Development of the Employee Grit (E-Grit) Measurement: Dimensionality, Convergent Validity, and Reliability

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ABSTRACT

Grit is a psychological concept that can explain the relationship between individual characteristics—such as intelligence and personality—and one's work performance. General life-domain grit measurements have been developed over the years. Specific life-domain grit measurements are essential because of individual differences in resource allocation among many aspects of life. The current study aimed to develop a context-specific measurement of work-employee grit—the Employee Grit (E-Grit) measurement—based on the Triarchic Model of Grit (TMG). Four hundred thirty-three full-time and part-time employees participated in this study to evaluate the psychometric properties of the new measurement, which initially consisted of 32 items. Quantitative item analysis produced 15 items to test for dimensionality using exploratory and confirmatory factor analysis. The results of the initial exploratory factor analysis suggested that the three-factor solution was the best fit for the construct. The confirmatory factor analysis results showed fit for both badness-of-fit criteria (χ^2/df, RMSEA, SRMR) and goodness-of-fit criteria (CFI and TLI). The three-correlated-factor model also provided a better fit compared to the one-factor or three-uncorrelated-factor models. The E-Grit measurement provided convergent validity by zero-order correlation and structural equation modeling that included the conscientiousness subscale of the Big Five Inventory. The overall coefficient of reliability of the E-Grit and the coefficients of each of its dimensions were categorized as acceptable according to the criteria. Thus, the employee grit measurement is a good new instrument that can be used to measure grit in the work context.

Keywords: grit, measurement, psychometrics.

1. INTRODUCTION

Most Human Resource (HR) management practices rely on the measurement of potential aspects (e.g., intelligence and personality testing) as the main indicators of decision-making (Gusdorf, 2008). Employees may display a level of intelligence or a personality trait that is considered suitable for a job, but there may be a difference in their work performance. A previous study suggested that intelligence and personality explained only 36% of the variation in employee performance (Schmidt & Hunter, 1998), which indicates that there are many psychological aspects of work performance. One of the many commonly

explored research interests is the noncognitive aspect of work performance: effort to achieve the best result.

Besides individual profiles, the success of employees and organizations depends on persistence—effort and perseverance to achieve goals. Passion is also key to maintaining interest in work. Both aspects are conceptualized as grit (Duckworth, Peterson, Matthews, & Kelly, 2007). Employees with these two aspects are expected to have the potential to become high-achievers and be able to provide the best results, even amidst difficulties. Innovation and the speed of changes among internal and external organizations also encourage employees to have high morale and work persistence. Furthermore, grit has been acknowledged as an important factor for learning— achievement, engagement, extra-role performance, and response to setbacks (Duckworth et al., 2007; Eskreis-Winkler, Shulman, Beal, & Duckworth, 2014; Ion, Mindu, & Gorbănescu, 2017; Reed, Schmitz, Baker, Nukui, & Epperly, 2012; Suzuki, Tamesue, Asahi, & Ishikawa, 2015).

The current challenge for HR management is to not only manage full-time employees but also part-time workers because of the current work trend, owing to the emergence of the gig economy, that allows part-time employees to take multiple jobs through technology intermediaries (Thompson, 2018; Stanford, 2017). The trend predicts that the full-time work arrangement will be significantly decreased and part-time workers will play a major role in the global labor market in 2020, therefore creating an urgent desire to prepare a part-time employee management plan (International Labor Organization,

2016; Intuit, 2010). However, work practice still distinguishes full-time workers from part-time workers (Clinebell & Clinebell, 2007). Consequently, it is necessary to provide an inclusive and objective evaluation of part-time employees. Gritty part-time workers can maximize themselves in terms of income and portfolio and maintain motivation to develop themselves in knowledge and skills within their pursued field of work. HR management can also benefit from grit evaluation among part-timers to prioritize those who provide high work output for available job opportunities.

Cormier, Dunn, and Dunn's (2019) study showed that there was a significant difference between general-domain and specific-domain (e.g., school and sport) grit measurements; specific-domain grit measurements provided more variation to grade point average (GPA) than global domain measurements. This finding suggested that the use of more specific and contextual domains to assess grit is better than general measurement. Nevertheless, a work-specific grit measurement has not yet been developed. The need for this measurement is also supported by a finding about limited personal resources— grit itself may not have a universal status in all aspects of life (Jordan, Ferris, Hochwarter, & Wright, 2019). Duckworth and Gross (2014) also mentioned that grit works best when passion in a certain life-domain drives achievement, which explains why successful people excel in certain areas of life as opposed to all. A specific work-contextual grit measurement is essential for HR to support management in developing and managing talent in an organization.

