Developing and Validating Pre-Service EFL Teachers' Grit Scale: Evidence from Indonesia

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Abstract

Background: Training to become an English teacher can be challenging for pre-service non-native English language teachers. In L2 English settings, they need to play a unique dual role as L2 teachers-in-training and L2 learners. Unlike trainees in other subjects, EFL teacher trainees use the target language they are still learning as the medium of instruction. Grit, a positive psychology concept referring to passion and perseverance, may help explain their perseverance and passion to become future EFL teachers. However, a specific grit scale to measure pre-service EFL teachers' grit is still unavailable.

Objective: The purpose of the present study is to develop and validate a pre-service EFL teachers' (PET) grit scale. The scale was designed to measure pre-service EFL teachers' grit to become English language teachers.

Methods: To develop and validate the scale, an Exploratory Factor Analysis (EFA) (n = 117) and a Confirmatory Factor Analysis (CFA) (n = 149) were conducted. Participants were final year pre-service EFL teachers in a private teacher training institution in Indonesia.

Findings: The self-report questionnaire comprised 11 items which were categorized into three subscales: passion for professional development, perseverance for professional development, and determination to become English teachers. The results indicated that the scale demonstrated moderate fit indices (RMSEA = .081; CFI = .92; TLI = .89; SRMR = .079, RNI = .92) with a chi-square value of χ^2 = 81.077 (df = 41). Furthermore, the empirical findings suggested that the newly designed instrument was valid and reliable (ω = 0.81; α = 0.80) for measuring pre-service EFL teachers' grit.

Conclusion: The present study provides a valid and reliable measurement tool to evaluate the success of pedagogical interventions targeting grit among pre-service EFL teachers. For example, the scale can be utilized to identify pre-service EFL teachers who may need additional support to sustain their grit during challenging phases (e.g., teaching practicum, early stages of teacher training), thus enabling targeted interventions aimed at improving their grit levels. PET-Grit which can help improve teacher training programs and contribute to the growing body of

research in this area. Theoretically, the present study highlights the complexity of pre-service EFL teachers' dual roles as both L2 learners and future L2 teachers, demonstrating that grit manifestation is culturally and contextually sensitive, thereby supporting the need for context-sensitive psychological constructs in applied linguistics.

Keywords: EFA, CFA, grit, pre-service EFL teachers, scale development

Introduction

Recent decades have witnessed a substantial proliferation of research on non-cognitive factors influencing educational outcomes in second/foreign language (henceforth, L2) learning contexts. These non-cognitice factors include various positive psychology constructs, such as well-being (Nazari & Alizadeh Oghyanous, 2021), enjoyment (Khajavy & Aghaee, 2022; Shirvan, Taherian et al., 2021), growth mindset (Hejazi et al., 2024; Khajavy et al., 2021; Soleimanzadeh et al., 2024), and grit (Teimouri et al., 2022; Sun & Wang, 2024) have been studied in L2 field. This growing interest in positive psychology constructs has facilitated a more comprehensive understanding of L2 related challenges, ultimately supporting both learners and teachers to flourish (MacIntyre, 2016).

Among these positive psychology constructs, grit has gained significant attention in applied linguistics (i.e., Alamer, 2021; Khajavy et al., 2021; Sudina, Brown, et al., 2021; Teimouri et al., 2021). Originally studied in psychological research, grit is conceptualized as "perseverance and passion for long-term goals" (Duckworth & Quinn, 2009, p. 9). Within this conceptualization, the ultimate concern, representing the highest long-term aspiration, relates to success, achievement, and performance (Oxford & Khajavy, 2021).

Despite the extensive research on grit, pre-service English as a Foreign Language (EFL) teachers' grit remains largely unexplored. Previous studies have primarily focused on either in-service L2 teachers' grit or L2 learners' grit, with specific scales developed to measure L2 grit (e.g., Alamer, 2021; Teimouri et al., 2022) and teacher grit (e.g., Soleimanzadeh, et al., 2024; Sudina, Vernon et al., 2021). However, these existing scales may not adequately capture the unique duality of pre-service EFL teachers' roles in foreign language settings and the specific grit they require to navigate their distinctive challenges.

