

Associations Between Grit, Sustainable Behavior, and Emotional Well-Being

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Abstract

This paper investigated the impact of grit on sustainable behavior and emotional well-being. A questionnaire about grit, sustainable behavior, and emotional well-being was administered to 273 undergraduate students in South Korea. To examine the association between the variables, this study used two spell out (SEM) comparison models. The results show that grit is positively related to sustainable behavior and emotional well-being. The effect of grit on emotional well-being was mediated by sustainable behavior. The effect of grit is higher on sustainable behavior than emotional well-being. In addition, sustainable behavior has a positive relationship to emotional well-being. The results show that the grit has an important implication for sustainable environment education and individual well-being.

Keywords: grit, sustainable behavior, emotional well-being, spell out models, SEM

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Recently, a non-cognitive construct known as grit has gained much attention. Non-cognitive traits can affect success or happiness (Tough, 2012) and also, they have a high variability and can lead to desirable outcomes through educational and environmental interventions (Thaler & Koval, 2015). The concept of grit is meaningful because it is an important indicator of a person's success or performance. The elements of grit have been identified as growth, resilience, intrinsic motivation, and tenacity (Duckworth, 2016). Previous research shows that grit predicts a student's academic performance (Rimfeld et al., 2016; Duckworth & Quinn, 2009) and happiness orientation (Culin et al., 2014). Furthermore, student retention was predicted by grit (Eskreis-Winkler et al., 2014). Grit does not simply refer to resilience against failure. It also refers to an individual's tenacity in achieving a goal based on continuous effort.

Individuals with high grit better utilize their abilities and are less frustrated by failure or problems. These individuals were found to be more passionate about work requiring expertise (Duckworth et al., 2011). Challenging but well-structured work requires a high level of effort and patience (MacNamara et al., 2014). Thus, grit is an essential component of successful work that requires training or academic success. Grit has been proven to be a major predictor of success in various fields. Grit relates to everyday behavior (Ivcevic, & Brackett, 2014). Grit is needed to tolerate failure and to achieve goals in a highly uncertain environment. It is a factor that encompasses passion and effort.

Sustainable behavior also requires effort and perseverance. Sustainable behavior refers to continuous effort to protect humans and the earth's environment. To attain a sustainable future, we must behave sustainably no matter how hard it is to achieve this target. To foster sustainable behavior, we need sustained effort, like that exemplified by grit. A grittier person does not give up when faced with frustration and gives their best effort to accomplish a goal. These people demonstrate a high level of engagement and achievement (Suzuki et al., 2015).

Grit is also associated with emotional factors. MacCann and Roberts (2010) reported that grit is positively related to life satisfaction. In another study, grit had a positive relationship with emotional well-being (Salles et al., 2014). As shown here, grit leads to well-being and enhances meaning in life (Datu et al., 2016).

Grit is intimately related to an individual's behavior and well-being. Despite its growing importance, empirical studies on grit are still lacking. To develop a program to enhance grit, you first need to know its conceptual attributes. A comprehensive review of the relationship between variables affecting grit and those affected by grit is needed. In the present study, we aim to expand the scope of research on sustainability based on grit. Therefore, this research is designed to explore the relationship between grit, sustainable behavior, and emotional well-being. We also consider whether sustainable behavior is mediated by grit and emotional well-being.

Literature Review

Grit and Sustainable Behavior

Grit has two important factors. These are the perseverance of effort and consistency of interest. These two variables lead an individual to continuously strive for success even amid setbacks to their plan (Ericcson et al. 1993). Previous studies have found that grit is correlated with self-regulation and engagement (Christensen & Knezek, 2014; Wolters & Hussain, 2015). Such self-regulation conceptually overlaps with grit. In particular, effort-regulation is important to students' achievement (Pintrich & de Groot, 1990). Thus, grit is associated with self-regulation and sustained behavior.

Grit is self-control in striving for long-term passions and goals. The higher the grit, the more likely people are to set goals and work hard to achieve them. Those with high grit have high satisfaction delay and self-control (Duckworth et al., 2007; Duckworth & Quinn, 2009). Whenever preschool teachers experience a negative situation such as work stress, physical exhaustion, and psychological frustration that they experience while educating young children, grit is the psychological capacity to use as a springboard for rebounding (Lee et al., 2017).