The objective of this study was to develop a new instrument to assess grit in the context of work, which can be used by HR management as a means to screen for employees with the potential to become high-grit performers and to support later career stages as well as to fill certain strategic positions that require persistence in certain work fields. This study also aimed to develop an inclusive grit measurement for full-time and part-time workers that can be expected to detect potential low-grit performers or a decrease in grit over a certain period, which would immediately be followed by an appropriate intervention.

2. LITERATURE REVIEW

2.1. Grit

Grit is a personality trait that explains consistent effort. It was further defined conceptually as "...perseverance and passion for long-term goals." (Duckworth Peterson, Matthews & Kelly, 2007, p. 1087). Therefore, grit is a noncognitive trait that describes the passion for a particular interest and the persistence of effort. Some studies showed that grit differs empirically from other psychological aspects that are conceptually related to it, i.e., conscientiousness, work ethic, need for achievement, industriousness, hardiness, and self-control (c.f. Duckworth et al., 2007; Jordan, Ferris, Hochwarter, & Wright, 2019; Meriac, Slifka, & LaBat, 2015).

The two initial dimensions of grit were consistency of interest and persistence of effort (Duckworth et al., 2007). Later, a third dimension was introduced—adaptability (Datu, Yuen, & Chen, 2017). The report serves as a

reference for the development from the previous grit measurements (Grit-O and Grit-S) by proposing a new grit measurement model known as the Triarchic Model of Grit (TMG). The TMG framework also aligns with the finding that suggests that the model is more suitable for collective culture but requires further testing in other countries (Datu, Yuen, & Chen, 2017). Hence, the current study would support this inquiry among the Indonesian population. The TMG framework was used in this study to create a new work-specific grit measurement—E-Grit.

2.2. Consistency of Interest

Consistency of interest is defined as "... the ability to stay focused and passionate about specific interests and goals for a long period of time" (Datu, Yuen, & Chen, 2017, p. 198). A person with consistent interest would show the ability to commit in a certain area of work for a long time (Credé, Tynan, & Harms, 2017). It is believed that culture has an influence in explaining the consistency of interest. However, it is not very valuable compared to the ability to adapt to situational demands in collective culture because of the flexibility and lack of consistency needs among collectivist societies (Heine, 2001; Suh, 2007).

2.3. Persistence of Effort

Datu, Yuen, and Chen (2017) described perseverance of effort as "...the tendency to maintain commitment and keep trying in difficult times..." (p. 198). Persistent people show commitment and perseverance in difficult times (Credé, Tynan, & Harms, 2017) and will put effort into completing tasks despite discouraging conditions. When faced with failure, they

display greater enthusiasm and put forth more effort to overcome it.

One explanation for the better variance of this aspect to describe grit is that it indicates more resilience to tasks that require relevance and meaning for the self rather than just seeking pleasure from work (Disabato, Goodman, & Kashdan, 2018). Individuals with high persistence of effort have directed goals, so they try new ways to achieve their desired goals and believe that their work will be beneficial.

2.4. Adaptability

The third dimension is adaptability to situations. Adaptability is defined as "...the ability of an individual to make adjustments effectively to changing conditions in life" (Datu, Yuen, and Chen, 2017, p. 198). The ability to adapt is characterized by expecting challenges, being flexible, accepting change, and showing confidence to overcome new difficulties (Datu, Yuen, and Chen, 2017). Adaptive individuals can develop strategies when faced with challenges at work, including goal disengagement management (Jordan, Ferris, Hochwarter, & Wright, 2019). This means that adaptability accommodates a person's capacity to overcome challenges in achieving goals, whereas consistency of interests and persistence of effort play major roles in the sustainability of long-term goals. This finding supports the argument that adaptability can fill the gap between the other aspects of grit, especially in the Southeast Asian population.

The study of adaptability as a grit dimension began with skepticism about the two-factor model from Duckworth et al. (2007). Datu, Yuen, and Chen (2017)

found inconsistencies in factors among different cultural populations, hence they proposed adaptability within the TMG framework. The same study cited the argument from Vignoles et al. (2016) that adaptability is related to the cultural self-construal theory, which implies that individuals show behavioral adjustments depending on social and situational contexts. A qualitative study also found that the ability to be flexible about challenges and the willingness to get out of difficulties becomes the key to explaining grit in collective culture (Datu, Yuen, & Chen, 2018). Validation of the TMG scale found that adaptability has a greater degree of correlation with persistence of effort compared to consistency of interest (Datu, Yuen, & Chen, 2017).

