

## Personality Psychology

# Psychometric Properties of the Chilean Version of the Oviedo Grit Scale

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Grit is a non-cognitive variable that helps predict important variables in people's lives, such as academic, sport, and work performance, physical and mental health, and subjective well-being. However, there are few instruments measuring grit in the Chilean context. The aim of this study is to contribute new evidence of validity of the Oviedo Grit Scale (*Escala Grit de Oviedo*; EGO) through its adaptation to a Chilean sample. A sample of 359 Chilean participants was used ( $M_{years} = 41.28$ ;  $SD_{years} = 11.09$ ; 69.4% women), from the 16 regions that make up the Chilean territory. The unidimensionality of the EGO was confirmed in the Chilean context, also showing scalar invariance in terms of sex. The reliability of the scores on the EGO was excellent ( $\alpha = .92$ ;  $\omega = .92$ ), showing high correlations with grit, measured through the Grit-S scale ( $r = .577$ ), self-control ( $r = .500$ ), self-efficacy ( $r = .809$ ), and productiveness ( $r = .679$ ). In addition, the EGO showed statistically significant differences in terms of age. It is concluded that it is a reliable, valid, and brief scale to evaluate grit, and thus this construct can be studied in relation to important variables that affect people's lives.

Grit, defined as the passion and perseverance for long-term goals (Duckworth et al., 2007), is one of the non-cognitive variables that has received the most attention in the 21st century (Credé et al., 2017; Fernández-Martín et al., 2020). The boom is explained, mainly, by its relationship with important aspects in people's lives. For example, there has been a great proliferation of studies that relate grit to high subjective well-being (Hou et al., 2021; Salles et al., 2014) and good physical (Moore et al., 2018) and mental health, as the higher the levels of grit, the lower the levels of anxiety and depression (Datu et al., 2021; Disabato et al., 2019; Musumari et al., 2018). In the field of sports, grit is related to fewer thoughts of abandonment, as well as the increased deliberate practice of the sport in question (Tedesqui & Young, 2018). Within the education framework, many authors have found that grit is related positively to a better academic performance in university (Akos & Kretchmar, 2017; Fong & Kim, 2021), secondary school (Muenks et al., 2017; Steinmayr et al., 2018), and elementary school (Clark & Malecki, 2019; Hagger & Hamilton, 2018). This relation has also been demonstrated in longitudinal studies, where high levels of grit in the elementary stage are related to a better academic performance in the secondary stage (Jiang et al., 2019; Postigo, Cuesta, Fernández-Alonso, et al., 2021a, 2021b; Tang et al., 2021). In the

organizational context, grit has been related to greater entrepreneurial activity (Mueller et al., 2017; Postigo, Cuesta, & García-Cueto, 2021), with greater job stability (Eskreis-Winkler et al., 2014; Rodríguez et al., 2019), and greater job satisfaction and a higher income (Danner et al., 2019). In Latin America, studies have also been conducted testing the importance of this variable. For example, Oriol et al. (2017) showed with a sample of Peruvian students how grit is related positively to academic self-efficacy and academic satisfaction, whereas Lozano-Jiménez et al. (2021) showed, using a sample of Colombian students, how grit is related to basic psychological needs, such as autonomy, competence and school relationships.

However, grit has not been without controversy. The main debate has to do with the difficulty of finding a substantive framework that differentiates it from other more classical psychological constructs, such as self-efficacy or conscientiousness. Self-efficacy is closely related to grit (Oriol et al., 2017; Usher et al., 2019). However, core self-evaluations, such as self-efficacy, do not contemplate passion or a long-term framework (Southwick et al., 2021). For its part, conscientiousness is defined as the tendency to be self-controlled, responsible to others, hardworking, orderly, and rule-abiding (Roberts et al., 2009). Credé et al. (2017) showed in their meta-analysis that the global con-

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struct of grit has a very high correlation ( $r = .84$ ) with conscientiousness. However, it is beginning to be established that both constructs have different levels of conceptual hierarchy (Schmidt et al., 2018), so that grit, due to its more proactive nature, would be considered a facet of conscientiousness. However, grit differs from other facets of conscientiousness such as productiveness, responsibility, organization, and self-control. These facets do not specify the passion component and in addition, grit differs in its emphasis on long-term stamina rather than short-term intensity (Duckworth et al., 2007). Specifically, it has shown very high relationships with the productiveness facet (Schmidt et al., 2018), to such an extent that some authors have already called the relationship between both constructs a *jungle fallacy* or *new wine in an old bottle* (Ponnock et al., 2020; Schmidt et al., 2020). However, other authors state that, although very close relationships are found between both constructs, grit is not reduced to productiveness (Duckworth et al., 2007, 2019; Werner et al., 2019).