Pre-service EFL teachers face a two-fold challenge that distinguishes their experience. Firstly, unlike experienced L2 teachers with established L2 proficiency and pedagogical skills, pre-service teachers simultaneously develop their target language competence while learning to

teach it (Zhang & Huang, 2024). This transitional role presents additional complexities as they construct their professional identity (Lestari et al., 2024) while managing multifaceted relationships with mentors, students, and supervisors (Richards, 2023).

Secondly, in foreign language contexts, these teacher-trainees must consistently demonstrate L2 proficiency and deliver instruction in English (Zein, 2022), a requirement stemming from English as a Medium of Instruction (EMI) policies in non-native English settings (Dzormeku et al., 2024; Hamid et al., 2015). This expectation creates heightened pressure, as even minor language inaccuracies can be perceived as significant shortcomings by their students (Hoang & Wyatt, 2021). These complex circumstances present unique challenges that pre-service teachers of other subjects or those in L1 and second language contexts may not encounter. Consequently, the dual role of both L2 teacher and L2 learner necessitates a distinct form of grit that enables pre-service EFL teachers in pursuing an EFL teaching career. As specific instruments to measure this unique form of grit remain unavailable, the present study focuses on developing and validating a pre-service EFL teachers' grit scale.

Furthermore, developing a pre-service EFL teachers' grit scale specifically situated in the Indonesian context aligns with calls in the literature for research on domain-specific grit (Teimouri et al., 2021) and studies beyond Western, educated, industrialized, rich, and democratic settings (Datu, 2021). Indonesia, an EFL country where pre-service teachers encounter various contextual challenges, offers insights from an underrepresented cultural perspective. This perspective can particularly be valuable, considering that grit manifestations are culturally sensitive (Datu et al., 2017).

Therefore, to develop a valid and reliable instrument specifically designed in Indonesian EFL contexts, this study aims to assess the psychometric properties of the pre-service English language teachers' grit (PET-Grit) scale. The research addresses the following questions:

RQ 1: What are the factor structures of the pre-service English language teachers' grit scale?

RQ 2: How reliable is the Pre-service English Teacher Grit Scale?

RQ 3: How valid is the Pre-service English Teacher Grit Scale?

Literature Review

Grit

Grit has been reported as an essential trait among high achievers (Duckworth et al., 2007). Thus, grit has been used to predict achievement in various fields, such as health organization and academic training (e.g., Clark & Malecki, 2019). Further reported in Duckworth and Quinn's (2009) study, grittier students tended to achieve higher GPAs, progress further in their education, and were less likely to drop out and make career shifts. In line with this finding, meta-analyses on the relationship between grit and students' general academic achievement indicated a positive association between the two variables (Credé et al., 2017; Lam & Zhou, 2022).

Grit consists of two trait-level components: perseverance and passion. Perseverance is defined as continuous effort and tenacity in the pursuit of a long-term goal, and passion is defined as passion for a long-term goal despite adversities (Duckworth et al., 2007). The focus on the long-term goal distinguishes grit from other traits, such as conscientiousness and resilience. Even though grit has been reported to closely related with conscientiousness (Crede et al., 2017), grit is distinct from conscientiousness in its "emphasis on long-term stamina rather than short-term intensity" (Duckworth et al., 2007, p. 1089). In support of this claim, Teimouri et al. (2022) reported that conscientiousness did not have significant effect on L2 grit in their study. Additionally, while grit and resilience overlap on their commitment in overcoming failures, grit focusses more on overcoming challenges as a part of pursuing long term goals (Teimouri et ak., 2022).

The distinctiveness of grit becomes particularly relevant in L2 contexts where multiple positive psychology constructs intersect. L2 motivation, while sharing grit's goal-oriented nature, often varies across specific L2 tasks and contexts, whereas grit provides stable, trait-level persistence (Dornyei & Ushioda, 2021). Foreign language enjoyment represents positive emotional responses to L2 experiences that can fluctuate based on immediate classroom dynamics, contrasting with grit's sustained commitment independent of momentary affective states (Dewaele & MacIntyre, 2016). Self-efficacy reflects individuals' belief in their perceived competence (Waddington, 2023), whereas grit maintains consistence effort and interest

regardless individuals' confidence in their L2 related capabilities. These conceptual distinctions underscore the necessity of examining grit as a unique construct in L2 research, particularly given its potential to predict long-term outcomes that may not be captured by more context-dependent or emotionally driven variables.