2.5. Overview of Existing Measurements

A study by Duckworth et.al. (2007) showed internal and test-retest consistency and also predictive validity for career changes in the development of the Grit-O. A shorter version, the Grit-S, consists of 8 items (initially 12) that are reliable and predictively valid based on various criteria, including conscientiousness, GPA, cadets' evaluation of the armed forces, and success in spelling bee competitions (Duckworth & Quinn, 2009).

Regarding factor inconsistencies in different cultural populations, Datu, Yuen, and Chen (2017) developed the Triarchic Model of Grit Scale (TMGS) that considers cultural contexts, especially in collective cultures. The TMGS was developed by testing an instrument on a sample of 350 students in the Philippines, which resulted in 11 items and was adequate in internal reliability, content

validity, structural validity, and criterion validity.

3. METHODS

3.1. Participants

A total of 433 full-time and part-time employees participated in this study. Their ages ranged from 18 to 62 years ($M = 28.06$, $SD = 7.80$). Most were women (53.81%), graduated high school or had equivalent education (49.65%), and currently work as full-time staff/individual contributors in a company or government agency (57.04%).

3.2. Preparation and Data Collection Procedure

Thirty-two items were constructed to form the item pool ("consistency of interest" dimension: 8 items; "persistence of effort" dimension: 11 items; "adaptability" dimension: 13 items). Each item was measured using a five-point Likert scale, ranging from 1 (very unlikely) to 5 (very likely). The items were reviewed qualitatively by 10 employees to assess readability. As a result, general comments showed that both the instructions and the items were easily understood and 9 items were revised to increase the quality of the items.

Data collection was conducted through both online and face-to-face methods. Face-to-face data collection from 24 participants was performed by distributing questionnaire booklets to a private company in Central Jakarta. Online data was collected from 409 employees who completed Google Forms (http://bit.ly/karyawan-tekun).

3.3. Data Analysis

The development procedure of the E-Grit measure began with item selection based on common psychometric criteria. Exploratory and confirmatory factor analysis was conducted to assess structural validity. The conscientiousness dimension from the Big Five Inventory (BFI) was added to the measurement model for evaluation of convergent validity. Two datasets were prepared from all participants' data points. The first dataset ($n = 250$) was used to conduct item analysis and exploratory factor analysis, whereas the second ($n = 188$) was used to conduct confirmatory factor analysis. An inter-item consistency analysis was conducted to assert the reliability of the measurement for both datasets.

3.4. Item Analysis

Integrative item analysis was conducted using four quantitative criteria to determine the status of the items (eliminated or maintained): corrected item-total correlation (CrIT) and Mann-Whitney U statistic (main criteria), kurtosis, and skewness. Previous literature mentioned that a value of 0.3 is a benchmark for CrIT item discrimination, and items with a CrIT value below 0.2 should be removed from the measurement (Coaley, 2010). CrIT was chosen as one of the main criteria because of its indication of item homogeneity in measuring a construct or dimension. For multidimensional measurements, Netemeyer, Bearden, and Sharma (2003) suggested that the total score of each (intended) dimension should be used as a reference for item performance.

The Mann-Whitney test is a nonparametric statistical analysis that is equivalent to the independent sample *t*-test, which functions as the analysis of mean score differences between groups

(Dancey & Reidy, 2017). A nonparametric test was used as the criterion to detect differentiation of item performance for full-time and part-time employees because of the non-normal item score distribution (Shapiro-Wilk $p < 0.001$). A significant result ($p < 0.05$) of this analysis implies that there is a distinction of item performance between full-time and part-time employees. Hence, the item should be eliminated.

Kurtosis and skewness were secondary criteria for item analysis to discern the tendency of the extreme responses. They can be used to detect non-normality in a distribution with the tendency to answer items at one extreme of the scale as evidence. Kim (2013) suggested the value of 3.29 as the benchmark for skewness and kurtosis normality for a study that has a maximum of 300 participants.

