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Development and Validation of the Short Grit Scale (Grit–S)

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In this article, we introduce brief self-report and informant-report versions of the Grit Scale, which measures trait-level perseverance and passion for long-term goals. The Short Grit Scale (Grit–S) retains the 2-factor structure of the original Grit Scale (Duckworth, Peterson, Matthews, & Kelly, 2007) with 4 fewer items and improved psychometric properties. We present evidence for the Grit–S's internal consistency, test–retest stability, consensual validity with informant-report versions, and predictive validity. Among adults, the Grit–S was associated with educational attainment and fewer career changes. Among adolescents, the Grit–S longitudinally predicted GPA and, inversely, hours watching television. Among cadets at the United States Military Academy, West Point, the Grit–S predicted retention. Among Scripps National Spelling Bee competitors, the Grit–S predicted final round attained, a relationship mediated by lifetime spelling practice.

Perseverance is more often studied as an outcome than as a predictor. For example, perseverance in difficult or impossible tasks has served as the dependent variable in studies of optimistic attribution style, self-efficacy, goal orientation, and depletion of self-control resources (see, e.g., Bandura, 1977; Baumeister, Bratslavsky, Muraven, & Tice, 1998; Elliott & Dweck, 1988; Muraven, Tice, & Baumeister, 1998; Seligman & Schulman, 1986). However, the study of perseverance as a predictor, in particular as a stable individual difference, was of keen interest to psychologists in the first half of the 20th century. In a review of the existing literature of his day, Ryans (1939) concluded that "the existence of a general trait of persistence, which permeates all behavior of the organism, has not been established, though evidence both for and against such an assumption has been revealed" (p. 737). Very recently, positive psychology has renewed interest in the empirical study of character in general and in the trait of perseverance in particular (Peterson & Seligman, 2004).

Duckworth, Peterson, Matthews, and Kelly (2007) introduced the construct of *grit,* defined as trait-level perseverance and passion for long-term goals, and showed that grit predicted achievement in challenging domains over and beyond measures of talent. For instance, at the U.S. Military Academy, West Point, cadets higher in grit were less likely to drop out than their less gritty peers, even when controlling for SAT scores, high school rank, and a measure of Big Five conscientiousness. In four separate samples, grit was found to be either orthogonal to or slightly inversely correlated with intelligence.

Duckworth et al. (2007) proposed that grit is distinct from traditionally measured facets of Big Five conscientiousness in its emphasis on stamina. In particular, grit entails the capacity to sustain both effort and interest in projects that take months or even longer to complete. Grit is also related to but distinct from need for achievement (*n* Achievement: McClelland, 1961). Individuals high in grit do not swerve from their goals, even in the absence of positive feedback. In contrast, McClelland (1985) noted that

> There is ample evidence that the moderate challenge incentive is crucial for individuals high in *n* Achievement; they will work harder when this incentive is present than when it is not present; that is, when tasks are too easy *or too hard* [italics added]. (p. 814)

Duckworth et al. (2007) identified a two-factor structure for the original 12-item self-report measure of grit (Grit–O). This structure was consistent with the theory of grit as a compound trait comprising stamina in dimensions of interest and effort. However, the differential predictive validity of these two factors for various outcomes was not explored. Duckworth et al. did not examine whether either factor predicted outcomes better than did the other. Moreover, the model fit of the Grit–O (comparative fit index [CFI][1] = .83; root mean square error of approximation [RMSEA][2] = .11) suggested room for improvement.

THIS RESEARCH

We undertook this investigation to validate a more efficient measure of grit. In Study 1, we identified items for the Short Grit Scale (Grit–S) with the best overall predictive validity across four samples originally presented in Duckworth et al. (2007). In Study 2, we used confirmatory factor analysis to test the two-factor structure of the Grit–S in a novel Internet sample of adults, compared the relationships between the Grit–S and Grit–O and the Big Five personality dimensions, and examined predictive validity for career changes and educational attainment. In Study 3, we validated an informant version of the Grit–S and established consensual validity. In Study 4, we measured the 1-year, test–retest stability of the Grit–S in a sample of adolescents. Finally, in Studies 5 and 6, we further tested the predictive validity of the Grit–S in two novel samples of West Point cadets and National Spelling Bee finalists.

STUDY 1

In Study 1, we aimed to extract a subset of items from the Grit–O to create a brief version (Grit–S). In selecting items, we considered predictive validity and replication of the two-factor

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[1]CFI is a noncentrality index that compares the proposed model to the independence model.

[2]RMSEA is the parsimony adjusted index of the discrepancy between observed and implied covariances.

TABLE 1.—Item-level correlations with outcomes in Study 1.

Item	West Point Class of 2008 Retention	West Point Class of 2010 Retention	2005 National Spelling Bee Final Round[a]	Ivy League Undergraduate GPA
Consistency of Interest				
1. *I often set a goal but later choose to pursue a different one.*	**.10**	**.11**	**.12**	.15
5. *I have been obsessed with a certain idea or project for a short time but later lost interest.*	**.08**	**.08**	−.05	**.16**
6. *I have difficulty maintaining my focus on projects that take more than a few months to complete.*	.04	**.04**	.07	**.28**
2. *New ideas and projects sometimes distract me from previous ones.*	.03	.03	**.17**	.13
4. My interests change from year to year.	.06	**.09**	.08	.03
3. I become interested in new pursuits every few months.	.04	−.03	**.12**	.01
Perseverance of Effort				
9. *I finish whatever I begin.*	**.13**	**.06**	**.12**	**.32**
10. *Setbacks don't discourage me.*	**.07**	**.07**	**.11**	.03
12. *I am diligent.*	**.11**	.00	.07	**.31**
11. *I am a hard worker.*	**.09**	.01	.09	**.26**
7. I have achieved a goal that took years of work.	.02	.01	**.16**	**.17**
8. I have overcome setbacks to conquer an important challenge.	.04	−.03	−.03	−.09

Note. Italicized items were retained in the Short Grit Scale. Boldface correlation coefficients are above the median.
[a] Spearman's rho correlation coefficients.

structure of the Grit–O across four different samples of children and adults.

