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## Do grittier people have greater subjective well-being? A meta-analysis

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### Abstract

The present study conducted a meta-analysis to examine the relation between grit and subjective well-being (SWB). The association between grit (i.e., overall grit, perseverance of effort, and consistency of interest) and SWB (i.e., positive affect, negative affect, happiness, depression, life satisfaction, job satisfaction, and school satisfaction) were synthesized across 83 studies and 66,518 participants. The results based on a random-effects model showed a substantial correlation between overall grit and SWB ( $\chi = .46$ , 95%-CI [.43, .48]), followed by perseverance of effort ( $\chi = .38$ , 95%-CI [.33, .43]) and consistency of interest ( $\chi = .23$ , 95%-CI [.17, .28]). The moderator analysis indicated that the correlations between overall grit / consistency of effort and SWB become weaker as age increased and these links were stronger in affective well-being than in cognitive well-being. Moreover, grit explained unique variance in SWB even after controlling for conscientiousness. Implications and directions for further research are discussed.

### Keywords

grit, subjective well-being, perseverance of effort, consistency of interest, meta-analysis

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## **Do grittier people have greater subjective well-being? A meta-analysis**

*Grit* – the pursuit of long-term goals with perseverance and passion – has received much attention since it was proposed by Duckworth and her colleagues in 2007. Although a relatively new psychological concept, it has been studied in diverse contexts and various populations. For example, studies have shown that grit is significantly associated with a range of positive achievement and performance outcomes, such as educational attainment, grade point average (GPA), and retention in school (Duckworth et al., 2007; Duckworth & Quinn, 2009), academic achievement (Jiang, Xiao et al., 2019), and entrepreneurial success (Mooradian et al., 2016).

In addition to achievement and performance outcomes, growing evidence suggests that grit is positively linked with aspects of physical and mental health, including the intensity of physical exercise (Reed et al., 2013), meaning of life (Kleiman et al., 2013), and psychological well-being (Lan et al., 2019). Among them, the correlation between grit and subjective well-being (SWB) is of special interest. Many studies found that persons with a higher grit level tend to report higher SWB (e.g., Akbağ & Ümmet, 2017; Jiang, Jiang et al., 2019; Jin & Kim, 2017), while others have showed that the associations were non-significant or even negative (Datu et al., 2016; Disabato et al., 2018; Kwon, 2021), and no study has summarized the correlation between grit and SWB.

Therefore, we performed a meta-analysis to obtain a more precise and generalizable estimate of the grit-SWB relation and examined the potential moderators that might influence its strength. The remainder of the introduction consists of four sections. First, we present definitions of grit and SWB. Second, we discuss the relation between grit and SWB from a theoretical and an empirical perspective. Third, we introduce potential moderators that might influence direction and strength of the grit-SWB relation. Finally, we describe previous meta-analytic syntheses of the relationship between conscientiousness (a related but not identical construct to grit) and SWB.

### ***Grit***

Duckworth et al. (2007) defined grit as “perseverance and passion for long-term goals” (p. 1087). Furthermore, they distinguish between two lower order facets: perseverance of effort and consistency of interest. Perseverance of effort refers to working hard despite of failure, adversity, and setbacks, while consistency of interest captures a tendency to keep interest and passion for long-term goals. In a series of studies, Duckworth and her colleagues (Duckworth et al., 2011;

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Duckworth et al., 2007; Duckworth & Quinn, 2009) demonstrated that grit is a significant and strong predictor of success and performance. They argued that the overall grit has stronger associations with these outcomes than its two facets alone, which is in line with the views of Schmidt and Hunter (2015). However, other researchers (Credé, 2018; Credé, Tynan, & Harm, 2017; Disabato et al., 2018) disagree with this view and argue that perseverance of effort and consistency of interest differ in their association strengths and should therefore be considered separately; this is consistent with a pattern pertaining to personality characteristics suggesting that narrower traits generally out-predict their composites (e.g., Paunonen & Ashton, 2001; Mõttus, 2016; Mõttus et al., 2020; Seeboth & Mõttus, 2018). Also, Credé et al. (2017) argued that there are methodological limitations in testing whether grit is a higher-order model or a two-factor model. Thus, we examined overall grit and its two facets simultaneously, while focusing more on these two facets.

### ***Subjective Well-Being***

Subjective well-being relates to how people evaluate their life and is defined as an individual's overall state of subjective wellness (Diener, 1984). Typically, researchers (Diener, 1984; Diener et al., 1999) argue that SWB is a broad concept with two different facets: affective well-being and cognitive well-being. Affective well-being is characterized by the presence of positive or pleasant affect (e.g., happiness) and the absence of negative or unpleasant affect (e.g., depression). Cognitive well-being, on the other hand, refers to the cognitive evaluation of overall life (i.e., life satisfaction) as well as of specific life domains (e.g., job satisfaction, school satisfaction). Based on these two components and prior studies (Luhmann et al., 2012; Steel et al., 2008), we regard positive affect, happiness, negative affect, depression, life satisfaction, job satisfaction, and school satisfaction as indicators of SWB and use the generic term "SWB" to encompass these indicators of subjective well-being.

