## Original article

**An evaluative study of reliability and validity of Grit 12 item scale in Indian Context**

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**Abstract**

**Background:** Grit refers to determination to achieve long term goals of life despite of unfavorable and unavoidable circumstances. It is implicated as the energetic working to challenges, along with preserving efforts and interests over the time, in-spite of facing barriers, hardships, and failures in the way of progress. The construct of grit comprises of two dimensions: consistency of interests and perseverance of effort. The grit scale by Duckworth, Peterson, Matthews, and Kelly (2007) is originally developed to measure grit among Ivy League undergraduates. In present study researcher made an attempt to explore whether this two-factor model of grit to Indian sample.

**Method:** The alternative model of grit was tested by employing confirmatory factory analysis (CFA) in AMOS 19.0. For this purpose, maximum likelihood techniques were used. 530 senior secondary school students from Himachal Pradesh, Northern India, completed the 12- item survey of grit.

**Results:** The confirmatory factor analysis of the grit revealed that the 12 item, two factor model of grit determines a good fit model on the Indian sample. The results revealed that the grit scale possesses a good psychometric property on Indian sample which is evident from calculated internal

consistency and composite reliability. The results also revealed that the grit scale have a good construct validity, as calculated AVE of all the factor was 0.50.

**Conclusion:** From the analysis it is evident that the grit scale possesses adequate psychometric properties in Indian sample. The instrument of grit can be considered as a unitary construct in the developing country like India.

**Keywords:** Grit, Indian validation, Confirmatory factor analysis, composite reliability, construct validity, Indian sample.

**Introduction**

Grit is a lately identified personality strength. Duckworth defined grit as passion and perseverance towards long term goals characterized by stamina, even while facing adversity [1]. In positive psychology it refers to tenacious strengthening of character [3]. In essence grit refers to determination to achieve long term goals of life despite of unfavorable and unavoidable circumstances [4]. Emerging researches on this concept suggests that it might act as a key instrument predicting adjustment and success of an individual in future [2].

It is implicated as the energetic working to challenges, along with preserving efforts and interests over the time, in-spite of facing barriers, hardships, and failures in the way of progress. Taking stamina as an advantage, a gritty person considers achievement as a long run task, they show passion (consistency of interests in their goals) and remains firm in their pursuit despite off acing setbacks which can be called as perseverance.

Grit is a multidimensional construct including perseverance of effort and consistency of interests as its dimensions. Duckworth and Quinn [5] reported that both the factors of grit show a strong relationship but there may be disparity in the effects, e.g. consistency of interests shows strong

relation with career changes, while perseverance of effort predicts grade points of students [5], sense of belonging, academic adjustment [6] emotional engagement and behavioral engagement of students [7]. These studies highlight the importance of grit by showing how both the subscales of grit are positively related with the predictors of success. Duckworth et al. [1] suggested the use of combined score of both subscales to measure grit as it possesses more predictive power than individual factors.

One of the fundamental requirement of human beings is to achieve well-being and happiness in life and the other basic requirement is to achieve long term goals and dreams [8]. Achieving goals and dreams leads to better life satisfaction and well-being [9]. One of the finest examples for drive to success can be traced in the constitution of America rooted in Declaration of Independence, that all men are equal with equal right to life, liberty and happiness. This dream comprehends that any individual who works hard has the right to be a successful person despite of disparity in class, ethnicity, class and religion [10].

To explore why some individuals are more successful, Galton [11] gathered information from individuals of different occupations. He reached the conclusion that ability of an individual is not the sole factor responsible for success; rather it is the ability along with zeal and capacity to work which makes an individual successful. That means most successful people possesses some talent combined with zeal and willingness to invest efforts. On similar lines, Bloom [12] on the basis of his quantitative study reported that individuals having high aspiration to reach higher levels are more successful than other.

Subsequently Angela Duckworth, a teacher of mathematics noticed intelligence or talent of an individual are not a necessary factor for success, rather determination, perseverance and hard work of individual are the factors contributing to success. Duckworth et al. [1] examined the factor

which differentiate high performers across different fields and revealed that it is not necessary that the talented people are the only high achievers rather individuals with stable commitment and ambition are also among high achievers. This led the Duckworth to coin the term Grit [1], which comprises active working of an individual towards his/her long-term goals while maintaining effort, interest and persistence, despite of facing challenges and failures.

The growing body of literature revealed that the construct of Grit has been explored together with different concepts. Some examples of these concepts comprise Tenacity, Perseverance, Orientation to happiness, Life events, Well-being, Resilience, Academic success, Meaning in life and so on. In the life of adolescents, the grit may act as a shield against the negative events and controls suicidal ideation [13]. Supporting Machell et al [13] another research conducted by Blalock, Young, and Kleiman [14], suggested that it could act like a defense mechanism in case of adverse situations.