When grit is assessed, the Grit-S instrument (Duckworth & Quinn, 2009), the short version of the original Grit scale (Duckworth et al., 2007), has been the most frequently used instrument. The Grit-S scale has two dimensions (with four items each): perseverance of effort and consistency of interests. This scale has been validated in different languages and cultures, such as Chinese (Li et al., 2016), Spanish (Arco-Tirado et al., 2018), German (Schmidt et al., 2019) and Czech (Schmidt et al., 2021), including validations in Latin American countries like Mexico (Marentes-Castillo et al., 2019), Colombia (Collantes-Tique et al., 2021), and the country of the present work, Chile, although on an exclusively working population (Rice et al., 2021).

Nevertheless, there have been several weaknesses that have begun to show around the psychometric properties of the Grit-S (Clark & Malecki, 2019; Credé, 2018; Muenks et al., 2017). With respect to content validity, it seems there is an absence of content referring to the long term (Morell et al., 2021) and even referring to passion (Jachimowicz et al., 2019). For dimensionality, according to the authors of the scale, grit would be a bidimensional variable, with two first-order factors (four items for consistency of interests and four items for perseverance of effort) and one second-order (grit; Duckworth & Quinn, 2009). Yet the higher-order factor is not supported (Credé, 2018; Tynan, 2021), as the authors themselves have recently concluded (Duckworth et al., 2021). In this vein, other studies with the Grit-S scale seem to show a better fit to a unidimensional structure (Areepattamannil & Khine, 2018; Gonzalez et al., 2020) or a bifactor model (Muenks et al., 2017). The unidimensional structure of grit has been found in other measurement instruments of grit, like the Academic Grit Scale (AGS; Clark & Malecki, 2019), or the Oviedo Grit Scale (*Escala Grit de Oviedo*, EGO; Postigo, Cuesta, García-Cueto, et al., 2021). Another problem with the Grit-S scale is the accuracy in the measurement. Usually, in many of the studies in which the Grit-S scale is used, a Cronbach's  $\alpha$  coefficient no higher than .70 is reached in either of the two previously mentioned dimensions or on the global score of the test. This is indicative that, on certain occasions, the Grit-S scale is not

very reliable for measuring grit (e.g., Clark & Malecki, 2019; Hasan et al., 2020), added to some of the factors not having sufficient identity (Disabato et al., 2019). For these reasons new measurement instruments of grit have been developed (Hasan et al., 2020). Among them, Postigo, Cuesta, García-Cueto, et al. (2021) developed the EGO for the Spanish general population. The EGO was born out of the need to develop a new instrument to measure grit in the Spanish context that could solve some of the problems that the Grit-S scale shows. The EGO is an instrument made up of 10 items that, even considering both facets of grit (perseverance of effort and consistency of interests), has presented an essentially unidimensional structure, like other instruments of grit (Clark & Malecki, 2019; Gonzalez et al., 2020). Grit (EGO instrument) showed high relationships with conscientiousness, risk-taking, self-efficacy and, especially, with achievement motivation. In addition, it also showed high relationships with the Spanish version of the Grit-S scale (Postigo, Cuesta, García-Cueto, et al., 2021).

Regarding to sociodemographic variables in grit context, when looking at sex, some studies have shown that women exhibited higher levels of grit than men, at ages specially in adolescents (Eskreis-Winkler et al., 2014; Oriol et al., 2017), whereas others, such as Credé et al. (2017) in their meta-analysis, have not found differences. In terms of age, grit seems to be consistent over time (Duckworth et al., 2007), and some studies have even shown it increasing with age (Cosgrove et al., 2016; Peña & Duckworth, 2018). However, longitudinal studies found that grit scores decreased over time, at least in the academic context (Postigo, Cuesta, Fernández-Alonso, et al., 2021a, 2021b; West et al., 2016).

Given the importance of grit in multiple contexts (Fernández-Martín et al., 2020), as well as the limitations that the Grit-S scale has demonstrated in some scenarios, having another instrument that can measure this variable in the Chilean context takes on special relevance. In this vein, the aim of the present work is the adaptation of the EGO in Chile. For this, the items on the scale will be adapted to the Chilean culture and its psychometric properties will be analyzed. Specifically, the EGO will be studied in terms of the internal structure, measurement invariance, reliability, evidence of validity in relation to other psychological variables, as well as the study of its discriminative capacity between different groups based on their levels of entrepreneurial personality.

## Method

### Participants

The sample was comprised of 359 participants from the Chilean general population. The sampling was incidental. Since the variance of the EGO scores in Spain had been calculated, and taking into account that a maximum error of 5% was intended, a minimum sample of 345 participants was needed in Chile. The participants came from the 16 regions that make up the national territory. The age ranged between 18 and 72 years, with a mean of 41.28 years and a standard deviation of 11.09. 69.4% of the sample were women, and 84.4% were actively employed.