Method

Participants. We used four samples engaged in a variety of challenging domains across the life span. Two samples of United States Military Academy, West Point, cadets were collected by Duckworth et al. (2007). Cadets in the class of 2008 ($N = 1{,}218$) completed all 12 items of the Grit–O on entering West Point in June 2004. As is typical of West Point classes, 84% of the sample was male, and the mean age was 19.05 years ($SD = 1.1$). Cadets in the class of 2010 ($N = 1{,}308$) completed the Grit–O in June 2006 and were demographically similar to class of 2008 cadets. In both cadet samples, we considered attrition from West Point after the rigorous summer training session to assess each item's predictive validity.

Duckworth et al. (2007) recruited a sample of finalists in the 2005 Scripps National Spelling Bee ($N = 175$). This sample completed the Grit–O prior to the final competition. Of the finalists, 48% were female (M age = 13.20 years, $SD = 1.23$). The outcome of interest in this sample was final round reached in the National Spelling Bee.

The fourth sample consisted of 139 Ivy League undergraduates (Duckworth et al., 2007). Of the participants, 69% were female. Participants in this sample completed an online version of the Grit–O in fall 2002. Self-reported GPA was the outcome of interest.

Procedure. We computed item-level correlations with outcomes for all four samples. Because we intended to consider predictive validity in each domain (West Point, the National Spelling Bee, and an elite university) separately and because mean correlations varied among domains, we chose not to compute average correlation coefficients for each item. Rather, we ranked the correlations within each domain and examined the number of domains in which each item was above the median in predicting an outcome. We then eliminated the two items from the Consistency of Interest and Perseverance of Effort subscales, which were most frequently below the median in prediction.

Results and Discussion

See Table 1 for item-level correlations. After excluding two items from each subscale, the resulting eight-item Grit–S displayed acceptable internal consistency, with alphas ranging from .73 to .83 across the four samples. As shown in Table 2, the four-item Consistency of Interest subscale showed adequate internal consistency as well, with alphas ranging from .73 to .79. Alphas were somewhat lower for Perseverance of Effort, with values ranging from .60 to .78.

Next, we ran four separate confirmatory factor analyses testing the two-factor model of grit with each sample. Consistency of Interest and Perseverance of Effort were first-order latent factors that loaded on a second-order latent factor called Grit. Structural equation models were run with AMOS Version 6.0 (Arbuckle, 2005) using the maximum-likelihood method. We used multiple goodness-of-fit indexes as recommended by Kline (2005) and Byrne (2001). Fit indexes for the Grit–S suggested a good fit in the West Point Class of 2008, χ^2 (19, $N = 1{,}218$) = 106.36, $p < .001$; RMSEA = .061 (90% confidence interval [CI] = .050–.073), CFI = .95. Similarly, fit statistics indicated a good fit for the Grit–S in the West Point Class of 2010,

TABLE 2.—Internal consistencies for the Grit–S, the Persistence of Effort factor, and the Consistency of Interest factor in Study 1.

Sample	*N*	Cronbach's Alpha		
		Grit–S	Persistence of Effort	Consistency of Interest
West Point 2008	1,218	.73	.60	.73
West Point 2010	1,308	.76	.65	.74
2005 National Spelling Bee	175	.80	.65	.76
Ivy League undergraduates	139	.83	.78	.79

Note. Grit–S = Short Grit Scale.

$\chi^2(19, N = 1{,}308) = 135.51$, $p < .001$; RMSEA = .068 (90% CI = .058–.080), CFI = .95. We found a slightly worse fit for 2005 Scripps National Spelling Bee finalists, $\chi^2(19, N = 175) = 71.57$, $p < .001$; RMSEA = .101 (90% CI = .077–.126), CFI = .86 and Ivy League undergraduates, $\chi^2(19, N = 139) = 43.63$, $p = .001$; RMSEA = .097 (90% CI = .059–.135), CFI = .93, although the higher RMSEA and lower CFI values are likely due to inadequate sample size (Kline, 2005).

Study 2

Study 2 was a cross-sectional online study with three objectives: (a) confirm the factor structure of the Grit–S in a large sample, (b) identify its relations with the Big Five personality dimensions, and (c) establish its predictive validity for career changes and educational attainment.

Method

Participants and procedure. Participants were adults aged 25 and older who visited www.gritstudy.com from October 2006 through July 2007. Potential participants were directed to the implied consent form and survey via links on A. L. Duckworth's personal Web site and www.authentichappiness.org, a noncommercial, public Web site providing free information about psychology research. In exchange for completing the online survey, participants were later emailed a summary of general findings from the study. To ensure that no individuals were included more than once in our analyses, all participants submitted their e-mail addresses with their surveys. We included only data from the first survey completed by each participant. A total of 25 individuals completed the survey more than once. Excluding duplicate responders, the final sample comprised 1,554 participants. The sample (M age = 45.64 years, SD = 11.27) was 81% female.

Measures. Participants reported their age, gender, and level of education (postcollege graduate degree, Bachelor's degree, Associate's degree, some college, or high school degree or less) and "the number of times I have changed careers." In addition, they completed the Big Five Inventory (BFI; John & Srivastava, 1999), a widely used five-factor personality questionnaire that includes 44 statements (e.g., "I see myself as someone who does a thorough job") on a 5-point Likert-type scale ranging from 1 (*Disagree strongly*) to 5 (*Agree strongly*). Observed internal reliabilities for the BFI subscales were .82, .84, .88, .80, and .87 for Openness to Experience, Conscientiousness, Extraversion, Agreeableness, and Neuroticism, respectively. Using a 5-point Likert-type scale ranging from 1 (*Not at all like me*) to 5 (*Very much like me*), participants endorsed 12 items comprising both the Grit–S and Grit–O (Duckworth et al., 2007).