### ***The Relation between Grit and Subjective Well-Being***

There are two relevant theories that account for the correlation between grit and SWB: (a) Telic or goal theory (Emmons, 1986; Michalos, 1980), and (b) top-down theories of SWB (Diener, 1984; Diener & Ryan, 2009).

First, telic or goal theory (Emmons, 1986; Michalos, 1980) assumes that people are

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consciously seeking goals and that reaching these goals results in well-being and happiness. Evidence from a meta-analysis conducted by Klug and Maier (2015) supports this notion as they found that successful goal striving and SWB are positively interrelated. Grit might facilitate the process of goal achievement by alleviating adverse impacts of failure and setbacks, as people who have higher level of grit can continue their efforts to reach goals even if witnessing the negative feedbacks or adverse impacts from obstacles (Duckworth et al., 2011; Duckworth et al., 2007). In this way, “grittier” individuals should be more likely to reach their goals and therefore show higher levels of SWB.

Second, the correlation between grit and SWB could be explained by top-down theories of SWB (Diener, 1984; Diener & Ryan, 2009). These claim that a relatively stable personality trait might contribute to SWB by influencing the way people interact with and interpret reality. Accordingly, individuals with positive attitudes or perspectives might interact with and interpret certain things more positively than those with negative attitude. People high in grit tend to have a more positive attitude towards themselves, life, and the world because such people exhibit a more optimistic way when they face adversities and setbacks (Duckworth et al., 2009; Jin & Kim, 2017). Moreover, some empirical studies have demonstrated that grit was significantly positively associated with optimistic attitudes (O’Sullivan et al., 2019; Sheridan et al., 2015). Thus, grit might contribute to the development of SWB. This point is in line with the results of a meta-analysis of the personality-SWB relation indicating that conscientiousness is significantly related to SWB (Steel et al., 2008).

In addition to these theoretical considerations, a number of recent empirical studies directly demonstrated the positive relation between grit and SWB (e.g., Arya & Lal, 2018; Li, Lin et al., 2018; Vainio & Daukantaite, 2016). For instance, Jiang, Jiang et al. (2019) conducted two studies (i.e., a cross-sectional survey and a 21-day diary study) among high school students and college students respectively, finding higher grit to be associated with higher SWB. However, the relation between grit and SWB varies between and within studies. More specifically, grit and its two facets show different (i.e., non-significant or negative) correlations with SWB (Datu et al., 2016; Disabato et al., 2018; Akbağ & Ümmet, 2017; Barete, 2019; Kwon, 2021). This may indicate that the associations depend on specific sub-components of these grit facets, as they are differently

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sampled in different grit instruments (Mõttus, 2016). Nevertheless, they agree that grit has an association with SWB, and the strength of this association may vary across samples and studies. For these reasons, we would conduct a meta-analysis to examine the associations between grit, its facets and SWB, and clarify the roles of demographic (e.g., age and culture) and methodological (e.g., measure of grit and facet of SWB) moderator variables.

### **Potential Demographic and Methodological Moderators**

#### ***Age***

Age might be a moderator in the relation between grit and SWB. Wenner and Randall (2016) found that the relation between grit and prosocial behavior varied with age. This might also be true for the relation between grit and SWB as prosocial behavior has a strong association with SWB (Yang et al., 2017). Both meta-analytical (Credé et al., 2017) and empirical studies (e.g., Kwon, 2021; Pennings et al., 2015; Samson et al., 2011; Vainio & Daukantaite, 2016) found that age has a positive association with grit. Furthermore, the relation between grit and SWB was higher in young adults (e.g.,  $r = .44$ , Renshaw & Bolognino, 2016;  $r = .38$ , Sheridan et al., 2015) than in adolescents (e.g.,  $r = .34$ , Jiang, Jiang et al., 2019;  $r = .21$ , Li, Lin et al., 2018), but some have also found a high correlation in adolescents ( $r = .41$ , Clark & Malecki, 2019). Thus, there might be a dynamic association between grit and SWB and a meta-analysis will help to clarify the strength of grit-SWB relation in individuals' life span.

#### ***Culture***

Several researchers argue that predictors of SWB might vary by cultural values in which individuals are embedded (Diener et al., 2003; Schimmack et al., 2002). Hence, it is reasonable to hypothesize that the correlation between grit and SWB also varies between different cultures. In collectivistic cultures, for example, people tend to emphasize relationship-oriented goals or group goals, while pursuing personal goals is emphasized more in individualistic cultures (Triandis, 1995). In a meta-analysis, SWB was most strongly associated with cultural values that foster relationships and social capital (Steel et al., 2018). Both cross-sectional (Emmons, 1991) and longitudinal studies (Salmela-Aro & Nurmi, 1997) also found that goals related to social relationships and family correlate with SWB more strongly than goals related to self. Moreover, working with others can satisfy individuals' belongingness, reflecting individuals' fundamental

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need to be an accepted member of a social group (Baumeister & Leary, 1995), whereas individualism can disrupt fulfilling this need. Indeed, Steel et al. (2018) found that individualism was negatively associated with life, family, and job satisfaction even after controlling for wealth.