3.5. *Validity*

The validity claim of this measurement was supported by testing the structural and convergent validity. The structural validity of this measurement was evaluated by dimension, using exploratory and confirmatory factor analysis. Exploratory factor analysis was conducted to determine the factor structure of the current measurement, in which two assumptions were assessed: Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy and Bartlett's test of sphericity. Field (2009) recommended that KMO must be above 0.5 and Bartlett's test must be statistically significant to support the assumptions for exploratory factor analysis. Factor extraction was conducted with parallel analysis to provide a better estimate of the number of factors than the vaguely

sourced Kaiser's eigenvalue criteria (Fabrigar & Wegner, 2012). In addition, a scree plot was used to determine the number of factors. The number of factors was determined using Promax rotation because of the previous claim regarding the TMG that each of the grit dimensions were correlated with each other (Datu, Yuen, & Chen, 2017). Items with minimum factor loadings of 0.40 were retained (Stevens, 2002).

The criteria used to confirm the fit of the empirical data with the TMG model were the ratio of the chi-square values with degrees of freedom (χ^2/df), comparative fit index (CFI), Tucker–Lewis index (TLI), root mean square error of approximation (RMSEA), and standardized root mean square residual (SRMR). The data and the model fit if the following criteria were met: χ^2/df < 3, CFI and TLI ≥ 0.90, RMSEA and SRMR ≤ 0.08 (Hu & Bentler, 1999; Schultz, Whitney, & Zickar, 2014; Steiger, 2000; Tabachnick & Fidell, 2007).

In addition, the measurement's convergent validity was tested by zero-order correlation and structural equation modeling, which includes the conscientiousness subscale from the adapted version of the BFI. The BFI has been linguistically and culturally adapted and has been tested for validity using confirmatory factor analysis and is internally consistent, measuring the personality facets of the Big Five personality theory (Ramdhani, 2012). The comparison scale consists of six items. A similar procedure was used in the development of the Grit-O (Duckworth, Peterson, Matthews, & Kelly, 2007). Although some of the psychometric literature suggests evaluation of

convergent-and-discriminant validity, Furr (2011) mentioned that evidence of convergent validity takes precedence because of the need to claim that the constructed measurement relates to relevant concepts or nomological networks.

3.6. Reliability

This study used a single-trial administration approach to testing the internal consistency. Cronbach's alpha and McDonald's omega coefficients were the two results of internal consistency testing used. McDonald's omega coefficient was included as a reliability coefficient to compensate for the tau-equivalent model assumption of Cronbach's alpha, which assumes that all items have the same average value and loading factor (Bandalos, 2018).

Cronbach's alpha and McDonald's omega coefficients were calculated from the final item set after confirmatory factor analysis was performed. The current study used the value 0.6 as the limit to determine the reliability of the E-Grit measurement as it is sufficient as a benchmark for internal consistency testing for social or psychological measurements (Ghozali, 2018). Furthermore, a reliability coefficient valued at 0.5–0.7 is considered to be moderate and acceptable for behavioral measurements (Hinton, Brownlow, McMurray, & Cozens, 2004). Coaley (2010) recommended that the number of participants used to test the internal reliability must be greater than 100 to achieve a stable reliability coefficient.

3.7. Statistical Analysis

All statistical analyses were performed with JASP software version 0.10 (JASP Team, 2019).

4. RESULTS

The participants for the item analysis and the exploratory factor analysis ($n = 250$) were mostly women (52.4%) and worked as full-time staff/individual contributors (48.40%). In this stage, the participants' ages ranged from 18 to 62 years ($M = 27.88$, $SD = 8.41$). An initial quantitative item analysis was conducted to determine which items would be included in the E-Grit scale. In the 32-item pool, there were 17 items that did not fulfill the two criteria and were eliminated from further analysis. All 15 remaining items met the kurtosis (-1.107 to 0.179) and skewness (-0.829 to 2.88) criteria and were further analyzed using exploratory factor analysis to investigate dimensionality.

Table 1. Corrected total-item correlation

Criteria	Item number	Total items	CrIT Range
CrIT < 0.3	**Consistency of Interest**: 5, 7, 8	7	0.110 - 0.198
	Persistence of Effort: 2, 11		0.121 - 0.150
	Adaptability: 4, 10		0.106 - 0.166

Table 2. Mann-Whitney statistics

Criteria	Item number	Total items	W range	p value
$P < 0.05$	**Consistency of Interest**: 8 **Persistence of Effort**: 5, 6, 9, 11 **Adaptability**: 1, 2, 3, 8, 9, 12, 13	12	9,365.5 6,255.5 – 8,890 5,859 – 10,432	< 0.001 0.008 – 0.024 < 0,001 - 0,029