Results and Discussion

Confirmatory factor analysis. A confirmatory factor analysis supported the two-factor model of grit. The two subscales, Consistency of Interest and Perseverance of Effort, were first-order latent factors that loaded on a second-order latent factor called Grit. We compared this two-factor model to a more parsimonious model in which all eight items loaded on a single latent factor. Structural equation models were run with AMOS Version 6.0 (Arbuckle, 2005) using the maximum-likelihood method. The two-factor model, $\chi^2(19, N = 1{,}554) = 188.52$, $p < .001$, fit the data significantly better than did the single-factor model, $\chi^2(20, N = 1{,}554) = 380.45$, $p < .001$ as indicated by a significant chi-square difference, $\Delta\chi^2(1) = 191.93$, $p < .001$. Other fit indexes suggest a good fit for the two-factor model, RMSEA = .076 (90% CI = .066–.086), CFI = .96. See Figure 1.

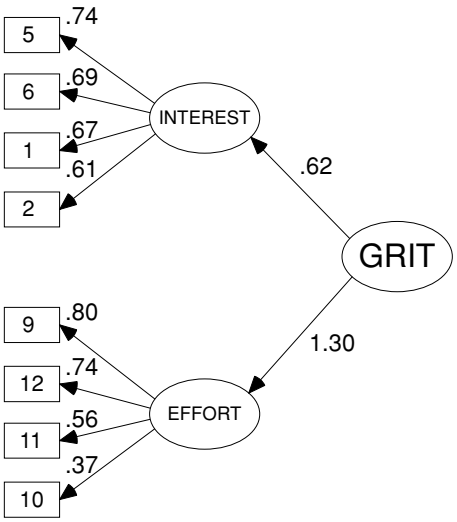

FIGURE 1.—Standardized factor loadings for the second-order model of grit for adults aged 25 and older in Study 2.

In contrast, although the chi-square statistic for the Grit–O was also significant, $\chi^2(53, N = 1{,}554) = 849.36$, $p < .001$, other goodness-of-fit indexes indicated that the Grit–O, RMSEA = .098 (90% CI = .096–.104), CFI = .86, did not fit the data as well as did the Grit–S.

The structure of the Grit–S did not vary across gender. We fit a model for participants in which path weights and error variances were constrained to be equivalent for men and women. The chi-square for this model was 223.13 ($df = 54$, combined $N = 1{,}554$, $p < .001$). The difference in chi-square values between the gender-invariant model and the baseline second-order model, $\chi^2(38, \text{combined } N = 1{,}554) = 201.00$, $p < .001$, which was 22.13 for 16 *df,* was not significant, $p = .14$. In the entire sample, the correlation between Grit–S scores and Grit–O scores was $r = .96$, $p < .001$. The Perseverance of Effort factor, the Consistency of Interest factor, and the whole Grit–S showed adequate internal consistency, αs = .70, .77, and .82, respectively. See Table 3 for summary statistics.

Relation to Big Five dimensions, education, age, gender, and career changes. As predicted, the Grit–S correlated more

TABLE 3.—Summary statistics for adults aged 25 and older in Study 2.

Group	*n*	Female (%)	Grit–S *M* (*SD*)	Consistency of Interest *M* (*SD*)	Perseverance of Effort *M* (*SD*)	Career Changes *M*
Age 25–34	300	79	3.2 (0.7)	2.9 (0.9)	3.6 (0.7)	1.3
Age 35–44	404	84	3.2 (0.8)	2.8 (1.0)	3.6 (0.7)	2.3
Age 45–54	476	82	3.4 (0.7)	3.0 (0.9)	3.8 (0.7)	2.6
Age 55–64	309	80	3.5 (0.7)	3.1 (0.9)	3.9 (0.7)	2.9
Age 65 +	65	72	3.7 (0.7)	3.4 (0.9)	4.0 (0.7)	2.8
Total sample	1,554	81	3.4 (0.7)	2.9 (0.9)	3.7 (0.7)	2.4

Note. Grit–S = Short Grit Scale.

TABLE 4.—Correlations between Big Five dimensions and Grit Scale for adults aged 25 and older in Study 2.

Big Five Dimension	Grit–S	Consistency of Interest	Perseverance of Effort	Grit–O
Conscientiousness	.77*	.64*	.74*	.73*
Neuroticism	−.40*	−.32*	−.42*	−.37*
Agreeableness	.24*	.18*	.25*	.23*
Extraversion	.20*	.12*	.26*	.19*
Openness to Experience	.06	−.02	.14*	.07

Note. Grit–S = Short Grit Scale; Grit–O = original 12-item self-report measure of grit.
* $p < .001$.

with BFI Conscientiousness ($r = .77$, $p < .001$) than with Neuroticism ($r = -.40$, $p < .001$), Extraversion ($r = .20$, $p < .001$), Agreeableness ($r = .24$, $p < .001$), or Openness to Experience ($r = .06$, $p = .03$). Following Meng, Rosenthal, and Rubin (1992), we confirmed that the association between Grit–S and Conscientiousness was significantly stronger than between Grit–S and any other BFI factor (ps $< .001$). See Table 4.

Because of the close association between Grit–S and Conscientiousness, it was important to test for incremental predictive validity for Grit–S over and beyond Conscientiousness. Educational attainment was an ordinal variable. We therefore used ordinal logistic regression models (Scott, Goldberg, & Mayo, 1997) to test the effects of predictors. We standardized all continuous predictor variables prior to fitting ordinal regression models to facilitate interpretation of odds ratios.