As a result, it is possible that grit has a stronger relation with SWB in collectivistic cultures than in individualistic cultures. A few studies (Disabato et al., 2018; Kwon, 2021; Liu & Mõttus, 2021) indicated that the correlation between grit and SWB varied across different cultures. For example, Disabato (2018) and Kwon (2021) found that the grit-SWB relation was higher within collectivistic cultures than in individualistic cultures. According to Hofstede's (2001, p. 215) classification of culture, we compared individualistic cultures (i.e., the United States, Canada, Australia, Finland, Sweden, Switzerland, Spain, and Romania) with collectivistic cultures (i.e., China, Colombia, Japan, South Korea, Philippines, Malaysia, Turkey, Peru, Pakistan, and Ghana) in the relation between grit and SWB. Countries with Individualism Index Values exceeding the mean of 53 were classified as individualistic and the others collectivistic.

### ***Measure of Grit***

The most widely used measure of grit is the 12-item Original Grit Scale (Grit-O; Duckworth et al., 2007) and the 8-item Short Grit Scale (Grit-S; Duckworth & Quinn, 2009). These two measures comprise two subscales assessing perseverance of effort and consistency of interest, respectively. Each item is rated on a 5-point scale ranging from 1 ("not like me at all") to 5 ("very much like me"), with a higher score representing a higher level of grit. Both of them demonstrated adequate psychometric properties among different samples (Duckworth et al., 2007; Duckworth & Quinn, 2009). Although Duckworth and Quinn (2009) found that the Grit-S had better predictive validity than the Grit-O in validation studies involving performance, achievement, and retention, Duckworth et al. (2021) argued that compared with the Grit-S, the Grit-O could better distinct perseverance of effort from consistency of interest. Moreover, according to the definition of grit, the pursuit of long-term goals is particularly important to distinguish grit from other relevant constructs; yet the Grit-S removed three items with strong content validity and only one of the remaining items reflects this core element. Thus, we tested the differences of the correlation of grit and SWB between the two test versions.

### ***Facet of Subjective Well-Being***

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As SWB consists of affective well-being and cognitive well-being (Diener, 1984; Diener et al., 1999), we explored whether they have different relations with grit. Affective well-being can be viewed as a momentary state (feelings or emotions), and easily fluctuate in short-term, whereas cognitive well-being considered to be more stable reflecting the evaluations of global and specific domains of life (Eid & Diener, 2004). From this perspective, grit might have a stronger relation with cognitive well-being as grit means sustained efforts towards long-term goals. Several studies have lent support to this notion. For instance, Schimmack et al. (2008) examined the associations of personality traits with affective well-being and cognitive well-being, demonstrating that conscientiousness had a stronger correlation with cognitive well-being than affective well-being. Additionally, Von Culin et al. (2014) examined the relation between grit and three facets of happiness (pleasure, meaning, and engagement); they found that grittier individuals are happier through meaning and engagement rather than via pleasure. More directly, in a nationally representative sample ( $N = 2,963$ ), Jiang, Jiang et al. (2019) indicated the relation between grit and life satisfaction ( $.34$ ) was stronger than that between grit and affect (negative =  $\sim .31$ ; positive =  $.24$ ). Thus, in the present study we compared the particular relation of grit with affective well-being (positive affect, happiness, negative affect, and depression) and cognitive well-being (life satisfaction, job satisfaction, and school satisfaction).

### ***Prior Meta-Analytic Syntheses Examining the Relationship Between Conscientiousness and Subjective Well-Being***

Grit is often found to have a strong correlation with conscientiousness, but the implications of the association are not clear yet. Some argue that grit should be regarded as a facet of conscientiousness due to substantial overlap between the two constructs (e.g.,  $r = .66$ ; Credé et al., 2017) and limited incremental validity explained by grit in academic performance outcomes after controlling for conscientiousness (e.g.,  $\Delta R = .004$ ; Credé et al., 2017). Indeed, recent empirical studies found that grit and conscientiousness are not unique constructs as they strongly overlap at the item level (Schmidt et al., 2018) and construct level (Ponnock et al., 2020). For instance, using Grit-S (Duckworth & Quinn, 2009) and NEO-PI-R (Costa & McCrae, 1992), Schmidt et al. (2018) found that perseverance of effort shared 95 % of its variance with the conscientiousness factors and was strongly related to the industriousness facet. However, consistency of interest shared



much less, 53 % of variance with conscientiousness, being mostly associated with the self-discipline facet. Hence, grit may at least partly be “old wine in new bottles” (Credé et al., 2017).