## Instruments

### ***Oviedo Grit Scale (Escala Grit de Oviedo, EGO; Postigo, Cuesta, García-Cueto, et al., 2021).***

The EGO is a unidimensional questionnaire of 10 items that evaluates grit (e.g., “Although the results seem far off, I persist in the task”). The items are on a Likert scale that goes from 1 (totally disagree) to 5 (totally agree). All the items were developed in positive form to reduce the response bias (Vigil-Colet et al., 2020). The instrument has excellent reliability ( $\alpha = .94$ ) as well as good evidence of convergent validity (Postigo, Cuesta, García-Cueto, et al., 2021). The adaptation of the EGO followed the guidelines of the International Test Commission (Hernández et al., 2020; International Test Commission, 2017; Muñoz et al., 2013). The Spanish version of the EGO was reviewed by a committee of five experts in Psychological Assessment in Chile, who did not identify cultural differences in any of the items. Therefore, according to the experts, the 10 items on the EGO were pertinent for their application in the Chilean population.

### ***Grit Short Scale (Grit-S; Duckworth & Quinn, 2009)***

The Grit-S is a questionnaire with eight items that evaluate two domains (four items per domain): perseverance of effort and consistency of interests. The responses to the items are given on a Likert scale from 1 (totally disagree) to 5 (totally agree). The validated version was used in Chile (Rice et al., 2021), which shows reliability coefficients ( $\omega$ ) of .76 for grit, .74 for perseverance of effort and .80 for consistency of interest. In the present study, the reliability coefficients ( $\alpha$  and  $\omega$ , respectively) were: grit: .733 and .735; consistency of interests: .726 and .733; and perseverance of effort: .544 and .604.

### ***Brief Self-Control Scale (BSCS; Tangney et al., 2004).***

The BSCS is a 13-item questionnaire that evaluates self-control (e.g., “I am good at resisting temptation”) on a Likert scale that goes from 1 (not at all like me) to 5 (very much like me). The adaptation to Latin American Spanish by Garrido et al. (2017) was used. As Lindner et al. (2015) recommends, in the present study the total score of the questionnaire was used, with adequate reliability ( $\alpha = .787$  and  $\omega = .790$ ).

### ***Battery for the Assessment of the Enterprising Personality (BEPE; Cuesta et al., 2018)***

The BEPE is a questionnaire with 80 items that evaluate the eight personality dimensions identified in the literature as most related to the enterprising personality (10 items per dimension): self-efficacy, autonomy, innovation, internal locus of control, achievement motivation, optimism, stress-tolerance, and risk-taking. The items are on a Likert scale that goes from 1 (completely disagree) to 5 (completely agree). For the present study, the dimensions of

self-efficacy ( $\omega = .921$ ; Cuesta et al., 2018) and achievement motivation ( $\omega = .907$ ; Cuesta et al., 2018) were used for being the variables most related to grit. In the current study, the reliability coefficients ( $\alpha$  and  $\omega$ , respectively) were excellent: self-efficacy: .896 and .898 and achievement motivation: .902 and .906.

### ***Short version of the Battery for the Assessment of the Enterprising Personality (BEPE-16; Postigo et al., 2020)***

The BEPE-16 is the short version of the BEPE (Cuesta et al., 2018). The BEPE-16 is a unidimensional questionnaire of 16 items that evaluate the enterprising personality, with two items having been selected from each specific aspect, those with the greatest factor load on the general factor of enterprising personality ( $\omega = .94$ ; Postigo et al., 2020). The items are on a Likert scale that goes from 1 (completely disagree) to 5 (completely agree). In the present study, the reliability of the scores on the BEPE-16 was excellent ( $\alpha = .909$ ;  $\omega = .912$ ).

### ***Big Five Inventory 2 (BFI-2; Soto & John, 2017)***

The BFI-2 is a questionnaire that measures the Big Five personality domains and 15 more specific facets through 60 items. The items are on a Likert scale that goes from 1 (strongly disagree) to 5 (strongly agree). In this line, the BFI-2 evaluates three facets (four items per facet) for each of the big five personality domains. The translation and validation for Spanish were done by Gallardo-Pujol et al. (2022). For the present study, conscientiousness ( $\omega = .86$ ) and negative emotionality ( $\omega = .88$ ) were used, with their corresponding facets, which were reviewed by a Chilean expert for their adaptation to Chilean culture. Although Spanish is spoken in both Spain and Chile, there are important singularities in the sociolinguistic codes that are related to the types of social structure and culture of each country. For these reasons, the comprehensibility and vocabulary of each of the items were evaluated. The Chilean expert, who has spent a long period of time in Spain, concluded that all the items were understood by the Chilean population without the need for linguistic and cultural corrections. The main reason to use these facets was that both are dominions on the Big Five to which grit has been most related. Reliability ( $\alpha$ ) for each of the variables was the following: Conscientiousness (domain):  $\alpha = .836$ ,  $\omega = .845$ ; Organization:  $\alpha = .793$ ,  $\omega = .800$ ; Productiveness:  $\alpha = .722$ ,  $\omega = .753$ ; Responsibility:  $\alpha = .630$ ,  $\omega = .641$ ; Negative emotionality (domain):  $\alpha = .860$ ,  $\omega = .865$ ; Anxiety:  $\alpha = .686$ ,  $\omega = .696$ ; Depression:  $\alpha = .803$ ,  $\omega = .812$ ; Volatility:  $\alpha = .783$ ,  $\omega = .794$ .