Further, Vainio and Daukantaite [15] stated that grit may contribute to the process of adjustment by strengthening the sense of constancy among students. Likewise, Zimbardo and Boyd [16] reported gritty students are future oriented, which facilitates optimistic vision and allows the adolescents to retrospect the crisis modelled by negative events and experiences of life. Gritty adolescents can derive greater meaning and satisfaction from life events by connecting to these events positively [13].

Further Machell et al. [13] argued that growing body of the literature suggests that most of the researches conducted on grit focus on achievements of an individual, non-achievement outcomes like happiness [3], life satisfaction [15], satisfaction with school [6], psychological well-being [17] and reduction suicidal ideation [18].

The present study aims to test the psychometric properties of Grit instrument on Indian sample. As grit is a lately developed psychological construct developing in late adolescence, senior secondary school students have been taken as a sample. Further, in developing country like India there is paucity of such type of measure which can measure that how much today adolescents are passionate for their long-term goals. Therefore, the present study attempts to fill the vacuum, by revalidating the construct of grit in the Indian context.

**Methods**

According to Bordens and Abbot [19] selection of appropriate research design is the most important part of an effective research. One of the best and widely used method to describe a large population in quick and economic way is survey research design [20, 21]. Hence researcher found survey research design more appropriate for present research.

Participants of the present study were students enrolled in various public and private senior secondary schools of Kangra, Mandi and Shimla districts of Himachal Pradesh, India. The students were selected using convenient sampling technique from different schools of these districts. Proper instructions were given to the students before conduction of test. Respondents were asked to respond on a five-point scale (1 = not at all like me to 5 = very much like me). A total of 650 questionnaires were distributed and only 610 were returned by the respondents. Out of 610 questionnaires, 80 were discarded during the cleaning process resulting in a total sample of 530 respondents. The sample of the present study includes 54% of male and 46% of female senior secondary school students. The respondents of the present study fall in the age group of 15-17 years. Further, 41% of the sample is from schools of rural areas and 59% of students belong to schools of urban areas. 53% of the sample comes from private institutions and 47% of sample is enrolled in public institutes.

*Grit scale*

The grit was assessed with the help of a 12-item scale developed by Duckworth, Peterson, Matthews, and Kelly [1]. The 12 items of the grit scale were rated on a 5 point Likert scale (1 = Not like me at all and 5 = Very much like me). The statements were distributed in two factors namely Consistency of Interests and Perseverance of Effort. The "Consistency of Interests" was tapped with the help of six items (e.g. 'I often set a goal but later choose to pursue a different one'), and "Perseverance of Effort" was also scaled with the help of six items (e.g. 'I have achieved a goal that took years of work'). The grit is a highly reliable and valid scale validated on the 6 different samples. Highlighting its importance, the authors of the grit scale argued that the grit accounted for the 4% of variance in success outcomes of an individual.

**Statistical analysis**

The alternative model of grit was tested by employing confirmatory factory analysis (CFA) in AMOS 19.0. For this purpose, maximum likelihood technique was used. The purpose of employing CFA is to test whether observed variables of an instrument load on its primary factors based on theory or prior research (Byrne, 2010) [22]. In significant sense, CFA also analyses that whether the measurement errors are random or not.

The assessment of model fit was based on various goodness of fit statistics like CMIN/DF (Chi-square/df) which is less sensitive to sample size [23], RMR (standardized root mean square residual) which tests how well model fits with data, CFI (comparative fit index) and RMSEA (root mean square error of approximation) which explains how well present model fits with respect to other previous models. According to Hu and Bentler [24] the value closer or less than of RMR = 0.08, CFI = 0.90 and RMSEA = 0.06 indicates a good model.

The results of the confirmatory factor analysis revealed that the model fit indices of grit were found sufficiently acceptable on Indian sample as all the indices satisfies the threshold mark, the calculated model fit indices were CMIN/DF = 2.245, GFI = .966, AGFI = .948, CFI = .908 RMSEA = .048 and RMR = .069. (Figure-1).