Grit is a property that drives one to continuously engage in performance-oriented behaviors by controlling one's effort. Sustainable behavior also requires self-control. It is a set of actions to protect the environment (Corral-Verdugo et al., 2011). For example, it includes environmentally friendly behaviors sparing and protecting resources to protect the environment. Furthermore, it also includes altruistic and fair

behavior for the good of the community. All of these behaviors aim to promote a sustainable future. Previous studies also reported that effort regulation, engagement, self-control, and grit are mutually related (Costa & McCrae, 1992; Pintrich & de Groot, 1990; Wolters & Hussain, 2015).

Sustainable Behavior and Emotional Well-Being

People who engage in sustainable behavior consider others before themselves. They wish to allocate resources fairly (Choi, 2016). My previous study reported that sustainable behavior has a positive relationship with happiness (Choi, 2016). Also, sustainable behavior promotes subjective well-being (Corral-Verdugo et al., 2011; Fischer et al., 2012). For these reasons, sustainable behavior may be associated with emotional well-being.

Emotional well-being includes the presence of various emotions (Kahneman & Deaton, 2010). It is a positive state of mind and positive feelings. We experience various emotions every day. They could be positive or negative emotions. Experiencing high levels of positive emotion and low levels of negative emotion is closely linked to emotional well-being. For example, hope was positively related to life satisfaction (Valle et al., 2006). Positive emotions trigger one's emotional well-being (Fredrickson & Joiner, 2002). It is an important facet of satisfaction of life and quality of life. Previous research suggested that emotional well-being is stable over time (Diener et al., 1999).

Previous research also suggests a link between grit and emotional well-being. Salles et al. (2014) reported that grit had a relationship with emotional well-being. In that study, residents' working in hospital emotional well-being was related to grit. Grit has a direct and indirect relationship with emotional well-being. In addition, researchers suggest that self-control provides clues to the relationship between grit and well-being (Jin & Kim, 2017). For these reasons, emotional well-being may be associated with grit and sustainable behavior.

Purpose of This Research

This research aims to examine the relationship among grit, sustainable behavior, and emotional well-being in undergraduate students. I reviewed previous studies and decided to employ two spell-out (SEM) models. The models were developed as the result of previous studies. In these previous studies, it has been shown that

those with high grit have high self-control (Duckworth et al., 2007; Duckworth & Quinn, 2009). Sustainable behavior also requires self-control (Salanova et al., 2010; Costa & McCrae, 1992; Pintrich & de Groot, 1990; Wolters & Hussain, 2015). Sustainable behavior promotes subjective well-being (Corral-Verdugo et al., 2011; Fischer et al., 2012). Grit has a relationship with emotional well-being (Salles, Cohen, & Mueller, 2014). These studies have shown that grit, sustainable behavior, and emotional well-being were positively related.

Based on this assumption, two models were estimated. In Model 1, grit and emotional well-being are fully mediated by sustainable behavior. In Model 2, grit and emotional well-being are partially mediated by sustainable behavior. Also, this study tried to determine whether differences exist in the constructs by gender.

Methodology

Participants

The participants for this research were 273 undergraduate students from two universities in South Korea. While the sample is not a random national sample, it does contribute to existing research as a replication of previous research. Participants reported their age, gender, and year in school. They were recruited from different regions of South Korea. This study used a self-administered questionnaire for the assessment of grit, sustainable behavior, and emotional well-being. Out of 273 participants, 95 were male (34.8%) and 178 were female (65.2%). The participants included 102 (37.4%) first year students, 68 (24.9%) second year students, 56 (20.5%), third year students, and 47 (17.2%) fourth year students. The participants' mean age was 21.1 and the age range was 19 to 28.