## Procedure

First, personal contact was made with potential participants and organizations who were in the 16 regions of the Chilean national territory. The inclusion criteria for the study were to be of legal age and be resident in the Chilean territory. Also, professional social networks were used to

search for potential participants. A non-probability snowball sampling procedure was followed, where potential participants were asked to respond to the questionnaire while ensuring anonymity and confidentiality of responses. In turn, we also asked if they could disseminate the questionnaire to potential participants who met the inclusion criteria. Contact was made through emails and professional social networks. The study was presented to participants online. This procedure was done for nine months (May-December 2021). The average response time of the participants to answer the different questionnaires was 25 minutes. The items on all the applied questionnaires were randomized. The participants did not receive any reward for participating in the study and their informed consent was sought prior to beginning the application of the different instruments. Anonymity and confidentiality were carefully respected, and the strict fulfillment of data protection was guaranteed.

## Data analysis

The analyses were not pre-registered but are standard kinds of psychometric analyses. First, descriptive statistics were used (mean, standard deviation, skewness and kurtosis) for the 10 items on the EGO. The discrimination indices of the items were analyzed (corrected item-test correlations), being considered adequate when they were over .20 (Muñiz & Fonseca-Pedrero, 2019).

The internal structure of the EGO was analyzed by confirmatory factor analysis (CFA), verifying whether the unidimensional factorial structure of grit was also found in the Chilean version. Some items showed values of skewness and kurtosis outside the range of  $\pm 1$ , which is why the CFA was performed on the polychoric correlation matrix (Ferrando et al., 2022), and mean and variance adjusted unweighted least squares (ULSMV) was used as the estimation method. As indices of fit, comparative fit index (CFI), Tucker-Lewis index (TLI), and root mean square error of approximation (RMSEA) were used, establishing a good fit when CFI and TLI  $> .95$  and RMSEA  $< .08$  (Hu & Bentler, 1999). In addition, given the importance of studying the factor structure of a construct through different populations, the measurement invariance was studied in terms of sex. For this, the configural, metric, and scalar invariance was studied through the multi-group confirmatory factor analysis (MG-CFA). When dealing with nested models, assuming there is measurement invariance, a change in CFI less than  $-.01$  and in RMSEA less than  $.015$  ( $\Delta CFI < -.01$ ,  $\Delta RMSEA < .015$ ; Chen, 2007) is accepted.

On the other hand, the dimensionality of the Grit-S scale in Chile was carried out. An Exploratory Factor Analysis (EFA) was carried out with the items of the Grit-S scale to study its internal structure on the Pearson correlation matrix. Unweighted Least Squares (ULS) was used as the estimation method and Promin was used as the rotation method to achieve factor simplicity.

To contribute evidence of convergent validity, Pearson's correlation was calculated between the Chilean validation of the EGO and the Grit-S scale, both in its dimensions (perseverance of effort and consistency of interests) and its

total score. Also, as evidence of validity in relation to other variables (AERA et al., 2014), Pearson's correlation was analyzed between the EGO and self-efficacy, achievement motivation, self-control and enterprising personality. In addition, the relations between the EGO and variables of the Big Five model with which grit has shown a relation, such as the facets of conscientiousness (organization, productivity and responsibility) and facets of negative emotionality (anxiety, depression and volatility), were analyzed.

Also, in order to obtain extrinsic convergent validity evidence (Gonzalez et al., 2021), correlations were calculated between grit, assessed through the Grit-S scale, and the facets of conscientiousness with the rest of the variables in the study. The main objective is to study whether the correlations shown by the EGO instrument with external variables are similar from the correlations shown by the Grit-S instrument and different by the facets of conscientiousness. Fisher's  $z$  transformation was used to test the differences between EGO and Grit-S correlations. Cohen ( $q$  effect size) proposes the following categories for the interpretation:  $< .1$ : no effect;  $.1$  to  $.3$ : small effect;  $.3$  to  $.5$ : medium effect; and  $> .5$ : large effect (Cohen, 1988).

Possible differences in the grit construct based on sex was studied. A  $t$ -test of mean differences was conducted for independent samples and as effect size, Cohen's  $d$  was used. Finally, a simple linear model on age was studied, also analyzing whether the quadratic effect between the two variables was fulfilled.

Descriptive statistics, Pearson's correlations differences between groups, and linear regression model were calculated with the SPSS 24 program (IBM Corp, 2016). The reliability of the scores was calculated with the Jamovi program. The EFA was carried out with FACTOR program (Ferrando & Lorenzo-Seva, 2017; Lorenzo-Seva & Ferrando, 2021). The CFA and measurement invariance were carried out with the MPlus8 program (Muthén & Muthén, 2017).