**Unidimensionality and reliability:** The results revealed that the grit scale is a unidimensional construct as each observed variable belongs to only one fundamental construct (Bollen1989) [25]. Further to assess the reliability of the present scale a fresh sample was collected by employing convenient sampling technique. For this purpose, 500 questionnaires were distributed out of which only 430 questionnaires were returned and 35 responses were discarded due to incomplete and missing information. The respondents were in the age group of 14 to 18 years. Out of 395 responses, 40% were females and 60% were males. The respondents belonged to three districts i.e. Kangra, Mandi and Shimla of Himachal Pradesh. 38% of respondents belonged to schools of rural area and 62% of respondents belonged to schools of urban areas. Further, 45% of respondents were enrolled in public institutes and 55% were enrolled in private institutions
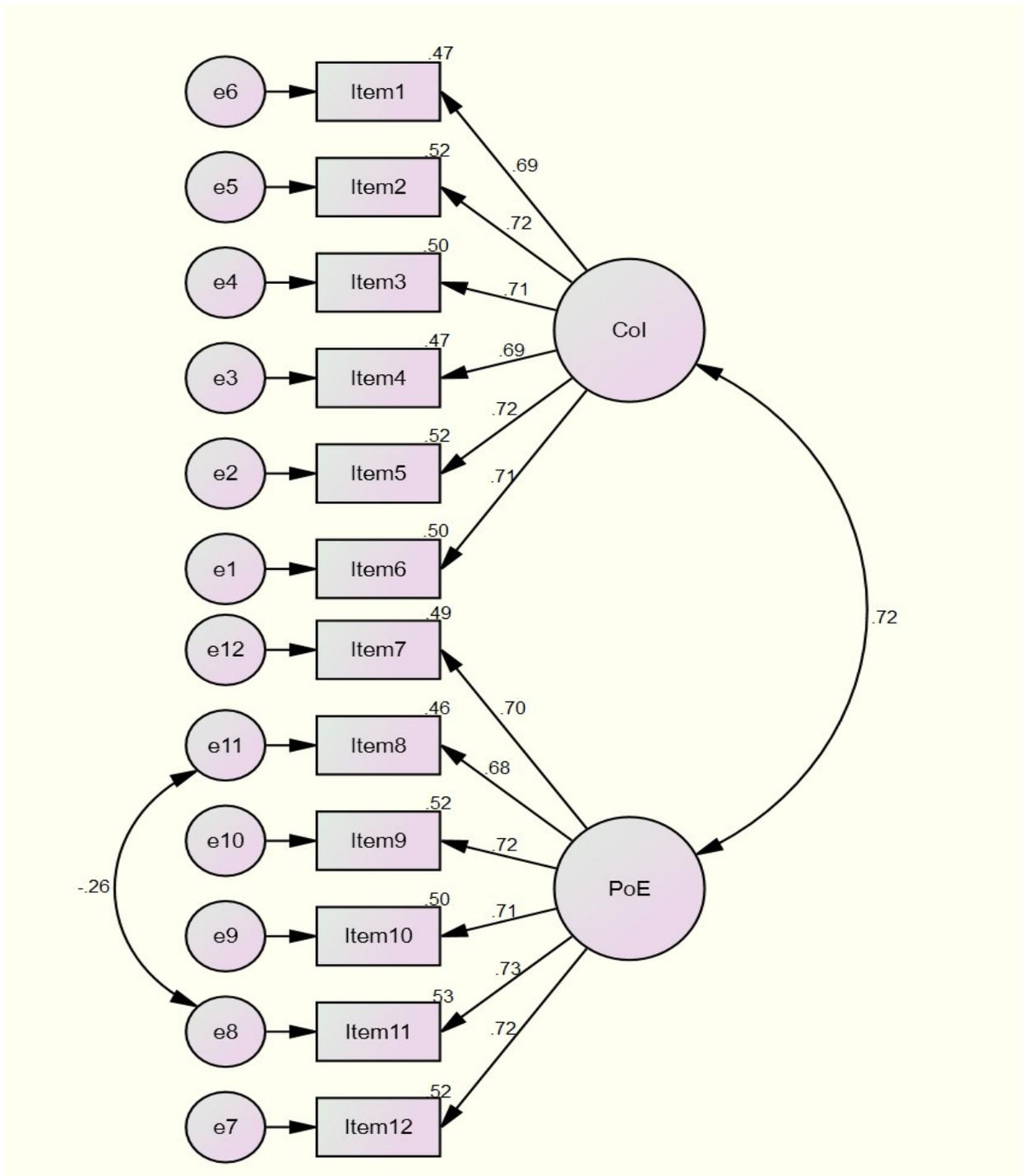
Figure 1: Confirmatory Factor Analysis.

The results further revealed that the grit scale possess a good reliability as the calculated value of Cronbach's alpha is 0.724 and the value of composite reliability ranges from .85 to .86, reflecting a high internal consistency of the construct [26].