The KMO value was 0.796, indicating that the dataset appeared to be adequately sampled for exploratory factor analysis. Bartlett's test of sphericity result showed that there was a pattern in the correlation matrix (χ^2 (105) = 824.923, $p < 0.001$). The initial results from the exploratory factor analysis generated a five-factor solution. Eigenvalues scores for each factor were 4.110, 1.461, 1.280, 1.099, and 1.006, respectively. Together, these factors explained 41.13% of the variance in the grit scores. Two factors were removed from further analysis because each factor only consisted of one item, leaving a three-factor model for further investigation. This model explained 34.68% of the variance in the grit scores. Figure 1 displays a scree plot of the exploratory factor analysis result, which implies support for the three-factor model because the fourth and fifth factors were close to the simulated data. The first factor consisted of items that measured persistence of effort, the second assessed consistency of interest, and the third represented items regarding adaptability to situations. Internal consistency evaluation showed that each dimension and aggregate measurement of E-Grit had met the criteria (Ghozali, 2018; Hinton, Brownlow, McMurray, & Cozens, 2004). Cronbach's alpha reliability coefficients of each subscale yielded the following results: $\alpha_{perseverance} = 0.709$ ($\omega = 0.721$); $\alpha_{consistency} = 0.683$ ($\omega = 0.685$); $\alpha_{adaptability} = 0.655$ ($\omega = 0.665$).

The participants for the confirmatory factor analysis ($n = 183$) were mostly women (55.7%), were aged 18–54 years ($M = 28.31$, $SD = 6.90$), and worked as full-time staff/individual contributors (68.31%). The confirmatory factor analysis with the three-correlated-factor model was performed to test the TMG model with empirical data. The analysis used robust error estimation owing to the non-normal distribution of the item scores in each dimension, as this is recommended in cases of non-normal data distributions because it provides better error estimates than standard estimates (Bandalos, 2018). The analysis of the 15 items provided results that met the standards of both the badness-of-fit and the goodness-of-fit criteria (χ^2 (32) = 60.042, $p = 0.002$, $\chi^2/df = 1.87$, RMSEA = 0.069, SRMR = 0.075, CFI = 0.931, TLI = 0.903). The value of "alpha if item deleted" for each item was also less than the initial reliability coefficient when analyzed per dimension or in total, suggesting no need to eliminate the final items. The Cronbach's alpha reliability coefficients of each subscale yielded the following results: $\alpha_{perseverance} = 0.727$ ($\omega = 0.732$); $\alpha_{consistency} = 0.739$ ($\omega = 0.747$); $\alpha_{adaptability} = 0.650$ ($\omega = 0.663$). Relative to the previous analysis, the results from the current dataset provided a higher internal consistency estimate for the consistency of interest dimension.
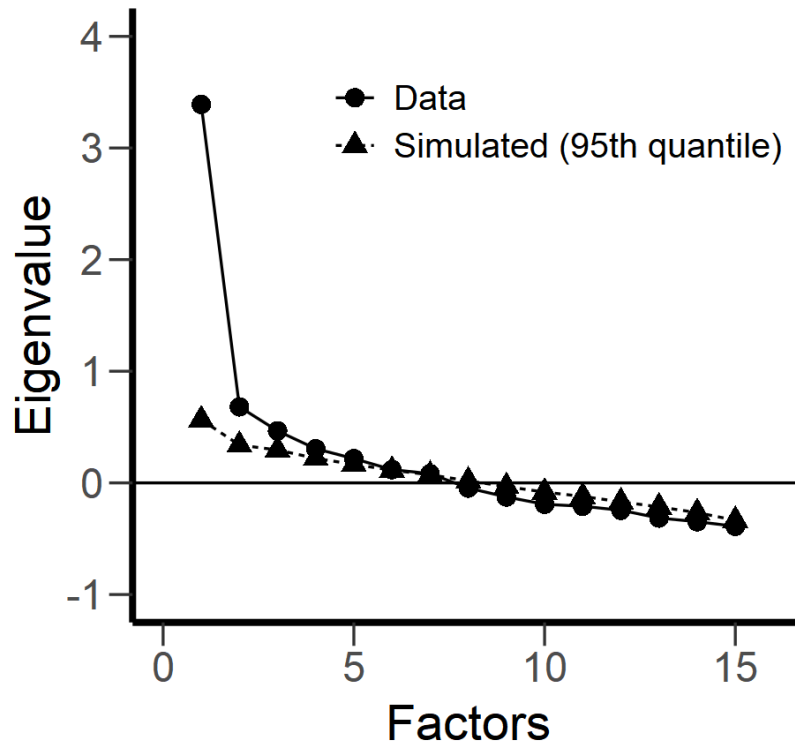
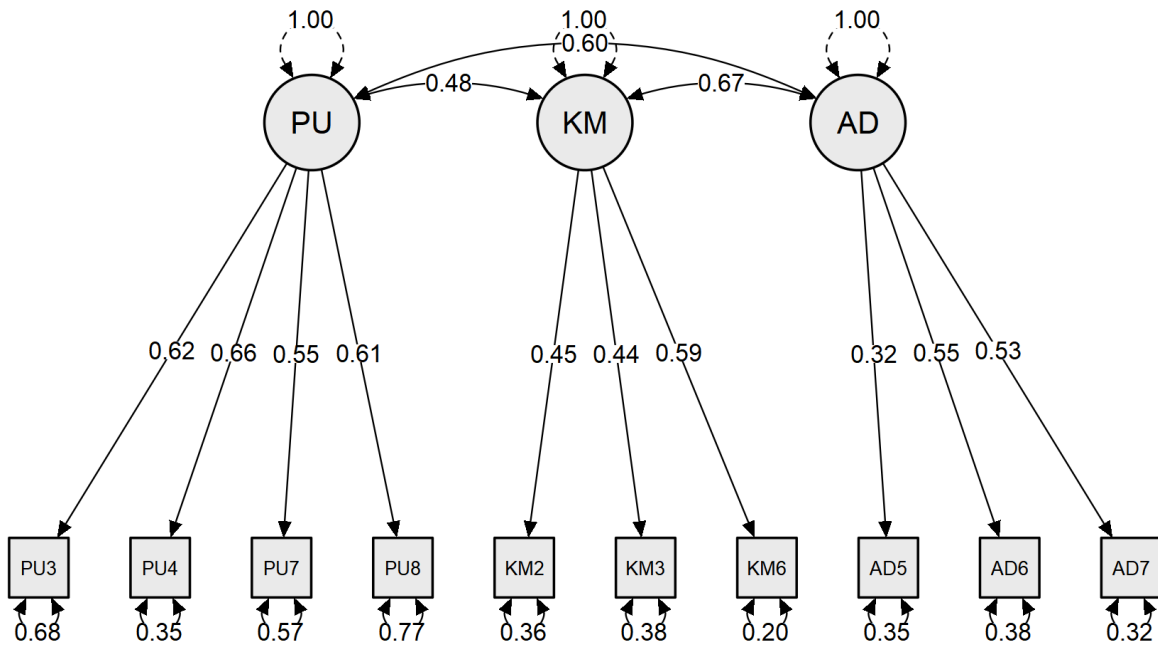Figure 1. Scree plot of exploratory factor analysis result