## Results

First, descriptive statistics of the items of the EGO in Chile were studied. Each of the items showed adequate values in skewness and kurtosis (Table 1). Item one showed a slightly high kurtosis value, due to people tending to select alternative four or five (agree and completely agree, respectively). The discriminative power was very high for each of the items (I.D. [.581 - .757]).

The unidimensional factor structure of the Chilean version of the EGO was verified by CFA. The fit of the data to the unidimensional model was adequate for the Chilean total sample (Table 2). Next, the invariance measurement was studied based on sex, with the three studied levels of invariance (configural, metric and scalar) being fulfilled, as shown in Table 2. In addition, the reliability of the scores of the EGO were very high ( $\alpha = .917$ ;  $\omega = .919$ ).

On the other hand, regarding the internal structure of the Grit-S scale, the bidimensional model fit of the Grit-S scale is adequate (GFI = .996; RMSR = .030). In contrast, the factor loadings of the items do not load along the two dimensions of the Grit-S scale (perseverance of effort and consistency of interests), but load along the direction of the

**Table 1. Descriptive Statistics, Discrimination Indices, and Factor Loadings of the Items on the Oviedo Grit Scale**

| Item   | Mean  | Standard Deviation | Skewness | Kurtosis | Item-test correlation (corrected) | Factor loading |
|--|-------|--------------------|----------|----------|-----------------------------------|----------------|
| 01. When I set myself an objective, I continue until I achieve it.<br>[Cuando me planteo un objetivo persisto en él hasta conseguirlo]                     | 4.31  | 0.818              | -1.378   | 2.531    | .581                              | .654           |
| 02. I do what I set out to do.<br>[Cumpro lo que me propongo]  | 4.00  | 0.827              | -0.709   | 0.634    | .686                              | .763           |
| 03. I am consistent in my interests.<br>[Soy constante en mis intereses]   | 4.21  | 0.817              | -0.953   | 0.710    | .744                              | .845           |
| 04. I am clear about my objectives.<br>[Tengo mis objetivos claros]  | 4.36  | 0.715              | -1.036   | 1.263    | .742                              | .859           |
| 05. Even though the results seem far off, I persist in the task.<br>[Aunque los resultados se vean muy lejos, persisto en la tarea]                        | 4.29  | 0.788              | -0.947   | 0.551    | .670                              | .766           |
| 06. I work hard every day to get closer to my goals.<br>[Cada día trabajo duro para acercarme más a mis objetivos]   | 4.23  | 0.789              | -0.801   | 0.309    | .624                              | .716           |
| 07. When I have a project in mind I do everything possible to get it done.<br>[Cuando tengo un proyecto en mente hago todo lo posible por llevarlo a cabo] | 4.33  | 0.708              | -0.805   | 0.546    | .757                              | .872           |
| 08. I spend as much time and energy as I can on reaching my goals.<br>[Dedico el máximo de mi tiempo y energía a lograr mis metas]                         | 4.31  | 0.702              | -0.702   | 0.037    | .709                              | .821           |
| 09. If I set myself something to do, I will work on it until I achieve it.<br>[Si me propongo algo, trabajaré en ello hasta conseguirlo]                   | 4.26  | 0.747              | -0.554   | -0.743   | .732                              | .849           |
| 10. I finish what I start.<br>[Termino lo que empiezo]   | 4.16  | 0.840              | -0.910   | 0.798    | .701                              | .792           |
| Total  | 42.46 | 5.879              | 0.826    | 0.753    | -                                 | -              |

**Table 2. Factor Structure and Measurement Invariance for the Oviedo Grit Scale Based on Sex**

|            | CFI  | TLI  | RMSEA [90%]        | $\Delta$ CFI | $\Delta$ RMSEA |
|------------|------|------|--------------------|--------------|----------------|
| Total      | .986 | .983 | .076 [.060 - .093] | -            | -              |
| Sex        |      |      |                    |              |                |
| Men        | .970 | .962 | .105 [.074 - .137] | -            | -              |
| Women      | .989 | .986 | .073 [.053 - .094] | -            | -              |
| Configural | .987 | -    | .076 [.061 - .091] | -            | -              |
| Metric     | .988 | -    | .085 [.067 - .102] | .001         | .009           |
| Scalar     | .991 | -    | .056 [.040 - .072] | .003         | .029           |

items, with positive (direct) items loading on one dimension and negative (inverse) items on another dimension (Table 3). The correlation between the perseverance of effort dimension and the consistency of interests dimension was .499. The eigenvalues were 2.82 for the first variable, 1.37 for the second variable, and 0.88 for the third variable. However, the Parallel Analysis recommended a single dimension. The real data explains 39.9% of variance, above the 31.8% of the first variable of the Parallel Analysis

simulated data. However, the second variable of real data explains 19%, being already surpassed by the second variable of the simulated data, explaining 25.5%. Thus, the EFA was carried out to the unidimensional model. This model showed a good fit to the data (GFI = .962; RMSR = .091) and the factor loadings of the items are adequate (Table 3). In this line, a total grit score through the Grit-S scale is justified for the study of extrinsic convergent validity evidence.