**Construct Validity:** Construct validity of an instrument can be established by measuring Average Variance Extracted of all the fundamental factors of a model [27]. Table 1 revealed that the factors measuring the construct of grit exhibits an AVE score of .50, which according to Fornell and Larcker [28] provides sufficient evidences of construct

**Table 1: Description of Items, loading, composite reliability and Cronbach's alpha for grit scale**

| Factors | Items | Loading | Average Variance Extracted | Composite Reliability | Alpha Dimension wise | Cronbach's Alpha |
|---|---|---|---|---|---|---|
| Consistency of Interests | Item1 | .69 | .50 | .85 | .697 | .724 |
| | Item2 | .72 | | | | |
| | Item3 | .71 | | | | |
| | Item4 | .69 | | | | |
| | Item5 | .72 | | | | |
| | Item6 | .71 | | | | |
| Perseverance of Effort | Item7 | .70 | .50 | .86 | .701 | |
| | Item8 | .68 | | | | |
| | Item9 | .72 | | | | |
| | Item10 | .71 | | | | |
| | Item11 | .73 | | | | |
| | Item12 | .72 | | | | |

**Implied Correlations (Group number 1 - Default model)**

|        | Item7 | Item8 | Item9 | Item10 | Item11 | Item12 | Item1 | Item2 | Item3 | Item4 | Item5 | Item6 |
|--------|-------|-------|-------|--------|--------|--------|-------|-------|-------|-------|-------|-------|
| Item7  | 1.000 |       |       |        |        |        |       |       |       |       |       |       |
| Item8  | .665  | 1.000 |       |        |        |        |       |       |       |       |       |       |
| Item9  | .496  | .628  | 1.000 |        |        |        |       |       |       |       |       |       |
| Item10 | .521  | .658  | .590  | 1.000  |        |        |       |       |       |       |       |       |
| Item11 | .533  | .787  | .501  | .627   | 1.000  |        |       |       |       |       |       |       |
| Item12 | .619  | .556  | .689  | .513   | .725   | 1.000  |       |       |       |       |       |       |
| Item1  | .156  | .182  | .134  | .152   | .160   | .150   | 1.000 |       |       |       |       |       |
| Item2  | .123  | .144  | .106  | .120   | .127   | .119   | .663  | 1.000 |       |       |       |       |
| Item3  | .177  | .207  | .152  | .172   | .182   | .171   | .535  | .786  | 1.000 |       |       |       |
| Item4  | .158  | .185  | .136  | .154   | .163   | .153   | .610  | .666  | .538  | 1.000 |       |       |
| Item5  | .172  | .201  | .148  | .167   | .177   | .166   | .428  | .581  | .559  | .432  | 1.000 |       |
| Item6  | .147  | .172  | .126  | .143   | .151   | .142   | .395  | .554  | .421  | .698  | .615  | 1.000 |

**Discussion**

The aim of the present study was to test the psychometric properties of "Grit Scale" in Indian context. A 12-itemgrit scale has been revalidated to adapt it for Indian sample. The analysis revealed that the grit has been evaluated as a two-factor construct, comprising of Consistency of Interests and Perseverance of Effort. Psychometric evaluation of the present instrument revealed that the instrument of grit passes the fundamental reliability and validity tests such as, factor structure, unidimensionality, Cronbach's alpha, composite reliability, and construct validity.

From the analysis, it is apparent that the two-factor model of grit is found a good fit in Indian sample. The perusal of Table 1 shows that the internal consistency for 'Consistency of Interests' is slightly lower than the threshold value but is quite acceptable [29] and that of factor 'Perseverance of Effort' and whole scale is found sufficiently satisfying.

The table also revealed that the composite reliability of the scale is found up to the mark of threshold, as suggested by Nunnally and Bernstein [26]. Moreover, the CFA reveals that grit

possesses a good factor structure along with significant construct validity as AVE of each factor is 0.50 [26]. The results of the present study may be considered tentative for reasons as the sample is collected from only one state of India at a single point, as the researchers MacCallum et al [30] argued that it is sufficient to have different groups of sample at the time of data collection. Therefore, on the basis of above results the instrument of grit can be considered as a unitary construct in the developing country like India. Also 12 item grit scale will be a preferred construct as it provides good empirical evidences on Indian sample. Present study will act as a contributory work towards this concept, as the concept of grit will flourish in developing country like India only when there is availability of a valid instrument. Also exploring empirical evidences for its psychometric properties will accelerate the research and academic literature on grit.

**Limitations**

Present research doesn't claim the generalizations of the results to whole India as it is restricted to only one North Indian state. Further the other age group population which was not targeted in the study may show significantly different results. Therefore, further research involving all the regions and different populations of students should be considered to check the variations in the results. Further the scale has been specifically tailored for senior secondary school students, hence future research can be conducted on the population of college and university students.

**Conflict of interest:** None declared

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