However, although the correlation between grit and conscientiousness tends to be high (e.g.,  $r = .66$ ; Credé et al., 2017), it is not so high as to consider the constructs psychometrically entirely redundant. For example, good measures of broad traits such as Conscientiousness have (retest) reliabilities close to .90 their facets – paralleling grit – in .80s (McCrae & Mõttus, 2019; Henry, Thielmann, Booth, & Mõttus, 2021), suggesting that the unreliability-corrected grit-conscientiousness correlation should remain below .80. Indeed, some believe that grit “differs from conscientiousness in its emphasis on long-term stamina rather than short-term intensity” (Duckworth et al. 2007, p. 1089). Also, some studies have found that grit is incrementally related with important variables. For example, grit predicted high ( $\beta = .26, .07$ ) and moderate ( $\beta = .19, .08$ ) intensity exercise behavior (Reed et al., 2013) and academic goal motivation ( $\beta = .21, .15$ ; Werner et al., 2019) over and above conscientiousness.

Indeed, a general pattern of findings showing that broad personality domains have numerous facets and even narrower-still traits, nuances, with unique causes and consequences (Mõttus, Kandler et al., 2017; Mõttus et al., 2020), is consistent with the possibility that grit, a narrow that could be seen as a facet of conscientiousness, has unique associations with variables such as SWB. Therefore, the relations between grit and conscientiousness, including their incremental predictive validities, need further research.

With respect to well-being, two meta-analyses have explored the relationship between conscientiousness and SWB. DeNeve and Cooper (1998) reported an average correlation of  $r = .21$  ( $k = 115$ ). Likewise, Steel et al. (2008) showed that conscientiousness is significantly related to all SWB indicators such as life satisfaction ( $\chi = .27, k = 25, 95\text{-CI} [.23, .32]$ ) and positive affect ( $\chi = .31, k = 24, 95\text{-CI} [.27, .37]$ ). Grit has incremental associations with exercise behavior after controlling for conscientiousness (Reed et al., 2013), and perseverance of effort explains unique variance in SWB above and beyond conscientiousness (Kwon, 2021). Thus, it is warranted to conduct a meta-analysis on the grit-SWB relation to compare which one contributes more in predicting SWB.

### ***The Present Meta-Analysis***

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The goal of this study was to provide a meta-analytic integration of the current results concerning the correlation between grit and SWB. The specific purpose was to (1) estimate the meta-analytic correlations between grit (i.e., overall grit, perseverance of effort, and consistency of interest) and SWB, (2) assess whether their strength and directions vary across demographic and methodological moderators (i.e., age, culture, measure of grit, and facet of SWB), and (3) examine incremental associations of grit and conscientiousness with SWB.

## **Method**

### ***Literature Search***

The literature search was conducted in June 2021 (see **Figure S1** for the selection of studies). We used several search techniques. First, we conducted searches in electronic literature databases (i.e., Web of Science, PsycINFO, ERIC, and ProQuest) using all possible combinations of terms reflecting grit and SWB (i.e., positive affect, negative affect, happiness, depression, life satisfaction, job satisfaction, school satisfaction, subjective well-being). These searches identified 337 potential studies. Second, we conducted additional searches involving the web-based search engine Google Scholar using the combination of terms mentioned above yielding 56 potential studies. Third, we examined the reference list of potential studies to identify additional studies. If the full-texts were unavailable, we contacted the author(s) via email and/or ResearchGate. Finally, we contacted authors from the reference list to inquiry if they or colleagues have relevant unpublished data. We also searched PsyArXiv for unpublished studies.

### ***Inclusion and Exclusion Criteria***

Studies that met the following criteria were included in the meta-analysis: (1) empirical and quantitative studies, (2) written in English, (3) grit was assessed by Grit-O (Duckworth et al., 2007) or Grit-S (Duckworth & Quinn, 2009), and (4) studies reported the correlation coefficient (i.e., Pearson's  $r$ ) between grit and SWB. Studies were excluded if the statistical information was inadequate for coding (e.g., correlation coefficients were not reported). However, if these studies were published in the last five years, we tried to contact the authors for available information. Moreover, to eliminate duplicate confounding effects due to studies, we followed the recommendations of Wood's (2008) detection heuristics. Also, we carefully compared the title, the author(s), the participants, and the results between the identified studies. As a result, three

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master's dissertations were excluded as they were subsequently published (Kwon, 2018; Sharkey, 2017; Tiittanen, 2014); two studies were excluded as they based on the same sample and measures but described different correlations (Li, Wang et al., 2018; Zhong et al., 2018). These criteria yielded 83 studies containing usable data.

### *Coding Procedure*

There are nine coding categories: (a) sample size, (b) mean age, (c) correlation between grit and SWB, (d) reliability of grit measure, (e) reliability of SWB measure, (f) grit type (1 = overall grit, 2 = perseverance of effort, 3 = consistency of interest), (g) SWB construct (1 = positive affect, 2 = negative affect, 3 = happiness, 4 = depression, 5 = life satisfaction, 6 = job satisfaction, 7 = school satisfaction), (h) culture (1 = individualistic, 0 = collectivistic), (i) measure of grit (1 = Grit-O, 0 = Grit-S), (j) facet of SWB (1 = affective well-being, 0 = cognitive well-being), (k) measurement time (1 = same point, 0 = different points), and (l) measurement media (1 = same media, 0 = different media).