In developing the scale for the present study, the present study maintained the foundational grit theory in which Perseverance of Effort (PE) and Consistency of Interest (CI) are recognized as inseparable factors constituting grit (Duckworth et al., 2007; Duckworth & Quinn, 2009). This theoretical understanding guided our item selection and development process. While acknowledging the domain-general conceptualization of grit, we sought to capture its manifestation in the specific context of pre-service EFL teachers who simultaneously navigate roles as L2 learners and future L2 teachers. Following established approaches in domain-specific grit research (Teimouri et al., 2021; Alamer, 2021; Sudina, Vernon, et al., 2021), our items were carefully selected to reflect both the perseverance and passion dimensions as they relate to L2 development and L2 teaching skills. This approach aligns with recent calls for occupation-specific and context-sensitive measures of grit (Sudina, Vernon, et al., 2021) while maintaining theoretical consistency with the core conceptualization of grit as comprising both sustained effort and enduring interest in long-term goals.

Conceptualizing Grit in L2 Education Contexts

Grit studies within L2 education contexts included topics related to the associations between grit and other affective and cognitive variables. Grit has been reported to be associated with L2 learners' motivation (Changlek & Palanukulwong, 2015), L2 Willingness to Communicate (WTC) (Lee, 2020), L2 enjoyment (Li & Dewaele, 2021) and academic achievement (Lam & Zhou, 2022), among others. As a result of the growing interest in grit within the L2 field, L2 grit was conceptualized (Alamer, 2021; Teimouri, 2022). L2 grit refers to L2 learners' passion and perseverance in learning the target language (Teimouri et al., 2021).

Along with the conceptualization of L2 grit, L2 teacher grit also garnered much attention. It is no surprise, as in the domain-general field, grit has been reported to be associated with teachers' retention and teaching effectiveness (Duckworth et al., 2009; Robertson-Kraft & Duckworth, 2014). Shirvan, Lou, et al. (2021) investigated the dynamics of L2 teachers' grit

during the online L2 learning shift during the COVID-19 pandemic using a domain-general grit instrument. Their process-tracing study showed that L2 teachers' grit fluctuated in response to situational pressure and changes during the emergency online L2 learning shift. L2 teachers' fluctuations of grit during such a challenging time indicated the complex dynamicity of grit.

Noughabi et al. (2022) investigated the relationship between grit, teacher immunity, and work engagement. Their Structural Equation Modeling (SEM) results revealed that grit was a stronger predictor of teachers' immunity than work engagement. Furthermore, their L2 teacher grit was found to be a contributing factor that helped them overcome hurdles and stressors and commit to their work professionally.

Regardless of the growing interest in L2 teachers' grit, the examination of grit within pre-service EFL teachers remains scarce. To our knowledge, only a handful of inquiries have delved into the context of pre-service EFL teachers. To illustrate, Yates et al. (2015) reported the role of grit on the aspirations of African American male pre-service teachers in their pursuit of the teaching profession. Furthermore, the investigation conducted by Riddle (2018) yielded notable outcomes, wherein their bivariate regression analysis underscored the predictive capacity of grit about self-efficacy (β = .612). Noteworthy is the study of Nacario et al. (2022), which uniquely centered on pre-service EFL educators and reported a correlation between L2 grit and the intrinsic motivation for reading among Filipino pre-service EFL teachers.

Altogether, these findings pinpointed that grit may be an essential variable contributing to L2 teachers' success in overcoming day-to-day challenges and effectively managing their stress. Grit, in turn, can potentially enhance teacher retention and overall effectiveness. However, given the limited evidence from the L2 teaching domain, the results of these studies may not always apply to all L2 teachers across various contexts. Consequently, the call for further context-specific grit investigations becomes imperative, offering the potential to enrich ongoing discourse surrounding the concept of grit.

Measuring Grit

Two self-reported questionnaires, the Original Grit Scale (Grit-O) (Duckworth et al., 2007) and its shortened version, the Short Grit Scale (Grit-S) (Duckworth & Quinn, 2009), have been widely utilized to measure domain-general grit. Both self-report questionnaires measure

passion and perseverance in general contexts. They both have half positive items and half negative items.