**Table 3. One-dimensional and Bidimensional Models of Grit-S Scale**

| Dimensions               | Ítems  | Bidimensional model |             |                                    |                                    | One-dimensional |
|--------------------------|--|---------------------|-------------|------------------------------------|------------------------------------|-----------------|
|                          |  | Dimension 1         | Dimension 2 | Structure coefficients Dimension 1 | Structure coefficients Dimension 2 | Dimension 1     |
| Consistency of interests | New ideas and projects sometimes distract me from previous ones [Las ideas y proyectos nuevos a veces me distraen de ideas y proyectos anteriores]*  | -.047               | .564        | .234                               | .541                               | .509            |
|                          | I have been obsessed with a certain idea or project for a short time but later lost interest [He estado obsesionado/a con alguna idea o proyecto durante un tiempo breve, pero después he perdido el interés]* | -.018               | .723        | .342                               | .714                               | .678            |
|                          | I often set a goal but later choose to pursue a different one [A menudo me pongo una meta pero después cambio a otra diferente]*   | -.053               | .753        | .323                               | .727                               | .674            |
|                          | I have difficulty maintaining my focus on projects that take more than a few months to complete [Tengo dificultades para mantener mi atención en proyectos que requieren más de unos meses en completarse]*    | .039                | .541        | .309                               | .561                               | .557            |
| Perseverance of effort   | I am a hard worker [Soy muy trabajador/a]  | .597                | -.115       | .540                               | .183                               | .295            |
|                          | I am diligent [Soy diligente]  | .669                | -.167       | .586                               | .167                               | .289            |
|                          | I finish whatever I begin [Termino siempre todo lo que empiezo]  | .600                | .187        | .693                               | .486                               | .575            |
|                          | Setbacks discourage me [Los contratiempos me desaniman]*   | .090                | .356        | .267                               | .401                               | .416            |

Note. \* = reverse items

In terms of evidence of validity in relation to other variables, Table 4 provides Pearson's correlations between grit, measured through the EGO in Chile, and the remaining variables. The correlation matrix with other study variables can be found in Table S1 of the supplementary material. The correlation between grit measured through the EGO and grit measured through the Grit-S is high, particularly with the dimension perseverance of effort and with its total score. In addition, the EGO contributes evidence in relation

to other variables, showing high relations with self-efficacy, self-control and enterprising personality. It is worth noting, as in the Spanish version of the EGO, the high correlation with achievement motivation. Referring to the Big Five model, the EGO showed high relations with the dominion of conscientiousness and its facets, especially productivity. In the same way, the EGO was negatively related to negative emotionality, emphasizing its negative relation with depression.

**Table 4. Pearson's Correlations between the Chilean Version of the EGO, Grit-S and Conscientiousness facets (BFI-2) and BEPE, the BSCS, the BEPE-16 and the BFI-2**

|                                 | EGO   | Grit-S | <i>z</i> ( <i>p</i> )<br>EGO vs Grit-S | Cohen's <i>q</i><br>(effect size) | Conscientiousness (domain) | Organization | Productiveness | Responsibility |
|---------------------------------|-------|--------|--|-----------------------------------|----------------------------|--------------|----------------|----------------|
| Grit-S                          |       |        |  |                                   |                            |              |                |                |
| Grit-S Perseverance of effort   | .667  | .763   | -                                      | -                                 | .667                       | .424         | .692           | .517           |
| Grit-S Consistency of interests | .376  | .908   | -                                      | -                                 | .388                       | .196         | .424           | .342           |
| Grit-S Total                    | .577  | -      | -                                      | -                                 | .585                       | .336         | .622           | .483           |
| BEPE                            |       |        |  |                                   |                            |              |                |                |
| Self-efficacy                   | .809  | .508   | 7.53 (<.001)                           | .564 (large)                      | .479                       | .214         | .598           | .375           |
| Achievement motivation          | .878  | .485   | 11.17 (<.001)                          | .837 (large)                      | .540                       | .311         | .642           | .369           |
| BSCS                            |       |        |  |                                   |                            |              |                |                |
| Self-Control                    | .500  | .712   | - 4.16 (<.001)                         | .342 (medium)                     | .651                       | .419         | .617           | .564           |
| BEPE-16                         |       |        |  |                                   |                            |              |                |                |
| Enterprising personality        | .799  | .526   | 6.82 (<.001)                           | .511 (large)                      | .510                       | .254         | .627           | .375           |
| BFI-2                           |       |        |  |                                   |                            |              |                |                |
| Conscientiousness (domain)      | .596  | .585   | 0.23 (.409)                            | .017 (no)                         | -                          | .828         | .801           | .792           |
| Organization                    | .341  | .336   | 0.08 (.468)                            | .006 (no)                         | .828                       | -            | .451           | .485           |
| Productiveness                  | .679  | .622   | 1.32 (.093)                            | .099 (no)                         | .801                       | .451         | -              | .506           |
| Responsibility                  | .442  | .483   | -0.70 (.242)                           | .052 (no)                         | .792                       | .485         | .506           | -              |
| Negative Emotionality (domain)  | -.410 | -.446  | 0.59 (.278)                            | .044 (no)                         | -.383                      | -.141        | -.460          | -.360          |
| Anxiety                         | -.224 | -.251  | 0.38 (.352)                            | .029 (no)                         | -.138                      | .007         | -.247          | -.113          |
| Depression                      | -.488 | -.442  | -0.78 (.218)                           | .059 (no)                         | -.433                      | -.192        | -.514          | -.371          |
| Volatility                      | -.294 | -.404  | 1.67 (.048)                            | .125 (small)                      | -.368                      | -.158        | -.369          | -.399          |

