



REPLY TO GUO ET AL. AND CREDÉ:

Grit-S scale measures only perseverance, not passion, and its supposed subfactors are merely artifacts

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We (1) propose that evidence linking grit and performance is mixed because the measure used to assess grit—the Short Grit (Grit-S) scale (2)—captures only perseverance, not passion, whereas the definition of grit encompasses both perseverance and passion (3). Our studies find that the combination of perseverance (measured through the whole Grit-S scale) and passion (measured through the passion attainment scale) predicted higher performance.

In their letters, Guo et al. (4) and Credé (5) suggest that the Grit-S scale should be treated as reflecting two factors. Credé (5) subsequently advocates for and Guo et al. (4) conducts separate analyses for each supposed subfacet of the Grit-S scale (called “perseverance of effort” and “consistency of interests”).

In this response, we provide additional evidence that the Grit-S scale is unidimensional. That is, there is no validity to the claims by Guo et al. (4) and Credé (5) that the Grit-S scale is composed of two subfactors. As a result, the analyses advocated by both letters are inappropriate. Instead, the Grit-S scale should be treated as unidimensional, which is how we conducted our original analyses (1).

A careful examination of the Grit-S scale items reveals two important points. First, closely reading the scale items highlights that the Grit-S scale captures perseverance alone and does not capture passion. Passion, defined as “a strong feeling toward a personally important value/preference that motivates intentions and behaviors to express that value/preference” (1), is not captured in any of the Grit-S scale items (Table 1, upper section). For example, Guo et al. (4) and Credé (5) claim that the items “I often set a goal but later choose to pursue a different one” and “New ideas and projects sometimes distract me from

previous ones” capture passion. However, a careful reading of the items in the Grit-S scale reveals that there is not a single item in the Grit-S scale that reflects the theoretical concept of passion. Rather, each item in the Grit-S scale reflects perseverance. This is further supported by a recent study which finds no significant relationship between self-rated consistency of interests scores (i.e., the subfactor originally intended to measure passion) and other-rated passion (6).

Second, a careful examination of the Grit-S scale items also shows that all items for the perseverance of effort subfacet are positively worded, whereas all items for the consistency of interests subfacet are negatively worded (Table 1, upper section). It is well known that participants respond differently to positively and negatively worded items (7). For this reason, reverse-coded items are commonly evenly counterbalanced within rather than across factors. In the case of the Grit-S scale, this design flaw can lead to the spurious finding that the Grit-S scale loads on two factors. This does not, however, reflect a true underlying two-factor structure, but instead reflects a mere statistical artifact that produces a spurious multiple-factor structure [i.e., artifacts (8)].

Indeed, an independent research team recently published a paper which highlighted this flaw in the Grit-S scale construction, stating that “the two-factor structure of [the Grit-S scale] appears to be a method artifact, due to the use of both positively and negatively worded items” (9). Thus, it is most appropriate to collapse the whole Grit-S scale into a single measure of perseverance, which is how we employed this scale in our original analysis (1), and other authors have recently started doing as well (10).

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To further demonstrate the Grit-S scale's unidimensionality—that is, that it captures only perseverance, not passion—we wrote and tested two versions of the scale in which all items were positively worded ($n = 958$) or negatively worded ($n = 781$) (Table 1, lower sections; see ref. 11 for data and code). We then explored the factor structure of each measure by comparing the average variance extracted (AVE; i.e., the average variance that a latent factor explains in indicators as represented in the squared factor loadings) with the shared variance (SV) of the two latent factors [i.e., the squared latent correlation (12)]. A two-factor structure is present only if both AVEs are larger than the SV (13).

We first conducted a confirmatory factor analysis (CFA) on the responses to the all-positive version of the Grit-S scale (Grit-S-P) and modeled the two correlated subfacets [$\chi^2(19) = 185.65$, root mean square error of approximation (RMSEA) = 0.10, confirmatory fit index (CFI) = 0.96, standardized root mean square residual (SRMR) = 0.04]. Both subfacets correlated at $r = 0.95$ ($P < 0.01$). Thus, the SV was 0.90, while the AVEs for consistency of interests and persistence of effort were 0.55 and 0.47, respectively. Since the SV was greater than both AVEs, our results highlight that both factors do not have sufficient discriminant validity (12, 13) (Table 2, upper section).

We find similar results when conducting a CFA on the responses to the all-negative version of the Grit-S scale (Grit-S-N), modeling the two correlated subfacets [$\chi^2(19) = 291.0$, RMSEA = 0.14, CFI = 0.93, SRMR = 0.06]. This time, both factors correlated at $r = 0.90$ ($P < 0.01$),

resulting in a SV of 0.81. The AVEs for consistency of interests and persistence of effort were 0.50 and 0.71, respectively. Once again, the SV was greater than both AVEs, highlighting that both factors do not have sufficient discriminant validity (12, 13) (Table 2, lower section).

These new results further demonstrate that both subfacets should not be treated as unique factors, but instead should be considered as overlapping facets loading on a single construct. These data make it clear that the Grit-S scale measures only perseverance, not passion. This empirical evidence, together with the theoretical reasons discussed above, highlight that one reason for the mixed findings in prior literature between the Grit-S scale and performance is that the Grit-S scale only captures perseverance, but does not capture passion (1).

In sum, the evidence presented here and in our original paper (1) reveals three points that render the analyses advocated by Guo et al. (4) and Credé (5) moot. First, the Grit-S scale measures perseverance only, and none of its items conceptually capture passion. Second, an apparent two-factor structure of the Grit-S scale is the result of a statistical artifact based on reverse-coded items; thus, it is most appropriate to collapse the whole Grit-S into a single measure of perseverance, which is how we employed the scale in our original analysis. Third, our original conclusion—that it is the combination of both perseverance and passion that predicts performance—remains valid (1).