Along with the adoption of grit into multiple domains, context-specific grit instruments have been developed. Factorial structure variations have frequently been observed among several of these recently developed measures. As a case in point, the Triarchic Model of Grit Scale (TMGS) was developed to measure grit among undergraduate students of the collectivist society in the Philippines (Datu et al., 2017). Unlike the original Grit-O and Grit-S, originally developed in the non-collectivist American culture, TMGS consisted of a higher-order grit with a three-factor solution (i.e., perseverance of effort, consistency of interests, adaptability to situations). In addition, the Academic Grit Scale (AGS) was designed to measure adolescents' grit in the academic setting (Clark & Malecki, 2019). AGS constructs (i.e., determination, resilience, focus) partly overlap with the general grit constructs (i.e., perseverance of effort, consistency of interests). These scales, developed in non-western settings, lend support to the role of cultural contexts in shaping grit (Datu et al., 2017).

Subsequently, several domain-specific grit scales have been developed in L2 education contexts. An EFL context-specific grit scale (Ebadi et al., 2018), which collected data in Iran, was developed to measure students' grit in learning English in a non-native context. The EFA analysis yielded a higher-order grit scale with four factors. Afterward, Teimouri and colleagues (2021) introduced the L2 grit scale (L2GS), a contextualized grit scale to measure L2 learners' passion and perseverance in achieving their L2 learning goals. In proposing their newly constructed instrument, they validated their L2 grit scale with L1-Persian students studying English translation (N = 191). The result of their principal component analysis (PCA) showed a higher-order construct with two factors, labeled as Perseverance of Effort (PE) and Consistency of Interest (CI). Another model of the L2 Grit Scale was proposed by Alamer (2021). Like Teimouri et al.'s (2021) L2 grit scale, the newly proposed instrument aimed to measure L2 learners' PE and CI in their L2 learning. However, unlike the previous work, which was developed via PCA, Alamer's L2GS was developed and validated via Exploratory Factor Analysis (EFA) and Confirmatory Factor Analysis (CFA). The results of the analysis reported a bi-factor model of L2GS. The scale demonstrated a good measurement fit (RMSEA = .007, CFI = .95, TLI = .91, SRMR = .05) and an adequate internal consistency (CI's α = .83, PE's α = .85).

Then, an L2 teacher grit scale (L2TGS) was developed by Sudina, Vernon et al. (2021). They adopted their items from the Grit-S scale and added more related to teachers' grit. They also added a retention-related scale in which they listed items that may not represent teachers' grit but deal more with teachers' retention. A total of 204 ESL/EFL teachers working in the United States, Canada, the United Kingdom, Japan, and China participated in the study. A PCA was run to determine the proposed instrument's factorial solution. L2TGS possessed sufficient internal consistency reliability (ω = 0.77), and the PCA results indicated a two-component structure with sufficient construct validity (Proportion of Variance: POV = 50.87%).

Furthermore, to measure L2 teachers' grit in foreign language teaching contexts, the Foreign Language Teacher Grit Scale (FLTGS) was developed (Soleimanzadeh et al., 2023). The results of their EFA and CFA in Iranian contexts indicated that the scale included 14 items and consisted of two components: Perseverance of Effort (PE) and Consistency of Interest (CI). The 6-point-Likert scale demonstrated high internal consistency for both components of PE (α = 0.87, ω = 0.87) and CI (α = 89, ω = 0.89) as well as overall grit (α = 0.92, ω = 0.92).

Table 1. Comparisons of Grit Scales

Scale	Context	Population	Cultural Setting	Factor Structure
Grit-S (Duckworth & Quinn, 2009)	Domain-general	General population	Western (US)	2-factor
TMGS (Datu et al., 2017)	Academic	Undergraduate students	Non-Western (Philippines)	3-factor
L2GS (Teimouri et al., 2021)	L2 learning	L2 learners	Non-Western (Iran)	2-factor
L2TGS (Sudina et al., 2021)	L2 teaching	In-service L2 teachers	Multi-cultural (US, Canada, UK, Japan, China)	2-factor
FLTGS (Soleimanzadeh et al., 2023)	Foreign language teaching	In-service FL teachers	Non-Western (Iran)	2-factor
PET-Grit (Present study)	Pre-service EFL teaching	Pre-service EFL teachers	Non-Western (Indonesia)	3-factor

