	7. I finish whatever I begin.	G6. Termino todo lo que empiezo.
	8. I am diligent.	G7. Soy perseverante, diligente.

Data Analysis

An *exploratory factor analysis* (EFA) of *GRIT-SR* was carried out to determine the factorial structure of the eight-items in the scale. Extraction of the factors was done using the *maximum likelihood method*, together with *oblique rotation* to simplify factors (Lorenzo-Seva, 1999). All items with a factorial weight lower than 0.40 were eliminated from the final scale in order to optimize the scale structure (DeVellis, 2012).

Factorial validity, goodness of fit, and psychometric properties of the proposed scale were analysed using *confirmatory factor analysis* (CFA), calculating the values of the *Kaiser-Meyer-Olkin index* (KMO) and *Bartlett's sphericity* (X^2). Selected indices to determine the global fit quality of the factorial model were then *normalized to Chi-square* (χ^2/df), the *mean squared error of approximation* (RMSEA), the *mean squared residual* (RMR), the *Tucker-Lewis index* (TLI), the *comparative fit index* (CFI), the *goodness of fit index* (GFI), and the *standardized root mean square residual* (SRMR) (Brown, 2015; Byrne, 2016; Hu & Bentler, 1999; Kline, 2011; Marôco, 2014). Values equal to or less than .05 were considered excellent for RMSEA, RMR, and SRMR, while values less than .08 were acceptable. The X^2/df ratio must be less than 3 to establish a correct model, and TLI, CFI and GFI values greater than .95 are interpreted as a good fit to the data (Marôco, 2014; Pereira & Pinto, 2017).

Convergent validity was analysed by the calculation of the *Average Variance Extracted* (AVE); a value greater than .50 indicates adequacy (Angelo et al., 2019; Hair et al., 2018; Ramos et al., 2017). Discriminant validity was calculated verifying that correlations between the constructs were lower than the square root of the AVE (Farrel, 2009; 2010; Hu & Bentler, 1999).

Internal consistency was evaluated by calculating *Cronbach's alpha coefficients* for both the full scale and each factor, with values of this coefficient equal to or over .70 considered sufficient (Avecillas & Lozano, 2016; Terwee et al., 2007). The calculation of *composite reliability* was performed to ensure internal consistency, where values greater than or equal to .70 reflect good consistency (Angelo et al., 2019; Hair et al., 2018).

Data analysis was performed with *AMOS Statistical Software* (v. 25, SPSS, An IBM Company, Chicago, IL).

RESULTS

The results of the factor analysis confirmed the validity according to the values of the *Kaiser-Meyer-Olkin index* (KMO=.747) and *Bartlett's sphericity* (X^2=11846.286; p<.000).

Prior to obtaining the final model selected (the most appropriate psychometric properties and the fittest model), other alternatives were tested in which some of the indices did not meet recommended values. The fit values of the hypothetical models tested as a result of CFA were the following: Model 1. *Grit* understood as a single factor with 7 items [(χ^2=13.719; df=6; p=.033; CMIN/DF=2.287; RMSEA=.050, GFI=.992, CFI=.993, TLI=.977, SMR=.0136 and RMR=.028]; Model 2. *Grit* understood as a first-order factor and two second-order factors with 7 items [(χ^2=30.070; df=11; p=.002; CMIN/DF=2.734; RMSEA=.092, GFI=.959, CFI=.962, TLI=.927, SMR=.0620 and RMR=.068].

Table 4 shows the values of central tendency, variability, asymmetry, kurtosis and the minimum response (*floor effect*) and maximum response (*ceiling effect*) percentage for each of the items. The most remarkable finding was the existing negative asymmetry for all the items. A positive kurtosis was also observed for four of the items, and negative for the rest. All the items presented a *floor effect*, with item 5 being the most pronounced ("*A menudo establezco unos objetivos deportivos, pero después los cambio por otros*").

Table 4. Descriptive statistics of the *Grit-SR* items.