Measures

A grit scale was used to test grit traits (Duckworth & Quinn, 2009). This scale yielded two factors, the first is composed of four consistency of interest items and the other factor has four perseverance of effort items. The grit scale assesses the ability to maintain interest and effort in daily tasks. Each item was scored 1 (never) to 5 (very often). High grit scores indicate more of each factor. The scale reliability was .60 and

it was a moderate level (Liston & Brouwer, 1996).

The sustainable behavior scale was used to assess an individual's sustainable behavior (Choi, 2016). This scale has three facets. It includes pro-environmental behavior, fairness, and altruistic behavior. The total number of items was 12. This scale measures the attitudes and behaviors towards a sustainable future. Items include: I save water, I take care of children, All humans have value. Each item was scored 1 (strongly disagree) to 5 (strongly agree). Higher scores indicate more of each factor. The reliability of this scale was .74.

Emotional well-being was measured using the emotional well-being scale (Yun & Choi, 2018). Emotional well-being has three dimensions: positive emotion, negative emotion, and life satisfaction. This scale consists of 16 items. Some of the items include; I feel good these days, I feel lonely, I am satisfied with my life. Each item was scored 1 (strongly disagree) to 5 (strongly agree). The reliability of this scale was .68

Data Analysis

To analyze the data, this study used factor analysis, independent t-tests, correlation analysis, and one-way analysis of variance. Model 1 and Model 2 were compared to find the best-fit model. To evaluate model fit, this study used fit indices. It includes the chi-square test (χ^2), χ^2/df , TLI (Tucker-Lewis Index), CFI (Comparative Fit Index), and RMSEA (root means the square error of approximation). CFI and TLI should be above .90 (Hu & Bentler, 1999). The RMSEA value of under .08 is suggested (Browne & Cudeck, 1993). And also, the fit of two models is compared statistically. Therefore, this study used model fit indices to consider parsimony and examined path coefficients to examine assumptions. The data were analyzed using SPSS 22.0. To estimate model fit, this study used Amos 18.0.

Results

Descriptive Statistics

Table 1 shows the descriptive statistics. This study has found no gender differences in grit, sustainable behavior, and emotional well-being. The emotional well-being mean score was higher than the other areas.

Table 1

Descriptive Statistics (N=273)

Variables	Male (M/SD)	Female (M/SD)	t
Grit	13.4 (2.7)	13.5 (2.5)	-.22
Sustainable behavior	15.2 (2.6)	15.4 (1.9)	-.47
Emotional well-being	16.1 (1.6)	15.9 (1.6)	1.2

Correlation coefficients are presented in Table 2. These three variables showed a positive linear relationship. The correlation coefficients of variables showed they were statistically significant. Grit was found to be most highly correlated with emotional well-being. This indicated that the strength of the association among variables was relatively high. The students scored highest on sustainable behavior (M=15.3; SD=2.2). Emotional well-being (M=15.1; SD=2.4), and grit (M=13.5; SD=2.6) followed. The factor loadings are shown in Table 3. Varimax rotation was examined. Three factors were identified and explained 51.6% of the total variance. These factors show Eigenvalues greater than 1.0. These three constructs are distinct.

Table 2

Correlation Between Variables (N=273)

Variables	Grit	Sustainable behavior	Emotional well-being
Grit	1		
Sustainable Behavior	.437**	1	
Emotional Well-Being	.598**	.591**	1
M	13.5	15.3	15.1
SD	2.6	2.2	2.4

** $p < .01$

Table 3

Factor Analysis (N=273)

Measure	Component	Factor 1	Factor2	Factor3
Grit	1	.839		
	2	.808		
	3	.658		
	4	.566		
Sustainable behavior	5		.713	
	6		.705	
	7		.693	
	8		.593	
Emotional well-being	9			.705
	10			.699
	11			.594
	12			.469
eigenvalues		3.518	1.494	1.207

Measurement Model

The measurement model was tested and estimated with maximum likelihood estimation. I evaluated the measurement model fit with these fit indices: χ^2 , χ^2/df , CFI, TLI, RMSEA. All four goodness of fit models showed that this measurement model has a good model fit. χ^2 was 96.657 ($p=0.001$). TLI was over .80 and CFI was over .90. RMSEA was under .70. The results are shown in Table 4.