Table 1. Original Grit-S scale facets differ in the valence of item loading, and corrected unidimensional Grit-S-P and Grit-S-N scales

Item	Facet	Valence
Original Grit-S scale		
Setbacks don't discourage me. I am a hard worker. I finish whatever I begin. I am diligent.	Perseverance of effort	Positive
New ideas and projects sometimes distract me from previous ones. I have been obsessed with a certain idea or project for a short time but later lost interest. I often set a goal but later choose to pursue a different one. I have difficulty maintaining my focus on projects that take more than a few months to complete.	Consistency of interests	Negative
Grit-S-P scale		
Setbacks don't discourage me. I am a hard worker. I finish whatever I begin. I am diligent.	Perseverance of effort	Positive
I don't get distracted from previous ideas and projects by new ones. I have been obsessed with a certain idea or project for a short time and later did not lose interest. When I set a goal, I follow through with it. I have very little difficulty maintaining my focus on projects that take more than a few months to complete.	Consistency of interests	
Grit-S-N scale		
Setbacks discourage me. I am not a hard worker. I don't finish whatever I begin. I am not diligent.	Perseverance of effort	Negative
New ideas and projects sometimes distract me from previous ones. I have been obsessed with a certain idea or project for a short time but later lost interest. I often set a goal but later choose to pursue a different one. I have difficulty maintaining my focus on projects that take more than a few months to complete.	Consistency of interests	

Table 2. Standardized factor loadings of two-factor CFA of Grit-S-P responses (n = 958 participants) and Grit-S-N responses (n = 781)

Grit-S-P scale items	Factor loadings ^a
Consistency of interests (revised; positively worded)	
When I set a goal, I follow through with it.	0.911***
I have been obsessed with a certain idea or project for a short time and later did not lose interest.	0.361***
I have very little difficulty maintaining my focus on projects that take more than a few months to complete.	0.878***
I don't get distracted from previous ideas and projects by new ones.	0.680***
AVE (average variance extracted)	0.55
Perseverance of effort (original; positively worded)	
I finish whatever I begin.	0.406***
Setbacks don't discourage me.	0.602***
I am diligent.	0.852***
I am a hard worker.	0.788***
AVE (average variance extracted)	0.47
Correlation between factors	0.948***
SV (shared variance)	0.90
Model fit	
χ^2	185.65
df	19
RMSEA	0.096
CFI	0.957
SRMR	0.041
Grit-S-N scale items	Factor loadings ^a
Consistency of interests (original; negatively worded)	
I often set a goal but later choose to pursue a different one.	0.856***
I have been obsessed with a certain idea or project for a short time but later lost interest.	0.838***
I have difficulties maintaining my focus on projects that take more than a few months to complete.	0.846***
New ideas and projects sometimes distract me from previous ones.	0.819***
AVE (average variance extracted)	0.71
Perseverance of effort (revised; negatively worded)	
I don't finish whatever I begin.	0.881***
Setbacks discourage me.	0.584***
I am not diligent.	0.735***
I am not a hard worker.	0.576***
AVE (average variance extracted)	0.50
Correlation between factors	0.897***
SV (shared variance)	0.81
Model fit	
χ^2	291.20
df	19
RMSEA	0.135
CFI	0.931
SRMR	0.055

^aStandardized factor loadings are reported; *** $P < 0.001$.

- Jachimowicz JM, Wihler A, Bailey ER, Galinsky AD (2018) Why grit requires perseverance and passion to positively predict performance. *Proc Natl Acad Sci USA* 115:9980–9985.
- Duckworth AL, Quinn PD (2009) Development and validation of the short grit scale (grit-s). *J Pers Assess* 91:166–174.
- Duckworth AL, Peterson C, Matthews MD, Kelly DR (2007) Grit: Perseverance and passion for long-term goals. *J Pers Soc Psychol* 92:1087–1101.
- Guo J, Tang X, Xu KM (2019) Capturing the multiplicative effect of perseverance and passion: Measurement issues of combining two grit facets. *Proc Natl Acad Sci USA* 116:3938–3940.
- Credé M (2019) Total grit scale score does not represent perseverance. *Proc Natl Acad Sci USA* 116:3941.
- Grohman MG, Ivcevic Z, Silvia P, Kaufman SB (2017) The role of passion and persistence in creativity. *Psychol Aesthet Creat Arts* 11:376–385.
- Podsakoff PM, MacKenzie SB, Lee J-Y, Podsakoff NP (2003) Common method biases in behavioral research: A critical review of the literature and recommended remedies. *J Appl Psychol* 88:879–903.
- Marsh HW (1996) Positive and negative global self-esteem: A substantively meaningful distinction or artifactors? *J Pers Soc Psychol* 70:810–819.
- Vazsonyi AT, et al. (2018) To grit or not to grit, that is the question! *J Res Pers* 78:215–226.
- Alan S, Erta S, Boneva T (2019) Ever failed, try again, succeed better: Results from a randomized educational intervention on Grit. *Q J Econ*, in press.
- Jachimowicz J, Wihler A, Bailey E, Galinsky A (2019) Data from "Reply to Guo et al. and Credé: The Grit scale only measures perseverance and not passion, and its supposed subfactors are merely artifactors." Available at <https://osf.io/cz4n9/>. Deposited January 1, 2019.
- Fornell C, Larcker DF (1981) Evaluating structural equation models with unobservable variables and measurement error. *J Mark Res* 18:39–50.
- Farrell AM (2010) Insufficient discriminant validity: A comment on Bove, Pervan, Beatty, and Shiu (2009). *J Bus Res* 63:324–327.