The first and third authors in the author list coded all studies, and Cohen's kappa was calculated to evaluate the inter-rater reliability. All Cohen's kappa coefficients were satisfactory with  $\kappa = .84$  for sample size,  $\kappa = .84$  for correlation coefficient,  $\kappa = .85$  for reliability of grit measure,  $\kappa = .86$  for reliability of SWB measure,  $\kappa = 1$  for grit type,  $\kappa = .85$  for culture,  $\kappa = 1$  for age,  $\kappa = .99$  for measure of grit,  $\kappa = 1$  for facet of SWB,  $\kappa = .81$  for the measurement time, and  $\kappa = .98$  for the measurement media. All disagreements were resolved by reexamining the studies in a coder conference.

If studies reported correlations based on different samples, these correlations were separately coded as independent coefficients. For some samples, multiple correlations between grit and SWB were reported due to different indicators of SWB. In such cases, we followed the recommendations of Schmidt and Hunter (2015) in using the inter-correlations among indicators to estimate the composite correlation and reliability. Two studies (Burrow et al., 2018; Disabato et al., 2018) did not report the correlations among the indicators, so we used the correlations from Jiang, Jiang et al. (2019) and Goodman et al. (2017), respectively. At the same time, the sign of negative affect and depression correlations were reversed as well. A summary of studies included in the meta-analysis is available in **Table S1** in the Supplemental File. The corresponding

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statistical data are available at <https://osf.io/94gv6/>.

## **Statistical Analysis**

### ***Main Meta-Analysis***

We followed the meta-analytic strategy of Schmidt and Hunter (2015) and decided to employ a random-effects model since the studies might show different population correlations due to differences in the samples, measures of grit, etc. The Schmidt and Le (2004) software was used to estimate the overall effects of the correlation between grit and SWB. This method allows correcting artifacts (e.g., sampling error and measurement error) in the observed correlations and estimating the population correlation  $\rho$ . In this meta-analysis, we used individual corrections for sampling error and for unreliability in measurement by obtaining the Cronbach's alpha statistic of grit and SWB reported in each study. For a very small number of studies that reliability information was not provided, we used reliability estimates from the original scale development study (Robbins et al., 2004). For the study assessing job satisfaction by one single-item (i.e., Sellers, 2019), we used a reliability estimation ( $\alpha = .80$ ) of single-item measures of job satisfaction from a meta-analysis (Wanous et al., 1997).

We computed the sample size weighted mean observed correlation ( $r_{\text{obs}}$ ) and its standard deviation ( $SD_r$ ), the estimated population correlation ( $\mu$ ) and its standard deviation ( $SD_\mu$ ), 80% credibility interval (80%-CV), and 95% confidence interval (95%-CI) as well as the percentage of variance in correlations attributable to artifacts (% variance). According to Whitener (1990), 80%-CVs were used to evaluate the variability of the population correlation, whereas 95%-CIs were used for significance testing.

We followed the recommendations of Gignac and Szodorai (2016) to describe the  $r$  effect sizes of the relations analyzed in this study, that is, small, medium, and large effect sizes are .10, .20, and .30, respectively.

### ***Moderator Analysis***

Following the method outlined by Card (2012), moderator analysis was estimated by meta-regressions in CMA 2.0. For continuous moderator (i.e., age), we used mean age of each sample. For categorical moderators (i.e., culture, measure of grit, and facet of SWB), we evaluated them through dummy codes. A significant  $Q$  statistic is an indicator for the presence of a moderator.

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### ***Incremental Validity Analysis***

To assess the incremental validity of grit over and above conscientiousness in predicting SWB, we created correlation matrices (see **Tables S2, S3, S4**) of the meta-analytic relationships between overall grit, perseverance of effort, consistency of interest, conscientiousness, and SWB. These correlations were drawn from the present study (i.e., grit and SWB) and previous meta-analyses by using the uncorrected correlation of  $r = .21$  for the association between conscientiousness and SWB (DeNeve & Cooper, 1998), the conscientiousness correlations of  $r = .66$  for overall grit,  $r = .61$  for perseverance of effort, and  $r = .47$  for consistency of interest (Credé et al., 2017). The correlation matrices were used to perform hierarchical regression analyses using harmonic mean sample sizes (Viswesvaran & Ones, 1995).

## **Results**

### ***Study Characteristics***

Ultimately, we included 83 studies, 102 independent samples, 200 effect sizes, and 66,518 participants. All included studies were published between 2009 and 2021. The average age of the samples was 26.08 years ( $SD = 10.40$ ) and the mean percentage of females was 63% ( $SD = 0.18$ ). Most of the studies were conducted in the United States (37) and the remaining of the studies from China (12), South Korea (6), Canada (3), Australia (2), Japan (2), Peru (2), Philippines (2), Colombia (1), Spain (1), Sweden (2), Turkey (2), Finland (1), Ghana (1), Malaysia (1), Pakistan (1), Romania (1), Switzerland (1), and mixed (5). The majority of the studies were obtained using a convenience sampling method and a correlational study design measuring grit and SWB at one measurement point.