Based on our review of the literature, and the available grit scales (Table 1), three key research gaps emerged. First, apart from the growing interest and literature in scale development in L2

contexts (i.e., L2TGS, Sudina, Vernon, et al., 2021; L2GS, Teimouri et al., 2021; FLTGS, Soleimanzadeh et al., 2023), specific scales for pre-service EFL teachers remain unavailable. Secondly, there has been limited understanding of grit in non-western contexts, including in Indonesia. Grit studies outside Western and industrialized contexts may provide valuable insights into how grit manifests in diverse cultural, context-specific settings (Datu et al., 2017). Thirdly, pre-service EFL teachers' complex professional identity development (Lestari et al., 2024; Yin, 2019), including the dual challenges as L2 learners and future L2 teachers (Zhang & Huang, 2024), might need a specific grit scale that can capture the grit required in facing these complex challenges. Our research questions were built on the need to understand the psychometric properties of the proposed scale by examining its factorial structure, reliability, and validity with the context in mind. Our methodological approach of adapting items from existing scales (Grit-S, L2GS, L2TGS) while adding context-specific items aligns with established scale development practices in domain-specific grit research (Datu et al., 2017; Alamer, 2021) and ensures content validity for the unique challenges faced by Indonesian pre-service EFL teachers. Our proposed PET-Grit scale serves as a prototype that can be refined and localized in similar EFL teacher training contexts across broader Southeast Asia and global EFL contexts. The scale can be utilized as a diagnostic tool to measure grit among pre-service EFL teachers as well as to measure the success of teacher training initiatives to foster grit among pre-service EFL teachers in various future intervention studies.

Method

Participants

Participants in the present study were pre-service non-native English teachers enrolled in a teacher training institution in Indonesia. The program consists of a four-year bachelor's degree in English language teaching, which represents a typical teacher-training pathway for aspiring English teachers in Indonesia. Throughout their studies, students complete various courses focused on L2 skills (speaking, listening, reading, writing) and L2 teaching (e.g., teaching methodologies, materials design, course planning, and L2 acquisition). Each semester also includes mandatory school internships with a progressive sequence: first year at elementary schools, second year at junior high schools, and third year at senior high schools. Data collection

occurred during the participants' sixth (EFA) and seventh semester (CFA) (cohort 2021). This strategic timing was selected as students were nearly completing their final teaching practicum at schools while taking elective courses related to L2 skills (e.g., English for Tourism and English for Business).

Due to constraints in data collection imposed by the limited sample size of pre-service EFL teachers in their final year of the program (N = 216), participant overlap occurred between the exploratory factor analysis (EFA) (n = 119) and confirmatory factor analysis (CFA) (n = 164). This overlap was necessitated by the specialized nature of the population in the present study, as only a limited number of final-year pre-service EFL teachers were available at the institution during the data collection processes. Nevertheless, an interval of four months was maintained between the data collection periods for EFA and CFA to mitigate potential methodological concerns. We acknowledge this overlap as a limitation of our study and suggest that future research utilize independent samples across institutions to enhance the robustness of validation studies.

Based on the result of their self-report questionnaire, participants' proficiency levels were between lower intermediate (B1) and Advanced (C1), average on upper intermediate (B2) on the CEFR scale. English proficiency levels were determined through an institutional standardized assessment instrument based on CEFR benchmarks. The assessment tool, administered by the teacher training institution, evaluates reading, listening, grammar, and vocabulary skills using a format like established standardized tests.

In the development stage of the study (i.e., Exploratory Factor Analysis), 119 pre-service non-native English language teachers volunteered to fill out the questionnaire. However, two responses were detected as outliers and removed from further analysis. A total of 117 (male = 11; female = 106) participants' responses were included. Their GPA ranged from 3.2 to 3.97 (M = 3.67, SD = 0.191) out of 4.00.

In the validation stage of the study (i.e., Confirmatory Factor Analysis), 164 pre-service EFL teachers took part in the study. After removing the outliers from the collected data, 149 responses (male = 23; female = 126) were included. On a 4.0 scale, their GPA ranged from 2.25 to 3.97 (M = 3.53, SD = 0.343). Their age ranged from 19 to 26 years old (M = 20.89, SD = 0.863).