	Items	*M*	*Sd*	*Asymmetry*	*Kurtosis*	*% Floor*	*% Ceiling*
Consistency of interest	G1	3.29	1.079	-.316	-.375	13.0	7.2
	G2	3.77	1.092	-.760	-.082	28.6	4.1
	G4	3.87	.971	-.806	.438	27.2	1.8
	G5	4.08	1.041	-1.035	.384	44.4	2.3
Perseverance of effort	G3	3.51	.949	-.274	-.260	15.0	2.1
	G6	3.80	1.025	-.885	.458	25.5	3.9
	G7	3.94	.953	-.960	.920	29.6	2.7

We reviewed the results of the different models, paying special attention to the values of the factorial load of each of the items. All of them had factorial weights greater than .50, with the exception of item 2 ("*Los contratiempos (deportivos, familiares, laborales, salud, etc.), no me desaniman* "), so it was eliminated. As a result, there was an improvement in factorial weights (>.50), a reliability

greater than .70 (*Cronbrach's Alpha*), and an explained variance greater than 60% (Fleiss, 2011; Fornell & Larcker, 1981).

The use of the covariate error is a recommended strategy as long as the model fit rates improve considerably, although many researchers maintain otherwise. However, it should be used whenever there are solid theoretical arguments that support it (Avecillas & Lozano, 2016). Some of these arguments for model fitting could be a possible content overlap, a similar wording of the items, a reverse wording or a differential tendency to social convenience, etc., and that larger modification indices were initially addressed before the little ones (Fornell & Larcker, 1981).

Thus, it was decided to correlate errors e5 and e1; e4 and e6; e5 and e6. That achieved a better fit of the revised model than the first one, [(χ^2=30.070; df=11; p=.002; CMIN/DF=2.734; RMSEA=.092, GFI= .959, CFI=.962, TLI= .927, SMR=.0620 and RMR=.068], resulting in a structure of two factors and 7 items [*consistency of interest* (N items = 4), and *perseverance of effort* (N items = 3)].

All the obtained values from the analyses were compared with those obtained in both the original scale and the Spanish version, as recommended by Arco-Tirado et al. (2018) (Table 5).

Table 5. Reference values of the *Grit-S* in different studies.

Grit-S versions/Sample	*N*	χ^2	*df*	*CFI*	*RMSEA*
Spanish Adults	1826	825.52	19	.92	.084
Original West Point 2008	1218	106.36	19	.95	.061
West Point 2010	1308	135.51	19	.95	.068
2005 National Spelling Bee	175	71.57	19	.86	.101
Ivy League Undergraduates	139	43.63	19	.93	.097
Adults over 25 years-old	1554	188.52	19	.96	.076
Amateur runners	**514**	**30.070**	**11**	**.96**	**.092**

Figure 1 shows the representation of the two-factor model, with the factor loading of each item (Figure 1).

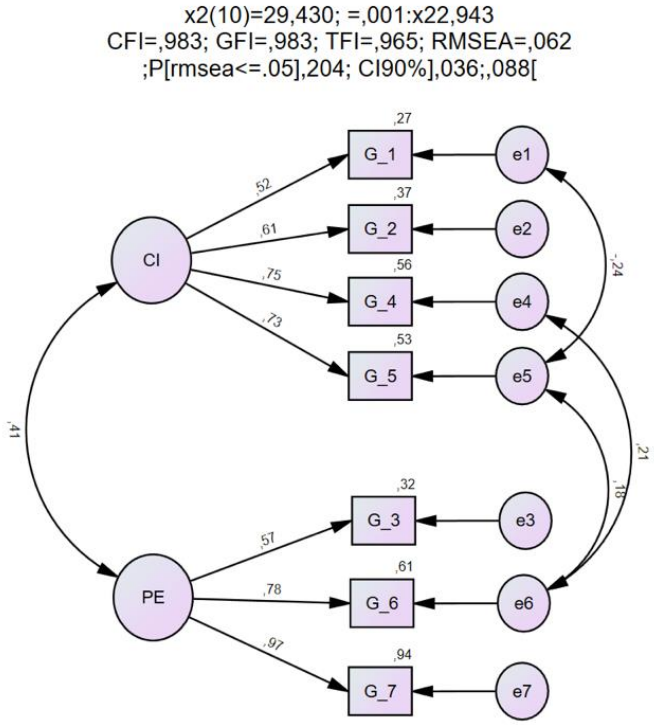

Figure 1. Confirmatory analysis of the two-factor model. CI = *consistency of interest*; PE = *perseverance of effort*.

Only one of factors obtained appropriate convergent validity analysed by means of the AVE. The *perseverance in effort factor* showed a value greater than 0.50 (AVE=.623), while the *consistency of interest* factor presented a value lower than .50 (AVE= .432), which is interpreted as this factor sharing less than 50% of its variance with each of the elements or items that comprise it. However, the Composite Reliability (CF) values were above .70 (CI=.749; PE=.825), as Fornell and Larcker (1981) proposed.