### ***Publication Bias***

To evaluate possible publication bias, we drew funnel plots and conducted Egger's test of funnel-plot asymmetry (Egger et al., 1997). A significant intercept was regarded as an asymmetry due to the exclusion of studies with weak effects. The Egger's test showed no significant funnel-plot asymmetry between overall grit / perseverance of effort / consistency of interest and SWB ( $ps > .05$ ). Thus, the presence of publication bias was unlikely in the present meta-analysis. The absence of a publication bias was also confirmed by funnel plots (**Figures S2, S3, S4**).

### ***Common Method Variance***

Common method variance results from the same source or rater, which may affect study results. Given the available information of each sample, we mainly examined whether measurement time (same point versus different points) moderates the relations between overall grit / perseverance of effort / consistency of interest and SWB. Also, we tested whether measurement media (same media versus different media) moderates the relation between overall grit and SWB. Both measurement time and measurement media were treated as dummy variables and calculated in meta-regressions (Card, 2012). The results showed that the moderating effects of measurement time and measurement media were not significant ( $ps > .05$ ). Thus, it appears that common method variance, at least that due to shared measurement time or media, was not a potential threat to the present study.

### ***Relations between Grit and Subjective Well-Being***

The results showed that overall grit was substantially related to SWB ( $\mathbf{x} = .46$ ,  $k = 79$ ,  $N = 55,610$ , 95%-CI [.43, .48]). For more results of the overall grit-SWB relation, please see **Table S5**.

Results specific to the relations between two facets of grit and SWB are presented in **Table 1**. Perseverance of effort and SWB showed a strong correlation ( $\mathbf{x} = .38$ ,  $k = 36$ ,  $N = 24,335$ , 95%-CI [.33, .43]). Perseverance of effort had weaker relations with negative affect ( $\mathbf{x} = .29$ ,  $k = 7$ ,  $N = 2,347$ , 95%-CI [.33, .25]) and school satisfaction ( $\mathbf{x} = .28$ ,  $k = 4$ ,  $N = 3,201$ , 95%-CI [.15, .41]), and stronger relations with happiness ( $\mathbf{x} = .48$ ,  $k = 6$ ,  $N = 9,413$ , 95%-CI [.46, .50]), life satisfaction ( $\mathbf{x} = .37$ ,  $k = 11$ ,  $N = 11,720$ , 95%-CI [.33, .41]), positive affect ( $\mathbf{x} = .34$ ,  $k = 5$ ,  $N = 1,832$ , 95%-CI [.23, .45]), depression ( $\mathbf{x} = .32$ ,  $k = 14$ ,  $N = 14,745$ , 95%-CI [.36, .28]), and job satisfaction ( $\mathbf{x} = .31$ ,  $k = 3$ ,  $N = 780$ , 95%-CI [.21, .42]).

Compared to perseverance of effort, consistency of interest had a smaller correlation with SWB ( $\mathbf{x} = .23$ ,  $k = 30$ ,  $N = 22,755$ , 95%-CI [.17, .28]). Except for positive affect ( $\mathbf{x} = .27$ ,  $k = 5$ ,  $N = 1,832$ , 95%-CI [.15, .39]), negative affect ( $\mathbf{x} = .33$ ,  $k = 5$ ,  $N = 1,832$ , 95%-CI [.38, .29]), and depression ( $\mathbf{x} = .28$ ,  $k = 12$ ,  $N = 14,204$ , 95%-CI [.32, .23]), similar weaker relations with consistency of interest were observed for other SWB indicators, that is, happiness ( $\mathbf{x} = .18$ ,  $k = 6$ ,  $N = 9,413$ , 95%-CI [.15, .21]), life satisfaction ( $\mathbf{x} = .15$ ,  $k = 9$ ,  $N = 11,222$ , 95%-CI [.08, .21]), and school satisfaction ( $\mathbf{x} = .07$ ,  $k = 4$ ,  $N = 3,201$ , 95%-CI [.06, .21]). Moreover, consistency of interest was strongly related to perseverance of effort with  $\mathbf{x} = .37$  ( $k = 27$ ,  $N = 14,726$ , 95%-CI

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[.31, .44]).

### ***Moderators of the Relation between Grit and Subjective Well-Being***

As indicated in **Table 2**, the correlation between perseverance of effort and SWB was not moderated by age, culture, measure of grit, and facet of SWB as the  $Q$  statistics were not significant ( $ps < .05$ ). Similarly, results from **Table 3** showed that the moderating effects of culture and measure of grit were not significant in the link between consistency of interest and SWB. However, the  $Q$  statistics for the moderating effect of age and facet of SWB on the relationship between consistency of interest and SWB were significant ( $Q = 5.63, p < .05$ ;  $Q = 7.34, p < .01$ , respectively), suggesting that age and facet of SWB moderated the consistency of interest-SWB relation. Specifically, the link between consistency of interest and SWB became weaker as age increased. Also, this positive relationship was stronger in affective well-being ( $\phi = .26$ ) than in cognitive well-being ( $\phi = .13$ ). The same moderating effects of age and facet of SWB in the link between consistency of interest and SWB were also showed in the overall grit-SWB relation, please see **Table S6**. The correlations among moderators were presented in **Table S7**.