Controlling for Conscientiousness as well as other BFI dimensions, grittier individuals had attained more education than individuals of the same age. In an ordinal logistic regression predicting educational attainment from Grit–S scores and using age as a covariate, both Grit–S ($B = 0.21$, odds ratio [OR] $= 1.23$, $p < .001$) and age ($B = 0.22$, OR $= 1.25$, $p < .001$) were significant predictors. That is, participants who scored 1 *SD* higher in grit than same-aged peers were 23% more likely to have attained more education. Moreover, in a hierarchical ordinal logistic regression with age, Conscientiousness, Agreeableness, Extraversion, Neuroticism, and Openness to Experience entered in Step 1 and grit added in Step 2, Grit–S was a significant predictor of educational attainment over and beyond Step 1, $B = 0.27$, OR $= 1.31$, $p < .001$. See Table 5.

TABLE 5.—Summary of hierarchical ordinal logistic regression predicting educational attainment in Study 2.

Variable	*B*	*SE B*	Odds Ratio (95% CI)	R^{2a}	χ^2
Step 1				.03	47.82
Age	0.23	0.05	1.26 (1.14–1.39)		
Agreeableness	−0.08	0.06	0.92 (0.82–1.04)		
Conscientiousness	0.15	0.05	1.16* (1.05–1.28)		
Extraversion	0.00	0.05	1.00 (0.90–1.11)		
Neuroticism	−0.01	0.06	0.99 (0.88–1.12)		
Openness to Experience	0.15	0.05	1.16* (1.05–1.28)		
Step 2				.04	59.45
Age	0.22	0.05	1.24* (1.13–1.38)		
Agreeableness	−0.08	0.06	0.92 (0.82–1.04)		
Conscientiousness	−0.04	0.08	0.96 (0.82–1.13)		
Extraversion	−0.02	0.05	0.98 (0.89–1.08)		
Neuroticism	0.03	0.06	1.03 (0.91–1.16)		
Openness to Experience	0.15	0.05	1.16* (1.05–1.28)		
Grit	0.27	0.08	1.31* (1.12–1.54)		

Note. SE = standard error; CI = confidence interval. $\Delta\chi^2 = 11.63$, $p < .001$.
[a] Nagelkerke R^2.
* $p < .01$.

Grit–S scores did not differ significantly by gender, $t(1552) = 1.50$, $p = .13$, $d = .10$ but were significantly associated with age, $r = .19$, $p < .001$. The finding that older adults reported higher levels of grit suggests that grit may increase with life experience. This account is consistent with evidence that interests stabilize over time (Swanson, 1999) and also that traits associated with psychological maturity increase over the life course (Roberts, Walton, & Viechtbauer, 2006). The cross-sectional design of Study 2 makes it equally possible that changes in American culture account for the association between grit and age, with individuals born in the 1950s growing up grittier than their counterparts born in the 1940s, and so on. Birth cohort differences have been documented for several other personality traits (Twenge, 2006), suggesting that historical changes in culture can materially impact personality development.

As predicted, Grit–S was inversely related to the number of lifetime career changes individuals had made, even when controlling for age, Conscientiousness, and other BFI dimensions. Because the distribution of lifetime career changes was skewed right ($M = 2.34$, $SD = 2.04$), we performed a median split to compare individuals with high (three or more) versus low (two or fewer) career changes. To allow for a more intuitive understanding of ORs, we standardized continuous predictor variables prior to analysis. In a hierarchical binary logistic regression predicting high versus low career changes with age and all BFI dimensions entered in Step 1 and Grit–S entered in Step 2, Grit–S significantly predicted fewer career changes over and beyond Step 1, $B = 0.22$, OR $= 0.80$, $p = .01$. That is, individuals scoring a standard deviation higher on the Grit–S than peers of comparable age and BFI profile were 20% less likely to have made three or more lifetime career changes. See Table 6.

STUDY 3

In Studies 1 and 2, we developed and validated a brief grit scale. The aim of Study 3 was to validate an informant report version of the brief form.

Method

Participants and procedure. Study 3 included adults aged 25 and older who visited www.gritstudy.com from April 2006 through September 2006 and who, in addition to completing the self-report measures described in Study 2, also nominated a friend and a family member to complete online, informant versions of the Grit–S. To nominate informants, index participants submitted names and e-mail addresses for one friend and one family member each. We then e-mailed these friends and family members a link to the informant Grit–S. Of the 613 index participants who visited www.gritstudy.com during this time period, only those ($N = 161$) for whom we received both friend and family member informant reports were included in this sample. Of the index participants, 89% were female (M age $= 43.11$ years, $SD = 10.59$).

Because all informant e-mail addresses were unique, it is unlikely that multiple participants were rated by the same informants. Informant versions of the scale were identical to self-report version with the exception that all first-person pronouns were replaced with gender-specific, third-person pronouns.

TABLE 6.—Summary of hierarchical binary logistic regression predicting career changes in Study 2.

Variable	*B*	*SE B*	Odds Ratio (95% CI)	R^{2a}	χ^2
Step 1				.11	134.49
Age	0.57	0.06	1.77* (1.57–1.99)		
Agreeableness	−0.13	0.06	0.88* (0.78–0.99)		
Conscientiousness	−0.17	0.06	0.84* (0.75–0.95)		
Extraversion	0.22	0.06	1.25* (1.11–1.40)		
Neuroticism	0.05	0.07	1.05 (0.91–1.21)		
Openness to Experience	0.10	0.06	1.11 (0.98–1.25)		
Step 2				.12	140.67
Age	0.58	0.06	1.79* (1.58–2.01)		
Agreeableness	−0.13	0.06	0.88* (0.78–0.99)		
Conscientiousness	−0.02	0.09	0.98 (0.82–1.17)		
Extraversion	−0.23	0.06	0.79* (0.70–0.90)		
Neuroticism	0.02	0.07	1.02 (0.89–1.17)		
Openness to Experience	0.10	0.06	1.11 (0.98–1.25)		
Grit	−0.22	0.09	0.80* (0.67–0.96)		

Note. *SE* = standard error; CI = confidence interval. $\Delta\chi^2 = 6.18$, $p = .01$.
[a] Nagelkerke R^2.
* $p < .05$.