Figure 2. Confirmatory factor analysis result of three-correlated-factor model Employee Grit Scale. PU = Persistence of effort, KM = Consistency of interest, AD = Adaptability

Table 3. Initial Factor Structure of Employee Grit

Item	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
KM1					0.677
KM2		0.490			
KM3		0.743			
KM4					
KM6		0.688			
PU1					
PU3	0.470				
PU4	0.690				
PU7	0.614				
PU8	0.515				
PU10					
AD5			0.772		
AD6			0.688		
AD7			0.405		
AD11				0.742	

KM = Consistency of interest, PU = Persistence of effort, AD = Adaptability. Empty cells indicate that the respective item has a loading factor below 0.4

To strengthen the validity, claim of the three-correlated-factor model, confirmatory factor analysis was reconducted by comparing the model with the one-factor and the three-uncorrelated-factor models. Testing of grit as a higher-order construct provided similar results to the three-correlated-factor model. This is similar to Muenks, Wigfield, Yang, and O'Neal's (2017) finding when examining the factor structure and predictive validity of the Grit-S in high school and university students. Testing of the bifactor model resulted in a non-convergent model. Based on the model testing, the empirical data showed that the greatest fit was with the three-correlated-factor model compared to the one-factor and the three-uncorrelated-factor models. A significant chi-square value was unavoidable because of the sensitivity to the number of samples (Bandalos, 2018).