### ***Incremental Validity***

The results of the incremental validity analysis were presented in **Table 4**. Overall grit and perseverance of effort showed substantial amounts of incremental variance ( $R^2 = .079$  and  $.047$ , respectively) in SWB after controlling for conscientiousness. Consistency of interest indicated negligible incremental variance ( $R^2 = .008$ ) in SWB after controlling for conscientiousness. These results suggest that grit, especially overall grit and perseverance of effort, accounts for non-trivial proportions of variance in SWB beyond conscientiousness.

### **Discussion**

Although many researchers have found evidence for the positive relation between grit and SWB, others have showed that their relation is either negative or non-significant. Considering these mixed findings, we used a meta-analytic approach to estimate the grit-SWB relation and explored whether this link is moderated by demographics (i.e., age and culture) and methodology (i.e., measure of grit and facet of SWB). We also compared the incremental variance of grit and conscientiousness in predicting SWB.

A recent meta-analysis on the relation between grit and academic performance showed that

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overall grit, perseverance of effort, and consistency of interest exhibited only small effect sizes in relation to academic performance, and that the effect size of perseverance of effort was higher than that for overall grit and consistency of interest (Credé et al., 2017). In the present study, we found that overall grit and perseverance of effort exhibit larger relations with SWB, whereas consistency of interest was weakly related to SWB. Moreover, overall grit had the strongest relation with SWB, followed by perseverance of effort and consistency of interest. The differences might occur because of the distinct outcome variables, suggesting grit and its two facets having unequal relations with academic performance and SWB. These results are also consistent with the suggestions of Duckworth and her colleagues (Duckworth et al., 2007; Duckworth & Quinn, 2009) that overall grit has a stronger predictive power than its two facets alone. Indeed, a number of empirical studies (Clark & Malecki, 2019; Disabato et al., 2018; Kwon, 2021; Sheehan, 2014; Weiss, 2018) found similar results with the relation between grit and SWB (e.g., life satisfaction, happiness, depression) being higher in overall grit than in perseverance of effort, and consistency of interest was the smallest. Consistently with a pattern emerging in personality psychology (Möttus et al., 2017; Seeboth & Möttus, 2018; Möttus et al., 2019; Möttus et al., 2020), broader self-reports constructs such as overall grit are predictive of other self-reports constructs such as SWB, whereas narrower constructs (here, the grit facets) generally hold an edge for the prediction of objectively measured behavioral constructs (e.g., academic performance).

As discussed in the introduction, the positive and strong link between grit and SWB can be accounted for by both the telic / goal theory (Emmons, 1986; Michalos, 1980) or the top-down theories of SWB (Diener, 1984; Diener & Ryan, 2009). In terms of the telic / goal theory, it may be possible that individuals with high grit tend to pursue their long-term goals regardless of negative feedbacks (Duckworth et al., 2011; Duckworth et al., 2007), which could be beneficial to achieve goals and thereby lead to higher SWB levels. Alternatively, this strong link could also be explained with the top-down theories, that is, high SWB occurs in part through positive attitudes and the influence of personality traits. Compared with individuals who have lower grit, those with higher grit may tend to perceive their failures and setbacks more positively and with greater optimism (O'Sullivan et al., 2019; Sheridan et al., 2015), and are subsequently less likely to experience low SWB. Empirical research is needed to clarify the mechanisms of negative



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feedback and optimism in the relation between grit and SWB. In sum, these findings supported both the telic / goal theory (Emmons, 1986; Michalos, 1980) and top-down theories of SWB (Diener, 1984; Diener & Ryan, 2009) by showing that grit is an important personality trait and that it might play a significant role in the development of human well-being.

In line with prior studies (e.g., Kwon, 2021; Reed et al., 2013), we found incremental validity of grit over conscientiousness when predicting SWB, indicating that the correlation between grit and SWB was not simply due to a redundancy between grit and conscientiousness. This is also consistent with a broader pattern of findings in personality psychology suggesting that constructs beyond the (core) Big Five personality traits tend to be predictive of a variety of outcomes (Möttus, 2016; Möttus et al., 2020). Also, we found that overall grit and perseverance of effort had higher incremental associations with SWB than consistency of interest, which might be because perseverance of effort is more relevant for SWB than consistency of interest or because the subscale with positively scored items somehow tags SWB-related variance better.

Some researchers claim that grit is teachable and several school-based intervention programs aimed at developing students' grit are initiated (Alan et al., 2019; Kirchgasser, 2018; Shechtman et al., 2013). Researcher and practitioners should be cautious before conducting grit intervention programs due to lacking evidence for a causal link between grit and SWB. It should also be noted that there are arguments on the structure of grit, that is, the higher order construct of grit has limited validity (e.g., Credé, 2018; Credé et al., 2017). Therefore, the grit research and interventions might benefit from a reexamination of the factor structure of grit and refinement of the grit scale with more rigorous methods (e.g., Item Response Theory or network models). However, these problems do not seem to be of particular importance in the context of our study. As the correlations with SWB as well as the incremental validities above conscientiousness of overall grit were higher than the corresponding values of perseverance of effort and consistency of interest.