Results and Discussion

Our findings suggest that grit can reliably be assessed by informants. Internal consistency estimates for Grit–S ratings by family members, peers, and self were $\alpha = .84$, .83, and .83, respectively. The correlations between the self-report version of the Grit–S and scores on the informant versions completed by either family members or peers were medium to large, $r = .45$, $p < .001$ and $r = .47$, $p < .001$, respectively. The correlation between family member and peer scores was also medium to large, $r = .37$, $p < .001$. These correlations compare favorably with estimates of consensual validity for the Revised NEO Personality Inventory (NEO–PI–R; e.g., self and peer ratings of NEO–PI–R Conscientiousness correlate at $r = .40$; Costa & McCrae, 1992b). Our estimates are also in line with associations reported by Meyer et al. (2001) in a summary of meta-analytic estimates ranging from $r = .31$ to .44 for associations among self-report and informant report Big Five personality measures.

STUDY 4

In Study 4, we sought to establish the test–retest stability of Grit–S scores in a population of high-achieving, middle and high school students. This prospective, longitudinal study also allowed us to test the ability of Grit–S to predict school grades and, inversely, hours watching television during the school year.

Method

Participants and procedure. In the spring of 2006, 45% of 7th-, 8th-, 10th-, and 11th-grade students ($N = 279$) at a socioeconomically and ethnically diverse magnet public school completed 12 items comprising both the Grit–S and the Grit–O. The following spring, participating students again completed these 12 items. The sample, which was part of an existing longitudinal research project, had a mean age of 13.94 years (*SD* = 1.59) and was 59% female. Of the participants, 58% were White, 20% were Black, 16% were Asian, 4% were Hispanic, and 1% were other ethnicities. Of participants, 18% were low-income as indicated by their participation in the federal free or reduced price lunch program.

TABLE 7.—Summary statistics and correlations with Grit for adolescents in Study 4.

Variable	*M*	*SD*	r With Grit: Spring 2006	r With Grit: Spring 2007
Grit, Spring 2006	3.4	0.8	—	.68*
Grit, Spring 2007	3.4	0.8	—	—
Age	13.9	1.6	.01	.02
GPA, 2006–2007	88.4	5.4	.30[a]*	.32[a]*
Hours watching television, 2006–2007	1.3	0.7	–.24[a]*	–.22[a]*

[a] Controlling for age.
* $p < .001$.

In the spring of 2007, in addition to completing items comprising the Grit–S and Grit–O for a second time, participants reported the number of hours per day they spent watching television. We obtained report card grades and demographic data from school records. GPA was calculated as the average of final grades in all academic subjects and was scored on a scale ranging from 0 to 100. See Table 7 for summary statistics.

Results and Discussion

We found evidence that Grit–S is relatively stable over time. The correlation between scores on the Grit–S from the spring of 2006 and Grit–S scores 1 year later was $r = .68$, $p < .001$. The Grit–S showed good internal consistency at both the 2006 and 2007 assessments, αs = .82 and .84, respectively.

Grit–S scores did not differ between genders. Because the sample included students ranging from 11 to 17 years old, age was controlled in all subsequent analyses. As expected, scores on the Grit–S, measured in the spring of 2006, predicted GPA 1 year later and (inversely) hours watching television per day. See Table 7.

STUDY 5

Admission to United States Military Academy, West Point, is extremely competitive. Specifically, admission depends heavily on a Whole Candidate Score, a weighted average of SAT scores, class rank, demonstrated leadership in extracurricular activities, and physical aptitude. Even with such a rigorous admissions process, about 1 in 20 cadets drops out in during the first summer of training. In Study 5, we expected the Grit–S to predict retention over the first summer at West Point.

Method

Participants and procedure. Participants were 1,248 freshman cadets comprising the West Point class of 2009. This group was typical of recent West Point classes in terms of gender (15% female) and ethnicity (75% White, 7% Asian, 7% Hispanic, 7% Black, 1% American Indian, and 2% other). Participants completed questionnaires during routine group testing after arrival to West Point in June 2005. Separately, official records were obtained for retention data.

Measures. Participants completed 12 items comprising the Grit–O and Grit–S. We obtained the Whole Candidate Score, which is used in conjunction with other information to admit applicants to West Point, from school records. A Whole Candidate Score is a weighted composite of high school rank, SAT

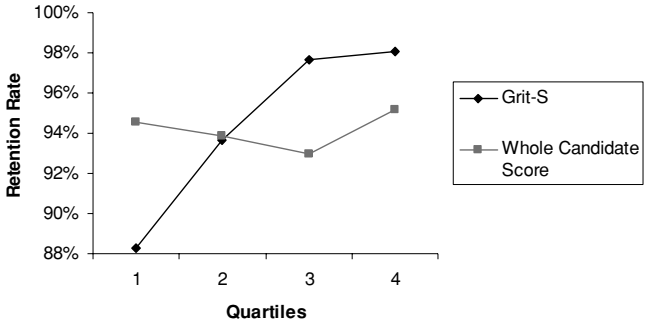

FIGURE 2.—Summer retention as a function of ranked quartiles of grit and the Whole Candidate Score among West Point Cadets in Study 5. Grit–S = Short Grit Scale.

score, participation in extracurricular activities, and a standardized physical exercise evaluation. Summer retention was coded as a dichotomous variable in which 1 = retained and 0 = separated as of the 1st day of the fall semester.