Table 4. Evaluation of the TMG model

Model type	χ^2	*df*	*P*	CFI	TLI	RMSEA (90% CI)	SRMR
One-factor	138.357	35	<0.001	0.746	0.674	0.127 (0.105–0.150)	0.089
Three-Uncorrelated-Factors	138.720	35	<0.001	0.748	0.676	0.127 (0,105–0,149)	0.188
Three-Correlated-Factors	60.042	32	0.002	0.931	0.903	0,069 (0,041– 0,096)	0.056

A Spearman rank correlation (ρ) was performed because of the non-normal distribution of all three dimensions, total E-Grit score, and conscientiousness subscale score (Shapiro-Wilk $p < 0.05$). The results of the analysis showed that all dimension scores and the total E-Grit score correlated significantly with conscientiousness, implying that the E-Grit measurement holds convergent validity and is able to measure the construct. The variance of conscientiousness that the E-Grit measurement could explain was 31%.

The testing of convergent validity was performed using structural equation modeling that included conscientiousness within the higher-factor model. Although decreasing in number, the model that included conscientiousness still met the badness-of-fit criteria (χ^2 (98) = 180.367, $p < 0.001$, χ^2 /df = 1.84, RMSEA = 0.068, SRMR = 0.058) and one of the goodness-of-fit criteria (CFI = 0.912). TLI as the other goodness-of-fit criterion was less than the standard (0.893). The standard estimate of correlation between conscientiousness and consistency of interest, persistence of effort, and adaptability was reported to be 0.462, 0.920, and 0.682, respectively.

Table 5. Employee grit factors and total score correlation with conscientiousness

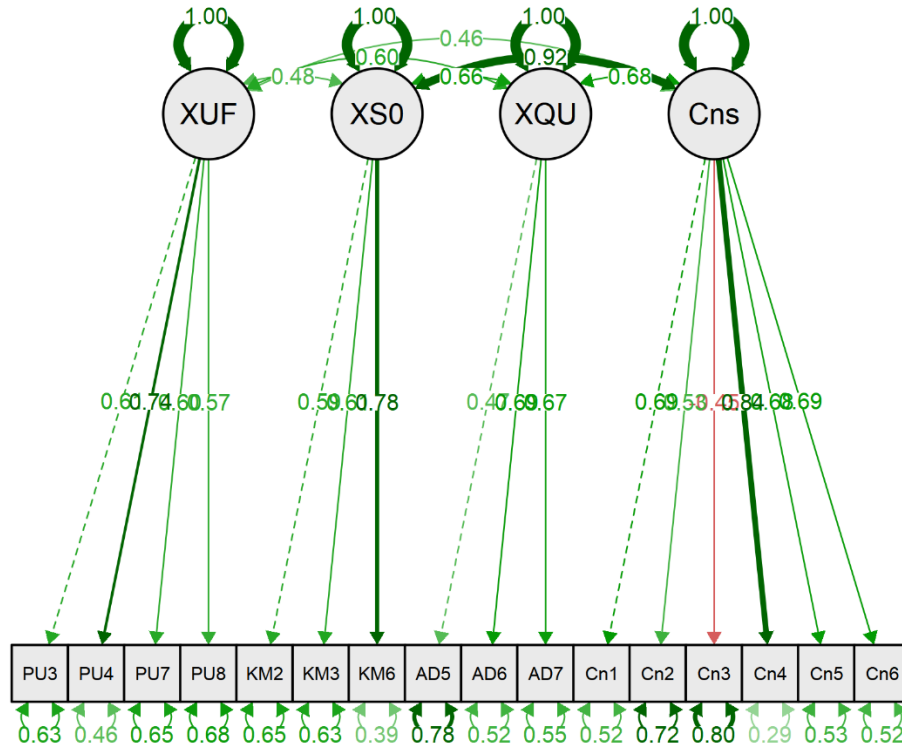|	*Spearman ρ*	r^2
Consistency of Interest	0.639***	0.479
Persistence of Effort	0.343***	0.118
Adaptability	0.454***	0.206
Employee Grit	0.557***	0.310

***$p < 0.01$, *one-tailed*

Figure 3. Structural equation modeling result of the three-correlated-factor model Employee Grit Scale and Conscientiousness scale. XUF / PU = Persistence of effort, XSO / KM = Consistency of interest, XQU / AD = Adaptability, Cns = Conscientiousness

To ensure nonsignificant differences of each dimension and the total score of the E-Grit between groups of full-time and part-time employees, a Mann–Whitney U statistical analysis was conducted. The results provided support that there were no significant differences in the four scores between full-time and part-time employees.