Table 4

Measurement Model (N=273)

Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA
Measurement model	96.657	51	1.895	.900	.912	.057

*** $p < .001$

The Measurement model showed a good model fit: $\chi^2 = 96.657$ ($df = 51, p < .001$), standardized $\chi^2 = 1.895$, TLI = .900, CFI = .912). RMSEA was also found to be .057. Model fit indices showed an acceptable model fit in most criteria. Path coefficients were found to be significant ($p < .001$). These ranged from .53 to .59.

Mediation Model

This study estimated two models to examine the mediating effects. To do this, a hypothesis was developed: the effect of grit on emotional well-being is mediated by sustainable behavior. In Model 1, the effect of grit on emotional well-being was directly predicted. In Model 2, the effect of grit on emotional well-being was indirectly predicted. All relationships are mediated by sustainable behavior. The model fit of Model 1 showed acceptable fit ($\chi^2 = 96.657, \chi^2/df = 1.895, TLI = .900, CFI = .912, RMSEA = .05$). The model fit of Model 2 showed marginal fit ($\chi^2 = 105.468, df = 52, \chi^2/df = 2.028, TLI = .825, CFI = .862, RMSEA = .06$). The fit of Model 1 is better than the fit of the Model 2. The path coefficients should be at least .20 (Chin, 1998). The path between grit and sustainable behavior was .55, the path between sustainable behavior and emotional well-being was .30, and the path between grit and emotional well-being was .43 (see Table 6). After comparing the two models, Model 1 was selected to be the best model (see Table 5 and Table 6). In Table 6, standardized path coefficients are presented. All direct and indirect paths were significant ($p < .05$).

Table 5

Structural Model (N=273)

Model	χ^2	df	χ^2/df	TLI	CFI	RMSEA
Model 1	96.657	51	1.895	.900	.912	.05
Model 2	105.468***	52	2.028	.825	.862	.06

*** $p < .001$

Table 6

Standardized Path Coefficients (N=273)

Variables	β	S.E.	C.R.	p
Grit -> sustainable behavior	.55	.42	3.79	***
Sustainable behavior -> emotional well-being	.30	.07	2.51	*
Grit -> emotional well-being	.43	.24	2.93	**

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 7

Results of Effects (N=273)

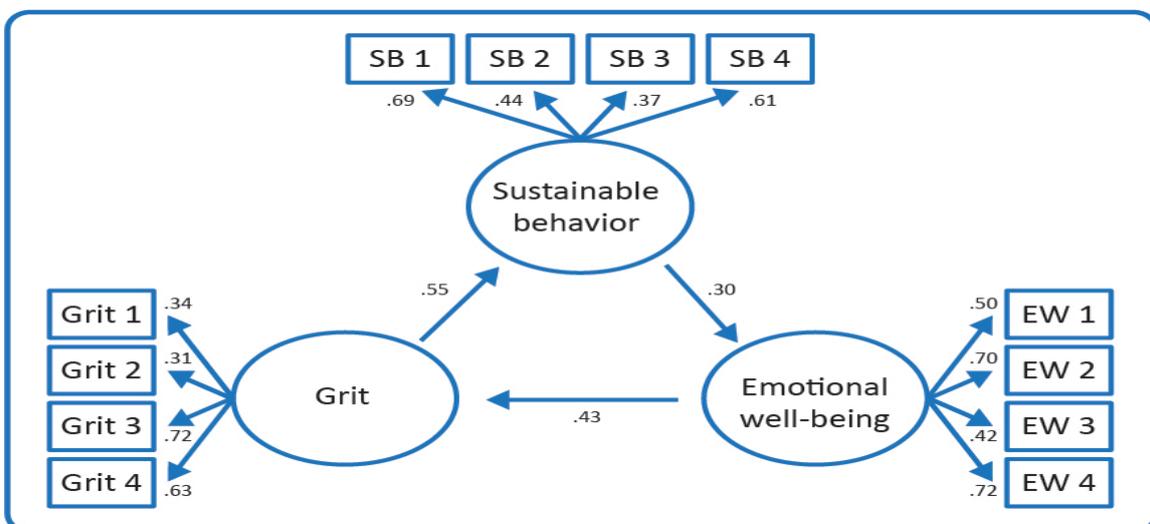
Variables	Direct effect	Indirect effect	Total effect
Grit -> sustainable behavior	.55***		.55***
Sustainable behavior -> emotional well-being	.30***		.30***
Grit -> emotional well-being	.43***	.16***	.59***