Results

Grit–S predicted completion of the rigorous summer training program better than the Whole Candidate Score. Observed internal consistency of the Grit–S was $\alpha = .77$. Predictor variables were standardized before regression analysis to allow for a more intuitive understanding of ORs. Cadets who scored a standard deviation higher than average on the Grit–S were 99% more likely to complete summer training ($B = 0.69$, OR = 1.99, $p < .001$). The Whole Candidate Score, the composite score used by West Point to admit candidates, did not predict summer retention ($B = 0.06$, OR = 1.06, $p = .64$). See Figure 2. Further, in a hierarchical binary logistic regression predicting retention with the Whole Candidate Score entered in Step 1 and Grit–S scores entered in Step 2, Grit–S was a significant predictor over and beyond the Whole Candidate Score, $B = 0.69$, OR = 1.99, $p < .001$. See Table 8.

STUDY 6

Study 6 was a prospective, longitudinal investigation of finalists in the 2006 Scripps National Spelling Bee, which tested the predictive validity of the Grit–S scale with respect to a behavioral (i.e., not self-report) measure of performance. Study 6 also allowed us to test whether the effect of grit on achievement was mediated by cumulative effort.

TABLE 8.—Summary of hierarchical binary logistic regression predicting West Point retention in Study 5.

Variable	*B*	*SE B*	Odds Ratio (95% CI)	R^{2a}	χ^2
Step 1				.00	0.22
Whole Candidate Score	0.06	0.12	1.06 (0.84–1.35)		
Step 2				.08	35.32
Whole Candidate Score	0.02	0.12	1.02 (0.80–1.30)		
Grit	0.69	0.12	1.99* (1.57–2.53)		

Note. *SE* = standard error; CI = confidence interval. $\Delta\chi^2 = 35.32$, $p < .001$.
[a] Nagelkerke R^2.
* $p < .001$.

Method

Participants and procedure. We mailed consent forms, self-report surveys, and prestamped return envelopes to the 274 finalists in the 2006 Scripps National Spelling Bee, an annual competition that involves thousands of children in the United States, Europe, Canada, New Zealand, Guam, Jamaica, Puerto Rico, the U.S. Virgin Islands, The Bahamas, and American Samoa. Of the finalists, 69% ($N = 190$) elected to participate by returning the questionnaires in April and May 2006, prior to the May 31st final competition. Participants ranged in age from 10 to 15 years old ($M = 12.88$, $SD = 1.07$); 47% were female. Scripps competitors who agreed to participate in the study did not differ from nonparticipating competitors on age, gender, final round reached, or number of prior competitions.

Measures. Participants completed 12 items comprising both the Grit–S and the Grit–O. The Grit–S showed good internal consistency, $\alpha = .82$. In addition, participants completed the BFI (John & Srivastava, 1999) and answered a series of questions about their spelling habits, providing detailed estimates of the time they spent studying and practicing spelling in previous years. Starting with the year that they began spelling competitively and ending with the current year, participants reported the months per year that they studied regularly and the average amount of time per week they studied. From these responses, we calculated the estimated cumulative hours of spelling practice for each participant.

Following the 2006 final competition, we obtained from records provided by the Scripps National Spelling Bee the following data for each speller: gender, birth date, final round attained in the competition before elimination, and number of prior Scripps National Spelling Bee competitions entered. The final competition of the Scripps National Spelling Bee is an oral competition conducted in rounds until only one speller remains. Beginning in the third round, if a speller misspells a word, he or she is eliminated. During the 2006 competition, the winner spelled words correctly during 20 rounds, the second place finisher correctly spelling words during the first 19 rounds, and so on. See Table 9 for summary statistics.

Results and Discussion

The primary outcome of interest in this study, final round achieved, was ordinal. We therefore used ordinal logistic regression models to test the effect of predictors. To facilitate interpretation of ORs, we standardized all continuous predictor variables prior to fitting ordinal regression models.

Grit–S scores were associated more strongly with BFI Conscientiousness ($r = .70$, $p < .001$) than with Agreeableness ($r = .44$, $p < .001$), Neuroticism ($r = -.28$, $p < .001$), Openness to Experience ($r = .18$, $p = .02$), and Extraversion ($r = .12$, $p = .10$). Males did not score significantly differently from females, $t(188) = .86$, $p = .39$, $d = .12$. National spelling bee competitors who participated in the study were no more likely to reach higher rounds than were nonparticipating competitors, $B = -0.11$, OR = 0.89, $p = .67$. See Table 9 for correlations between the Grit–S and the other continuous measures in Study 6.

As expected, scores on the Grit–S completed prior to competition predicted the final round attained by participants. Specifically, participants who scored 1 *SD* higher on the Grit–S than same-aged peers were 38% more likely to advance to further

TABLE 9.—Summary statistics for National Spelling Bee finalists in Study 6.

Variable	*M*	*SD*	α	*r* With Grit
Grit	3.4	0.8	.82	—
Big Five dimensions				
Agreeableness	3.6	0.8	.84	.47*
Conscientiousness	3.5	0.8	.86	.77*
Extraversion	3.5	0.9	.84	.05
Neuroticism	2.7	0.8	.79	−.28*
Openness to experience	4.0	0.6	.68	.17*
Age	12.9	1.1		−.01
Lifetime spelling practice	986.4	1,668.3		.27[a]*
Previous National Spelling Bees	1.3	0.7		.21[b]*
Final round	3.2	2.5		.16[b]*

[a] Correlation between grit and natural log transformation of cumulative spelling practice.
[b] Spearman's rho correlation coefficient.
* $p < .05$.

rounds ($B = 0.32$, OR = 1.38, $p = .04$). Moreover, in a hierarchical ordinal logistic regression with age, Conscientiousness, Agreeableness, Extraversion, Neuroticism, and Openness to Experience entered in Step 1 and Grit–S scores added in Step 2, Grit–S was a significant predictor of final round attained over and beyond Step 1, $B = 0.55$, OR = 1.73, $p = .03$. See Table 10.