The results showed that the correlation between the constructs (r=.410) was lower than the square root of the AVE (CI=.657; PE=.789), thus confirming the presence of discriminant validity in statistical terms.

The reliability of the constructs was evaluated by calculating *Cronbach's alpha* of the *Grit-SR* scale, with the values of the overall scale (α=.764) and each of its dimensions being above 0.70 (*consistency of interest*, α=.731; *perseverance of effort*, α=.806).

DISCUSSION

Sports Psychology has been concerned with investigating variables that influence athletes' development and performance. *Grit* could be among them, though it is a trait that has been studied primarily in domains other than sports using generic scales to assess it. That has led to an effort to explore potential differences between domain-specific and general characteristics of *grit*, along with a focus on ways to adapt these *grit* scales to specific contexts.

The use of original non-specific scales for this trait in samples of athletes has yielded interesting results. One example is the study by Martin et al., (2015), who discovered that subjects with higher *grit* scores were more involved in wheelchair basketball than others. Drury (2019) found that ~~how~~ a group of runners showed themselves to be less conscientious, *gritty* and mindful compared to another non-runners.

However, the absence of a specific tool for measuring *grit* generated doubts about the predictive validity of this construct in sports. Tedesqui and Young (2017) were the first to consider the goal of analysing the validity of the *Grit-O* in a sample of different athletic modalities.

Aware of the limitations of working with these generic scales, Cormier et al. (2019) developed a specific scale through the adaptation of *Grit-O* to sports. These authors, based on their study and other findings (Schmidt et al., 2017), proposed that *grit* could be conceptualized and measured as a domain-specific construct, although they recommended more research on this topic was needed to affirm that idea.

To address that suggestion, this study adapts and validates a version of *Grit-S* for a specific sports group -- amateur runners. As Duckworth (2016) points out, anecdotally this population fits perfectly with the described profile of *grittier* individuals because of their training habits and long-term performance goals.

The results of this study, using confirmatory factor analysis and validity assessment, support the use of a specific *grit* scale for runners. The factorial loads (>.50) and values of the AVE showed a necessary convergent validity to consider it as an adequate tool. *Cronbach's alpha coefficients* and CF values showed good internal consistency (>.70), both for the total scale and each of its two factors, as recommended by Huh et al. (2006) and Visauta and Martori (2003). Furthermore, our results were similar to those of the *Grit-O* (Duckworth & Quinn, 2009) and other adapted versions in different populations, such as those in Turkey (Haktanir et al., 2016), Poland (Wyszyńska et al., 2017), and the American Spanish-speaking one (Karaman et al., 2018).

Similar to the *Grit-S* by Haktanir et al. (2016), in which two items of the *perseverance of effort* factor were deleted, in our adaptation process we had to eliminate one of the items based on the CFA results. This might be explained by a semantic loss in translation or by a different perception of the concept and/or meaning of the item when it is transferred to sports context. This possibility brought with it the improvement of the fit/consistency indices of the *Grit-SR* (López-Walle et al., 2011).

Our research suggests that the *Grit-SR* scale that we have tested here offers a useful tool with a high degree of specificity to researchers both in Sports Psychology and for professionals from different disciplines or areas related to Sport Sciences.

Finally, it should be pointed out that understanding athletes' behaviours, along with subsequent interventions, can increase the probability of their success, which is related to higher *grit* scores and stronger commitment to the activity and persistence in achieving goals (Duckworth & Eskreis-Winkler, 2015; Eskreis-Winkler et al., 2016; Larkin et al., 2016).

CONCLUSIONS

Analyses suggest that the model or factorial structure that presented the best psychometric properties for *Grit-SR* was the one made up of seven items and two factors (*consistency of interest* and *perseverance of effort*). This is the first step to check if it is necessary to carry out the scale adaptation to different contexts or specific domains. In this way, we can affirm that *Grit-SR* can be considered as a useful, valid and reliable instrument to be used in scientific research.

LIMITATIONS AND FUTURE PERSPECTIVES

In this study, we have focused on analysing a group of amateur runners following the criteria of Lloret-Segura et al. (2014). In the future, it would be useful to expand the number and type of analysed sports in order to improve the validity and scope of the scale (Muñiz et al., 2013), and thus compare and corroborate domain-specific *grit*. For future studies, we also believe it would be helpful to test the construct and concurrent validity of the scale related to other psychological variables, such as resilience, perseverance, commitment and hardiness, all of which have the potential to produce some conceptual confusion.

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