*** $p < .001$

Table 7 shows the effects of the variables. Direct, indirect and total effects were determined. Grit was directly related to sustainable behavior ($\beta = 0.55, p < .001$). Sustainable behavior was directly related to emotional well-being ($\beta = 0.30, p < .001$). Grit was directly associated with emotional well-being ($\beta = 0.43, p < .001$). The association between grit and emotional well-being was mediated by sustainable behavior ($\beta = 0.16, p = .001$). The total effect of grit on emotional well-being was confirmed ($\beta = 0.59, p < .001$). The results of direct, indirect and total effect are presented in Figure 1.

Figure 1

Final Structural Equation Model



Discussion

The current study examined the associations of grit, sustainable behavior, and emotional well-being. Two structural equation models were compared. Some of the findings of this study are as follows: (1) Grit was directly associated with sustainable behavior; (2) Sustainable behavior was directly associated with emotional well-being; (3) Grit was directly associated with emotional well-being; and (4) The association between grit and emotional well-being was mediated by sustainable behavior. The results support the hypothesis of this study that there is a positive relationship between grit, sustainable behavior, and emotional well-being.

The findings in this study are consistent with previous studies that claimed a positive relationship between grit and well-being (Salles et al., 2014; Corral-Verdugo et al., 2011; Fischer et al., 2012). And also, this study is consistent with previous research that positively presented the relationship between grit, sustainable behavior, and emotional well-being (Wolters & Hussain, 2015; Tapia-Fonllem, et al., 2017).

These findings suggest that grit and sustainable behavior are needed simultaneously to raise the level of emotional well-being. Grit and sustainable behavior can act as major energy sources to promote personal growth and well-being. In addition, there is no previous study that directly validates the mediating effects of sustainable behavior in the relationship between grit and emotional well-being. This study presents an empirical basis for college students' adaptation and success by revealing the relationship between grit, sustainability behavior, and emotional well-being

In this study, grittier students intended to have more sustainable behavior, and also have a higher level of emotional well-being. Students who engage in sustainable behavior were more likely to experience emotional well-being. These findings indicate that goal-driven behavior like grit and sustainable behavior is a major factor for emotional well-being. For a more sustainable future, people have to act with concern for the environment. People need to act in a manner that will protect the environment. Sustained effort and mindful attention might be required in order to monitor this outcome. This is the reason for our focus on grit. Grit may promote sustainable behavior through sustained effort. So then grit leads to success and well-being (Datu, Yuen, & Chen, 2018). Sustainable behavior refers to a purposeful activity (Zhao & Kuh,

2004). Goal-directed behavior implies dedication with enthusiasm. This means that it can enhance an individual's emotional well-being. We have learned about the positive function of grit and sustainable behavior, which can be used as a basis for developing programs to promote emotional well-being. This study could contribute to efforts to create a sustainable future.

Grit is not a fixed state but an ability to grow. Grit will serve as a psychological capacity for students to overcome difficulties such as stress, exhaustion, and psychological frustration. Reinforcement of curriculum and student guidance programs is necessary to sustain the goals set by college students. However, this study has limitations due to the internal reliability coefficients for the grit scale (.60), which were lower than the conventional rule for reliability (i.e. < .70). This study used Cronbach's α to test reliability. However, this index falls thin with the lower bound estimate of reliability (Von Culin et al., 2014). This means that the true score may be higher than previously reported. Future studies should include more items to test reliability and explore additional variables to extend their work. Further, grit predicts positive emotion (Hill et al., 2016). Therefore, the pathways of each direction may be changed. I suggest research that identifies the effects of grit on psychological well-being with various variables and research methods. These efforts will expand the influence of well-being and sustainable environment education.

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