Capturing the multiplicative effect of perseverance and passion: Measurement issues of combining two grit facets

Jiesi Guo^{a,1}, Xin Tang^b, and Kate M. Xu^c

Recently in PNAS, Jachimowicz et al. (1) attribute the lack of empirical support for the strong grit–performance relationship to the measurement of grit (2, 3). While the grit scale (2, 3) comprises two facets—“perseverance of effort” (PE) and “consistency of interests” (CI; also sometimes referred to as passion)—Jachimowicz et al. argue that it focuses only on perseverance without adequately capturing passion, and that success requires both passion and perseverance by the grit definition (2). Consequently, they propose measuring grit through a combination of the passion attainment scale for passion and an aggregate of PE and CI for perseverance. They find a significant and synergistic interaction effect between perseverance and passion attainment on job (study 2) and academic (study 3) performance, providing support for their claim. We show that these results stem from inappropriate statistical analyses regarding measurement validity for the grit scale.

The assumption of the unidimensionality for the grit scale (only capturing perseverance) and the direct summation approach to aggregate facet-level scores into an overall grit score, used by Jachimowicz et al. (1), are problematic for several reasons. First, we meta-analyzed the correlation between PE and CI based on 39 studies from two previous metaanalyses (1, 4) and determined that PE and CI were only moderately correlated [Fisher's $z = 0.45$; weighted correlation, $r = 0.43$ (95% confidence interval, 0.30 to 0.54) (Fig. 1)]. Furthermore, a reanalysis with structural equation modeling of the raw data from studies 2 and 3 in Jachimowicz et al. (1) found that (i) the unidimensional model underlying the direct summation approach did not fit the data; (ii) the correlations between PE and CI were only 0.35 and 0.29, respectively; and (iii) more

importantly, PE and CI had differentiated correlation patterns with various psychological variables (e.g., the Big Five factors, intrinsic/prosocial motivation) (see ref. 5). These findings indicate that PE and CI are two distinct grit facets and should not be aggregated [also see a recent review (6)].

In line with these findings, we tested the interaction between grit and passion attainment, keeping PE and CI separate and relying on the more sophisticated statistical approach of latent moderated structural equations (7), which takes into account measurement errors, a particularly important consideration when testing interaction effects. Our findings revealed that neither PE nor CI interacted with passion attainment to predict job performance in study 2; and only CI (but not PE) significantly interacted with passion attainment to predict grade-point average scores in study 3 (estimate = 0.25, SE = 0.08, $P < 0.01$, see ref. 5). However, the interaction effect on the academic outcome should be interpreted cautiously, given that the items assessing passion attainment are work related (2), but CI is domain general.

To summarize, our reanalysis illustrates two important points. First, researchers using the current grit scale (2, 3) should treat the two grit facets separately, given that aggregating CI and PE into a single construct is not empirically justifiable. Second, the contribution of the interaction between perseverance and passion attainment in predicting performance, proposed by Jachimowicz et al. (1), needs further investigation.

Acknowledgments

X.T. thanks the support from the Academy of Finland Grant 273872 LEAD.

^aInstitute for Positive Psychology and Education, Australian Catholic University, North Sydney, NSW 2059, Australia; ^bFaculty of Educational Sciences, University of Helsinki, 00014 Helsinki, Finland; and ^cWelten Institute, Open University of the Netherlands, 6419 AT Heerlen, The Netherlands

Author contributions: J.G. and K.M.X. designed research; J.G. and X.T. performed research; J.G. and X.T. analyzed data; and J.G., X.T., and K.M.X. wrote the paper.

The authors declare no conflict of interest.

Published under the PNAS license.

Data deposition: All secondary data and analyses code are available via the Open Science Framework (<https://osf.io/7j5nd/>).

¹To whom correspondence should be addressed. Email: jiesiguoguo@gmail.com.

Published online February 26, 2019.

Study and Sample Size

Fig. 1. Forest plot of correlations between PE and CI.

- 1 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.
- 2 Duckworth AL, Peterson C, Matthews MD, Kelly DR (2007) Grit: Perseverance and passion for long-term goals. *J Pers Soc Psychol* 92:1087–1101.
- 3 Duckworth AL, Quinn PD (2009) Development and validation of the short grit scale (grit-s). *J Pers Assess* 91:166–174.
- 4 Credé M, Tynan MC, Harms PD (2017) Much ado about grit: A meta-analytic synthesis of the grit literature. *J Pers Soc Psychol* 113:492–511.
- 5 Guo J, Tang X, Xu KM (2019) Data from “Capturing the multiplicative effect of perseverance and passion: Measurement issues of combining two grit facets.” Available at <https://osf.io/7j5nd/>. Deposited November 26, 2018.
- 6 Credé M (2018) What shall we do about grit? A critical review of what we know and what we don’t know. *Educ Res* 47:606–611.
- 7 Klein A, Moosbrugger H (2000) Maximum likelihood estimation of latent interaction effects with the LMS method. *Psychometrika* 65:457–474.