Prior to commencing the data collection, ethical approval was obtained from the Institutional review board (IRB) of the university with which the authors are affiliated. Participants were also informed about the ethical considerations at the beginning of the study. Only upon agreeing to these considerations could they complete the questionnaire. All participant responses were kept anonymous.

Research Instruments

The instruments used in this study consisted of domain-general Grit-S (Duckworth & Quinn, 2009), the newly constructed domain-specific PET-Grit Scale, and the Background Information section. All items were translated into the Indonesian language since using a translated version of a grit scale can help ensure the accuracy of participants' responses (Sudina, Vernon, et al., 2021). Prior to filling out the two scales, participants were asked to fill out a background questionnaire. The background questionnaire included questions on age, gender, English proficiency score, and GPA.

Grit-S

The eight-item Grit-S scale was developed by Duckworth and Quinn (2009). The questionnaire aimed at measuring participants' domain-general grit. Grit-S was a shortened version of the 12-item Grit-O scale and was selected instead of Grit-O because "it was shorter and psychometrically stronger" (Duckworth & Quinn, 2009, p. 174). The eight-item scale consisted of two factors, Consistency of Interest (CI) and Perseverance of Effort (PE), which were measured by four items each. Sample items include "Setbacks don't discourage me" and "I often ser a goal but later choose to pursue a different one". A five-point Likert scale (5= very much like me, and 1= not like me at all) was applied. Negatively worded items were reverse-coded before conducting further analyses.

Pre-service English Teachers (PET) Grit Scale

Building on Grit-S (Duckworth & Quinn, 2009), L2 Grit Scale (Teimouri et al., 2021), and L2 Teacher Grit Scale (Sudina, Vernon, et al., 2021), a total of 30 items were initially adapted and pooled for PET Grit Scale. Similar with other grit scales (i.e., Datu et al., 2017; Duckworth

& Quinn, 2009; Sudina, Vernon, et al., 2021), five-point Likert scale (5= very much like me, and 1= not like me at all) was applied for the scale and negatively worded items were reverse-coded before conducting further analyses. Among those items, eight were from Grit-S, 12 were from L2TGS, and nine were from L2GS. Little (e.g., changing ESL/EFL teacher to pre-service non-native English teacher) to no adaptation was made for 23 items.

Additionally, we independently wrote seven items focusing on pre-service EFL teachers' determination and persistence in developing pedagogical skills necessary for effective EFL teaching. These items (e.g., 'I rarely look for effective strategies to motivate students to learn English' and 'I always look for ways to improve my classroom management skills') were included to capture pre-service teachers' commitment to developing their teaching capabilities. We hypothesized these might constitute an important dimension of grit specific to the pre-service EFL teaching context, where persistence in developing pedagogical skills is crucial alongside L2 proficiency (Domke et al., 2022; Parks, 2017). A list of the items and their source of adaptations could be found in Appendix A. Throughout the scale development process, we maintained a focus on the Indonesian pre-service EFL context and their dual foci, both on L2 learning and L2 teaching.

Procedure

The Preliminary Study

The preliminary study was conducted to find out the factor structure and items pool for the proposed PET-Grit scale. In this stage, firstly, a pool of items for the proposed PET-Grit scale was developed. The initial version of the scale was then translated into Indonesian and subsequently distributed to three pre-service EFL teacher educators for back translation and feedback. Suggestions obtained were solely for item 10 on the confusing translated form of the term 'career', which was then revised accordingly. Afterward, the scale was distributed to 15 current pre-service EFL teachers to check on the readability of the items. Suggestions obtained were solely for item 10 on the confusing translated form of the term 'career', which was revised accordingly.

The second step was data collection for Exploratory Factor Analysis (EFA). In this stage, a Google Forms survey asking participants' background information, Grit-S, and PET Grit was

distributed to potential participants via WhatsApp groups in. The online data gathering was conducted due to classes being closed as an emergency measure during the COVID-19 pandemic. The result was a proposed model and scale items that would be examined in the main study.

The Main Study

The main study aimed at validating the factor structure of proposed PET-Grit scale. Like previous procedure, subsequently, the second round of data collection took place in initially via WhatsApp groups. However, the data were then collected offline due to the low return rate after being kept open for six days (48 responses out of 216), and the offline classes started to be conducted.