On the other hand, Table 4 shows the correlations of the Grit-S scale and the facets of conscientiousness with the rest of the external variables of the study, and also whether the differences between the correlations of EGO and Grit-S with the rest of the variables are statistically different. As can be seen, the EGO scale shows higher correlations with the variables related to entrepreneurial personality, such as self-efficacy and achievement motivation (large effect size). In contrast, both the Grit-S scale and the facets of conscientiousness (especially productiveness) show higher correlations with self-control (medium effect size). On the other hand, both the EGO scale and the Grit-S scale show similar relationships with negative emotionality (only a small effect size was found with volatility). Finally, the EGO scale shows slightly higher relationships with the productiveness facet than the Grit-S scale but is statistically indistinguishable.

Finally, it was examined whether there were differences in grit in terms of sex. Referring to sex, women ( $M = 42.53$ ) did not present any statistically significant differences ( $p = .745$ ) from the men ( $M = 42.32$ ). In terms of age, EGO scores show a moderate relationship with participants' age ( $r = .176$ ;  $p = .001$ ), explaining 3.1% of the variance in age. The quadratic effect between both variables was not statistically significant ( $p = .273$ ).

## Discussion

Grit has proven to be an important predictor in multiple contexts in people's daily lives, be it education (Clark & Malecki, 2019), health (Hou et al., 2021), sports (Tedesqui & Young, 2018) or an organizational sphere (Postigo, Cuesta, & García-Cueto, 2021). Nevertheless, grit has scarcely been studied in the Chilean context and there are hardly any scales for its measurement. Rice et al. (2021) validated the Grit-S scale in a sample of Chilean workers. However, this scale has shown various limitations, which is why the validation of a new grit instrument in the general Chilean population may be a good starting point. Thus, the objective of the present study was the validation of the EGO scale (Postigo, Cuesta, García-Cueto, et al., 2021) in the Chilean population.

First, the discriminative power of all the items was high, discriminating between those people with low and high levels of grit, being the discrimination indices between .581 and .757. In addition, the unidimensional structure of the EGO is confirmed, according to the original Spanish version (Postigo, Cuesta, García-Cueto, et al., 2021). Although the concept of grit is formulated around two dimensions (perseverance of effort and consistency of interests), there has been controversy around its dimensionality. Therefore, the confirmed unidimensional structure in the present study is consistent with what was found by other authors in different measuring instruments for grit, or in measuring instruments of specific domains of grit (Clark & Malecki, 2019), as on the Grit-S scale (Gonzalez et al., 2020). In addition, measurement invariance was satisfied, which is why the unidimensional factor structure of the EGO is stable between men and women. This means that future studies in Chile that endeavor to study the differences between these

populations can do so by comparing the same factor structure, and it will be possible to compare the means, variances and covariances of the scores between women and men (AERA et al., 2014; Thompson, 2016).

Second, the scores from the EGO showed a very high reliability in the Chilean population ( $\alpha = .92$ ;  $\omega = .92$ ), as did the original Spanish version (Postigo, Cuesta, García-Cueto, et al., 2021). This solves one of the problems of the measurement of grit, where, on certain occasions, the reliability of the Grit-S scale scores is somewhat limited (Clark & Malecki, 2019; Hasan et al., 2020).