Grittier competitors outperformed their less gritty counterparts at least in part because they had accumulated more practice in spelling. We conducted two separate analyses that supported the hypotheses that the effect of grit on performance was mediated by (a) more accumulated lifetime spelling practice and (b) experience in more Scripps National Spelling Bee competitions. Three criteria must be met for a variable to be considered a mediator. The independent variable must predict the mediator, the independent variable must predict the dependent variable, and the mediator must predict the dependent variable when the independent variable is held constant. Following Baron and Kenny (1986), we established that Grit–S predicted final round in an ordinal logistic regression controlling for age (see previously). For the first mediation analysis, we conducted a simultaneous multiple regression with cumulative spelling practice as the dependent variable and age as a covariate. Grit–S was a significant predictor ($\beta = .27$, $p < .001$), whereas age ($\beta = .03$, $p = .65$) was not. Finally, in a simultaneous ordinal regression model predicting final round, cumulative spelling practice ($B = 1.20$, OR = 3.32, $p < .001$) was a significant predictor, but Grit–S ($B = 0.17$, OR = 1.19, $p = .32$) and age ($B = –0.17$, OR = 0.84, $p = .24$) were not.

We followed a similar procedure to show that experience in prior final competitions was also a mediator between grit and final round. Grit–S postdicted participation in prior National Spelling Bee final competitions. In an ordinal regression model with prior competitions as the dependent variable, Grit–S was a significant predictor controlling for age ($B = 0.53$, OR = 1.70, $p = .004$). Moreover, in a simultaneous ordinal logistic regression predicting final round, number of prior competitions ($B = 1.42$, OR = 4.14, $p < .001$) remained a significant covariate when age ($B = –0.20$, OR = 0.82, $p = .17$) was controlled, but Grit–S ($B = 0.14$, OR = 1.19, $p = .37$) did not.

TABLE 10.—Summary of simultaneous multiple ordinal logistic regression predicting National Spelling Bee final round in Study 6.

Variable	*B*	*SE B*	Odds Ratio (95% CI)	R^{2a}	χ^2
Step 1				.07	12.24
Age	−0.24	0.16	0.79 (0.57–1.09)		
Agreeableness	−0.27	0.19	0.76 (0.53–1.11)		
Conscientiousness	0.36	0.18	1.43 (0.99–2.07)		
Extraversion	−0.15	0.16	0.86 (0.63–1.18)		
Neuroticism	−0.15	0.17	0.86 (0.61–1.21)		
Openness to experience	−0.29	0.16	0.75 (0.55–1.02)		
Step 2				.09	17.07
Age	−0.20	0.16	0.82 (0.59–1.14)		
Agreeableness	−0.32	0.19	0.73 (0.50–1.06)		
Conscientiousness	−0.03	0.25	0.97 (0.58–1.61)		
Extraversion	−0.17	0.16	0.84 (0.61–1.16)		
Neuroticism	−0.13	0.17	0.88 (0.63–1.23)		
Openness to experience	−0.34	0.16	0.71* (0.52–0.97)		
Grit	0.55	0.26	1.73* (1.04–2.89)		

Note. *SE* = standard error; CI = confidence interval. $\Delta\chi^2 = 4.84$, $p = .03$.
[a] Nagelkerke R^2.
* $p < .05$.

GENERAL DISCUSSION

In this investigation, we developed and validated the Grit–S questionnaire, a more efficient measure of trait-level perseverance and passion for long-term goals. Confirmatory factor analyses supported a two-factor structure of the self-report version of Grit–S in which Consistency of Interest and Perseverance of Effort both loaded on grit as a second-order latent factor. Both factors showed adequate internal consistency and were strongly intercorrelated, $r = .59$, $p < .001$.

As shown in Table 11, differential associations with predicted outcomes provided evidence that these factors were distinct from each other. For example, Perseverance of Effort was a superior predictor of GPA, extracurricular activities, and (inversely) television watching among adolescents in Study 4. In contrast, Consistency of Interest was a better predictor (inversely) of career changes among adults in Study 1 and of final round attained among National Spelling Bee finalists in Study 6. Further, we found evidence that individuals may need both Perseverance of Effort and Consistency of Interest to succeed in the most demanding domains. The total Grit–S score was a better predictor of final round reached in the National Spelling Bee and retention among West Point cadets than was either factor alone. This pattern of findings supports the conceptualization of grit as a compound trait (Hough & Ones, 2002), although it is also possible that the superior predictive validity of the whole scale (compared to either subscale) is a consequence of its superior reliability.

Collectively, the studies summarized in Table 11 provide evidence for the predictive validity, consensual validity, and test–retest stability of the Grit–S questionnaire. In Study 2, grittier adults progressed farther in their education and made fewer career changes, controlling for age and BFI factors including Conscientiousness. In Study 3, correlations among self-report, peer report, and family member report Grit–S scores were medium to large, indicating that grit can be reliably assessed by informants. In Study 4, grittier adolescents earned higher GPAs and watched less television. In the same sample, the 1-year test–retest stability of the Grit–S ($r = .68$) compared favorably with Robins, Fraley, Roberts, and Trzesniewski (2001) finding that NEO Five-Factor Inventory (Costa & McCrae, 1992a) Conscientiousness scores correlate across 4 years at $r = .59$. In Study 5, grittier West Point cadets were less likely to drop out during their

TABLE 11.—Summary of criterion-related validity.