With regard to the moderation effect sizes, we found that age moderated the relations between overall grit / consistency of interest and SWB. Specifically, the links between overall grit / consistency of interest and SWB were weaker as age increased. A possible explanation could be that stability in personality traits (e.g., grit) increase from childhood to adulthood (Roberts &

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DelVecchio, 2000), while subjective well-being could be more easily influenced by individuals' affects and cognitions as well as other factors such as income and social relationship. Thus, as age increases, the relation between overall grit / consistency of interest and SWB could become somewhat weaker. We also found that facet of SWB moderated the relations between overall grit / consistency of interest and SWB in that these links were stronger in affective well-being than in cognitive well-being. This result is in line with prior studies that personality had non-significant relations with cognitive well-being after included affective well-being as a mediator (e.g., Schimmack et al., 2008).

However, we did not find any significant moderating effects in the link between perseverance of effort and SWB, indicating that the correlation between perseverance of effort and SWB is robust across these examined moderators. Of note is that the four moderators accounted for a small percentage of variation in the grit-SWB relation, indicating that there potentially exist other moderators, which influence the relations. Moreover, subjective well-being is likely a multifaceted construct (e.g., Diener et al. 1999), even though it's often viewed as a unitary construct (e.g., Kwon, 2021). Therefore, we should be cautious when interpreting these findings as this assumption of construct unity likely led to the observed heterogeneity in effect sizes across studies.

### **Theoretical Contributions**

The present study is the first effort to meta-analytically summarize the relation between grit and SWB. We first estimated the strength and direction of the grit-SWB relation, providing evidence on the large positive relation between grit and SWB, although the link between consistency of interest and SWB was relatively weaker. To clarify the observed inconsistencies in the link between grit and SWB, we then explored potential moderators from demographics and methodology. The findings point to the relations between overall grit / consistency of interest and SWB varied across age and facet of SWB, suggesting that these relations are comparatively less stable than the perseverance of effort-SWB relation.

Finally, Credé et al. (2017) argued in their meta-analysis on grit and performance that perseverance of effort is basically identical to conscientiousness and consistency of interest has very little incremental validity after controlling conscientiousness and perseverance of effort. To

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address this concern, we performed an incremental validity analysis to explore whether much of the variance grit is explaining in SWB is likely due to conscientiousness. Our findings indicated that overall grit and perseverance of effort explained unique variance in SWB when the variance of conscientiousness accounted for, suggesting that overall grit and perseverance of effort may provide unique explanatory power for SWB.

### **Limitations and Future Directions**

The current meta-analysis has several limitations. First, the identified literature concerning the grit-SWB relation consists mainly of cross-sectional studies that failed to capture changes of this relation over time so that it is hardly possible to ascertain the direction of effect among grit and SWB. More research using prospective designs are needed to identify the cause and effect in this relation, to the extent that even longitudinal studies can rule out common-cause or reverse causation explanations (there is no guarantee that longitudinal studies could do better than cross-sectional studies for the traits may be mostly stable). Ideally, randomized controlled trials would be needed, but these may be hard to conduct due to various practical and ethical reasons.

Second, the present study only analyzed the grit-SWB relation on the basis of studies written in English because most available studies were conducted in North America. Research regarding the grit-SWB relation investigated in other countries or regions is necessary to gain a more complete understanding of the difference or nature of this relation. Third, to clarify the observed variability of the grit-SWB relation, mainly demographic and methodological moderators were tested. The influence of other possible moderators such as stress (O’Neal et al., 2016) should be examined to get a more precise picture of this relation. Fourth, the present study did not examine the possible mediators underlying the grit-SWB relation, that is, how grit relates with SWB. Future studies should address the question whether the grit-SWB relation found in the present meta-analysis is mediated by other factors such as hope (Sheehan, 2014).

Finally, personality traits are organized hierarchically (McCrae & Sutin, 2018; Mõttus et al., 2020) and conscientiousness is a highly multi-faceted broad personality domain (Roberts et al., 2005). It therefore remains possible that grit facets can be conceived of as facets of the broad domain rather than stand-alone constructs, although they are often not covered in its instruments and could not therefore be fully controlled for in the present investigation. If so, this would not in

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any way diminish the value of grit or its facets: rather than pitting them against the broader conscientiousness domain, they could be seen as uniquely important parts of the domain – parts that are currently not given sufficient credit in conscientiousness measurement tools.

### **Conclusion**

The present meta-analysis focused on the current state of research on the relation between grit and SWB, which extended past research by estimating overall effect sizes, moderation effect sizes, and incremental validity. We found that overall grit / perseverance of effort was substantially related to SWB, and these relations do not appear to be due to conscientiousness. Also, the relationships between overall grit / consistency of interest and SWB were moderated by age and facet of SWB, providing preliminary evidence for the processes that may undergird the grit association with SWB. Collectively, this study advances our understanding of the role that grit plays in pathways to happiness.

### **Methods reporting and sharing**

We report all manipulations, measures, and exclusions in these studies.

### **Preregistration**

No studies in this manuscript were preregistered.

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### **Supplementary Material**

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Supplemental material can be found online with this article.

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