Third, referring to the nomological network of grit evaluated by the EGO, it may be said that the most remarkable relation is the one to do with achievement motivation, for being extremely high, as occurred in the study of the original Spanish version. Achievement motivation has to do with the desire to achieve standards of excellence (Muñiz et al., 2014), showing a certain overlapping with the passion and perseverance that people have towards their objective. Also, the EGO was highly correlated with the level of a person's enterprising personality (Postigo et al., 2020). This is associated with previous studies where grit has proven to be a good predictor of intention and an entrepreneurial activity (Mueller et al., 2017; Postigo, Cuesta, & García-Cueto, 2021). Finally, the EGO showed a high correlation with the Grit-S, the best-known scale and the one used to evaluate grit, both in total score ( $r = .577$ ) and in its dimensions (perseverance of effort,  $r = .667$ ; consistency of interests,  $r = .376$ ). In addition, the EGO showed evidence of validity in relation to other variables that have demonstrated high relations with grit, such as self-efficacy, self-control and achievement motivation (Muenks et al., 2017; Oriol et al., 2017; Usher et al., 2019; Vazsonyi et al., 2019). Referring to the Big Five, the EGO showed high relations with negative emotionality and conscientiousness. In particular, it showed a high negative relation with the facet of depression in line with previous studies where grit is a protective factor (Musumari et al., 2018). With respect to conscientiousness, the most noteworthy relation was with the facet productiveness, which contributes evidence of validity in relation to other variables.

On the other hand, the present study shows how the bidimensionality of the Grit-S scale is due to a statistical artefact of item redirection. The item "*Setbacks discourage me*", from the perseverance of effort dimension, loads in dimension 2 (with the rest of the items from the consistency of interests dimension). Therefore, these items, written inversely, load on one dimension, while the rest of the items, written directly, load on another dimension. This is in line with previous studies (Gonzalez et al., 2020; Vazsonyi et al., 2019) showing that grit, as assessed through the Grit-S scale, is essentially unidimensional, with the bidimensionality being due to an artefact of item reversal.

This led to study extrinsic convergent validity evidence and to examine whether the EGO scale shows similar relationships with other variables than the Grit-S scale (not *jingle fallacy*) and different relationships with the facets of conscientiousness (not *jingle fallacy*; Gonzalez et al., 2021). With respect to *jingle fallacy*, the EGO scale and the Grit-S



scale show similar correlations with respect to the facets of responsibility (for example, with respect to the facet productiveness the correlation is slightly higher with the EGO scale but statistically indistinguishable), and the facets of negative emotionality (slightly higher with the Grit-S scale, but only a small effect size was found with volatility). In contrast, the EGO scale shows higher correlations with motivational variables (self-efficacy and achievement motivation), and the Grit-S scale shows higher correlations with self-control. Regarding the *jangle fallacy*, the EGO scale correlates considerably with the facet productiveness, and both scales show similar correlations with external variables. However, with respect to self-efficacy, achievement motivation, entrepreneurial personality, and self-control, the relationships are notably different. With all this, it can be stated that the EGO scale shows extrinsic convergent validity evidence (Gonzalez et al., 2021) because it correlates with external variables in a similar way to the Grit-S scale, but notable differences are also observed, such as with the achievement motivation, self-control or self-efficacy. However, there is also some overlap between the grit scales (EGO and Grit-S) and the productiveness facet. This is related to the conclusions of other studies that state that the facet of productiveness is the most aligned with grit, with both concepts showing very similar theoretical frameworks, leading to talk of a *jangle fallacy* (Ponnock et al., 2020) or *new wine in an old bottle* (Schmidt et al., 2020). In line with these authors, it is difficult to show a clear separation between grit and productiveness because they predict very similar results. However, it is true that grit should be considered as a facet of conscientiousness, but distinct from productiveness. Although they share the perseverance and dispositional characteristic, this facet does not provide the passion and long-term content that grit does in its definition (Southwick et al., 2021).

In terms of the study of the differences in grit between men and women, there were no differences in the line with the findings of the meta-analysis by Credé et al. (2017). In terms of age, grit shows a moderate relationship with participants' age, consistent with previous studies that showed that grit increases with age (Cosgrove et al., 2016; Peña & Duckworth, 2018).

These findings must be taken in the light of some limitations. First, although generalizing to the different areas of Chile has been attempted, the sample used in the study is small. Future studies should broaden the sample and repli-

cate the results obtained in this study. This way, possible differences among the zones in Chile can be studied and thus create the scales for their later practical interpretation.

Definitely, this is a grit instrument with adequate psychometric properties for use on the Chilean population. Life skills have proven to be a key factor in adult life (e. g., García-Alba et al., 2021, 2022). Thus, given the importance that grit has demonstrated in different Latin American contexts (Collantes-Tique et al., 2021; Lozano-Jiménez et al., 2021; Marentes-Castillo et al., 2019; Oriol et al., 2017; Rice et al., 2021, having a brief scale with adequate psychometric properties can be a good starting point in Chile to study this construct in relation to important variables that affect people's lives.

## Contributions

The authors confirm contribution to the paper as follows: study conception and design: AP, JBG; acquisition of data: JBG; analysis and interpretation of data: AP; article drafting and revision: AP, JBG, EGC, MC. All authors reviewed the results and approved the final version of the article for publication.

## Competing Interests

The corresponding author states on behalf of all authors that no authors have competing interests to declare.

## Data Accessibility

No empirical data is associated with this manuscript. Data and analysis scripts for this research can be accessed via (<https://osf.io/93bmz/>).

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### Peer Review History

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