Table 6. Mean difference of employee grit and its factors between full-time and part-time employees

Variable	*Mann–Whitney U statistic*	*p*
Consistency of Interest	722	0.179
Persistence of Effort	1,261	0.063
Adaptability	943	0.988
Employee Grit	1,043	0.570

5. DISCUSSION

The current study aimed to develop a new specific work-context grit measurement for employees. The need for a domain-specific measurement of grit at work comes from the restriction of personal resources and passion in specific life domains that drive achievement

(Duckworth & Gross, 2014; Jordan, Ferris, Hochwarter, & Wright, 2019). The E-Grit measurement is also intended as an inclusive screening instrument for both full-time and part-time workers. As the contribution of part-time employees becomes increasingly significant in the global economy, it is expected that this measurement can be a non-discriminatory evaluation tool for workers.

The results generally provide support for the TMG model (Datu, Yuen, and Chen, 2017). Besides the consistency of interest and persistence of effort dimensions, the model adds adaptability as another dimension. Grit assessed using only the two initial factors has its downsides, such as a reluctance to change actions when plans or actions are predicted to fail or have failed (Alaoui & Fons-Rosen, 2016). With adaptability, gritty individuals are expected to adjust themselves and work effectively so that goals can be achieved.

Although some conditions of a good-fit model (CFI and TLI ≥ 0.95) were not met, the results of the analysis showed that the empirical data was in acceptable-fit categories to the model. Convergent validation was performed by correlating the new work-related grit instrument to the conscientiousness subscale of the BFI. The results showed that the dimensions of adaptability, consistency of interest, persistence of effort, and aggregate employee grit correlated significantly with conscientiousness. Although the E-Grit scale provided a lower correlation coefficient than previous grit measurements, this study finding corroborates a theoretical relationship (nomological network) between grit and

conscientiousness as two adjacent but not identical concepts.

The ages of the participants in this study were quite diverse, which is an inevitable consequence of using the online method for data intake. Maniaci and Rogge (2014) mentioned that an advantage of using the online research method is diverse population outreach; however, representation of the population becomes questionable. Senior participants who took part in this study might be representative of the senior workforce population. Nevertheless, their contributions in this study provided a variation of workforce age and became proof that internet use is not only a domain of the productive-age workforce.

6. CONCLUSION

The E-Grit scale has provided evidence to support the TMG framework, its internal consistency, and its relation to conscientiousness. A limitation of the validity testing in this study was that the final item set only consists of favorable items. Although this may trigger questions about the balance between favorable and unfavorable items, it may not become an important concern. In addition, Barnette (2000) argued that unfavorable items can reduce the reliability of a measurement after being reverse scored and could potentially add factors or dimensions that only contain unfavorable items. Variance also explains that positively or negatively worded items will group naturally before grouping items based on factors or dimensions (Bandalos, 2018). A similar concern regarding favorable vs. unfavorable items was also associated with Marsh's (1996) finding that negatively worded items on

the self-esteem scale loaded an artificial factor that was not necessary to theoretical building. Thus, unfavorable items have the potential to reduce the purity of the factor analysis results.

Further studies can consider the use of a multitrait-multimethod matrix (MTMM) to strengthen the claim of the validity of this measurement and simultaneously assess discriminant validity by comparing the E-Grit scale to other measurements that are conceptually distinct from grit. Convergent validity can also be strengthened by non-self-report measurements such as performance appraisal or performance rating from superiors.

The reliability evaluation provided satisfactory results, implying that the E-Grit measurement was internally consistent in measuring the concept and its dimensions. Although the adaptability subscale had not fulfilled the common standard of the single-administration procedure to assess reliability ($\alpha \geq 0.7$), the current measurement met the standard for initial development. Using the single-administration procedure to assess the reliability of an instrument has its own liabilities, i.e., the inability to detect consistency between time periods. Future research may consider the double-administration procedure to assess test-retest reliability. Intertemporal reliability evaluation also provides an opportunity not only to check the quality of the measurements, but also to appraise intervention for improving employee tenacity.

Further studies may also consider the utility aspects. Jordan, Wihler, Hochwarter, and Ferris (2019) provided a thorough explanation of grit benefits at work, ranging from recruitment and selection, learning and development, and performance appraisal to talent management and the succession planning process. As Kaplan and Norton (2004, p. 6) said, "...if you can measure it, you can manage it"; further research of the E-Grit measurement might consider a larger number of more representative participants to create an empirical norm for determining whether an employee has a considerable degree of grit for their job or not.

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