Sample	Design	Measure	% Variance in Success Explained: Grit–S	Perseverance of Effort	Consistency of Interest	Grit–O
Study 2: Adults aged 25 and older	Cross-sectional	Educational attainment	1.3[ab]	0.6[ab]	1.4[ab]	2.0[ab]
Study 2: Adults aged 25 and older	Cross-sectional	Career changes	1.3[ab]	0.2[ab]	2.0[abc]	1.5[ab]
Study 4: 7th- to 11th-grade students	Longitudinal (1 year)	GPA	8.9[a]	12.4[ac]	2.7[a]	7.9[a]
Study 4: 7th- to 11th-grade students	Longitudinal (1 year)	Hours watching television	5.9[a]	7.1[a]	2.6[a]	5.7[a]
Study 5: West Point cadets	Longitudinal (3 months)	Retention	7.8[b]	6.1[b]	5.2[b]	7.9[b]
Study 6: National Spelling Bee finalists	Longitudinal (1 month)	Final round	2.5[ab]	2.0[ab]	1.8[ab]	2.5[ab]

Note. Grit–S = Short Grit Scale; Grit–O = original 12-item self-report measure of grit.
[a]Controlling for age. [b]Percentage of variance estimated using Nagelkerke R^2. [c]In comparison with the other subscale, significantly stronger association with outcome according to a test for correlated correlation coefficients (Meng, Rosenthal, & Rubin, 1992).

first summer of training. In Study 6, grittier National Spelling Bee finalists were more likely to advance to further rounds than were their less gritty competitors, in part because they had accumulated more spelling practice. The prospective, longitudinal designs of Studies 4, 5, and 6 suggest that Grit–S drove the observed relationships with achievement rather than the other way around. Moreover, the majority of outcomes in this article were objectively measured, which effectively rules out the possibility of social desirability bias as an omitted third variable that accounts for these associations.

Limitations

We acknowledge several limitations of this investigation. First, it is possible that respondents answered positively to items on the Grit–S in anticipation of future achievement, in which case achievement would in fact be driving Grit–S scores even in a prospective longitudinal design. Against this possibility is the finding that in Study 2 and Study 6, Grit–S predicted outcomes over and beyond BFI Conscientiousness, another self-report measure that is susceptible to the same effects. Nevertheless, insofar as informants are less likely to be influenced by predictions of future achievement, multisource measurement of grit is preferable. For this reason, we validated an informant-report version of the Grit–S in Study 3. Future research into grit should employ both the self-report and informant-report versions of the Grit–S whenever feasible.

Participants in Studies 2 and 3 were largely female, possibly limiting the generalizability of the factor structure of the Grit–S. We found no significant gender differences in Grit–S scores, but because the confirmatory factor analysis was conducted using mostly women, the hierarchical structure of the Grit–S might not hold in more representative samples. However, this possibility seems unlikely given that this research confirmed a previously reported structure for grit (Duckworth et al., 2007) and that this structure was invariant between genders (see Study 2).

Because of time constraints, we were not able to administer the full NEO PI–R measure of the Big Five personality domains. Although the Grit–S predicted achievement outcomes over and beyond BFI Conscientiousness, fine-grained measures of the facets of Conscientiousness would have provided a more rigorous test of the incremental predictive validity of the Grit–S. Grit is similar to one Conscientiousness facet in particular, achievement striving, which is measured with items such as "I'm something of a 'workaholic'" and "I strive for excellence in everything I do" (Costa & McCrae, 1992a). We believe grit is distinct from achievement striving in grit's emphasis on long-term goals and persistence in the face of setbacks. However, further research is needed to determine the relationships between grit and other facets of Big Five Conscientiousness.

In Studies 2 and 3, we collected data using online surveys. The anonymity provided by the Internet prevents us from ensuring that we did not include any repeat responders. Although it is possible that some participants completed our survey twice by using different e-mail addresses to log on, there is no obvious incentive for them to have done so. Gosling, Vazire, Srivastava, and John (2004) reviewed evidence that questionnaires completed on the Internet demonstrate psychometric properties that are very similar to those of paper-and-pencil measures. Moreover, Internet samples tend to be more diverse than traditional samples.

An untested assumption of this investigation is that individuals in each study were actually invested in achieving the measured outcomes. For instance, we assumed that Spelling Bee finalists cared about winning the national competition and that West Point cadets wanted to stick through their first summer of training. Without explicitly assessing the goals of the participants in these studies, we cannot be sure how well the outcomes of interest mapped onto their personal objectives. In light of this limitation, it is more accurate to summarize these findings as evidence that grit predicts objectively measured achievement outcomes rather than outcomes of subjective importance.

Finally, an important conceptual question that should be addressed in further research concerns the domain specificity of grit. Like most personality measures, the Grit–S attempts to assess behaviors that are reasonably stable across time and situation. The implicit assumption is that the tendency to pursue long-term goals with passion and perseverance is relatively domain general, but of course, it is possible that an individual shows tremendous grit in her or his professional life but none at all in her or his personal relationships. Similarly, it may be that an individual sees oneself as gritty with respect to a serious hobby but not with respect to one's career. In these cases, how would these individuals answer the Grit–S items? Our intuition is that respondents integrate behavior over domains, but we cannot be sure. Future studies are needed to explore the domain-specific versus domain-general aspects of grit. One step in this direction would be to ask respondents to answer items separately with respect to particular contexts.

Conclusion

In sum, this investigation presents the Grit–S, a more efficient measure of grit. The 8-item Grit–S is both shorter and psychometrically stronger than the 12-item Grit–O. In confirmatory factor analyses, the Grit–S fit the data better than did that of the Grit–O. Moreover, the reduction of items from the Grit–O to the Grit–S does not come at the expense of predictive validity. Given its superior psychometric properties, comparable predictive validity, and fewer items relative to the Grit–O, we recommend the Grit–S as an economical measure of perseverance and passion for long-term goals.

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