Data Analyses

Prior to data analysis, the collected data were inspected for missing values in the questionnaire items. As a result, all data were included in both preliminary and main data analyses.

The Preliminary Study

Firstly, we ran the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy (MSA) and Bartlett's test of Sphericity in SPSS v. 29.0.2.0 (20) to check the appropriateness of the data for factor analysis. The results of the KMO test suggested sampling adequacy, as indicated by the overall MSA of 0.832. Additionally, the significant result of Bartlett's test of sphericity indicated that there were correlations among variables. Therefore, the factor analysis was feasible to be conducted.

Secondly, to investigate the appropriate factorial structure of the the proposed PET-Grit scale, an EFA with maximum-likelihood (ML) extraction method was performed after ensuring that the data followed normal distribution based on the result of the Kolmogorov-Smirnov Test and Shapiro Wilk test. A series of parallel analyses utilizing oblimin rotation was executed on the dataset on JASP 0.14.1. During these multiple EFAs, items with low factor loadings were removed. Additionally, to find out the reliability of the scale items, the internal consistency of the items, as reflected in the value of Cronbach's α and McDonald's ω.

The Main Study

Firstly, we assessed the normality of the data. After calculating Mahalanobis distances and removing outliers, data from 149 participants were retained for further analysis. The Kolmogorov-Smirnov and Shapiro-Wilk tests indicated that only univariate normality was achieved, and multivariate normality was not assumed. As an attempt to ensure that multivariate normality was also met, we applied a log transformation. However, the transformed data still exhibited elevated skewness and kurtosis compared to the original dataset. Therefore, we decided to use the original dataset as its skewness, ranging from -0.194 to -0.628, remains acceptable as it falls within the -3 to +3 range (Kline, 2016).

Secondly, we proceeded with CFA using Maximum Likelihood with Robust (MLR) estimator, which accommodates data with non-normal distributions (In'nami & Koizumi, 2011). Furthermore, when robust maximum likelihood estimators (i.e., MLR & MLM) are available, their use are preferred when multivariate normality was violated (Hair & Alamer, 2022). Alamer (p. 7, 2025) even advocates for the use of robust estimators even when normality was assumed due to its ability "to adjust standard errors and to provide more accurate standard errors and a scaled chi-square test statistic, making the model's inferences more reliable when data are skewed or kurtotic".

The final step was to investigate the psychometric properties of the PET-Grit Scale. Three types of validity were examined, concurrent, discriminant and predictive validity. Concurrent validity was examined to provide evidence that the newly developed scale was more suitable in the specific context compared to a more established instrument that measures theoretically related constructs (Sudina, Vernon et al., 2021). The concurrent validity was inspected by observing the correlation between the newly designed instrument, PET-Grit scale, and the well-established grit measure, Grit-S. Secondly, to provide evidence that the constructs did not overlap with each other, the discriminant validity was examined. Thirdly, the predictive validity of the scale was checked by conducting linear regression analysis between participants' PET-Grit and GPA.

Results

The Preliminary Study

In addressing RQ1 regarding the factorial structure of PET Grit, we conducted an Exploratory Factor Analysis (EFA). Before performing the EFA, we verified data reliability assumptions. Based on reliability testing, Items 5, 6, 10, and 22 were excluded from further analysis due to their item-rest correlation values exceeding .30 (Plonsky & Gonulal, 2015).

After confirming the prerequisites for factorial analysis, we proceeded with EFA using oblimin rotation and Maximum Likelihood (ML) estimator. Since the original global Grit scales (Grit-O and Grit-S) comprised two constructs (Consistency of Interest and Perseverance of Effort), we anticipated a two-factor solution to emerge from our data. Therefore, we initially conducted a manual analysis for a two-factor solution, establishing a factor loading threshold of > 0.4 (Matsunaga, 2010). Additionally, items loading onto multiple factors were excluded from further examination. However, the manual analysis for a two-factor solution yielded suboptimal results. Specifically, Item 9 ("I am more interested in teaching English than I used to be") loaded onto the Perseverance of Effort (PE) dimension rather than the expected Consistency of Interest (CI) dimension, despite being adapted from the CI dimension of Grit-S and Grit-O.

Given the unsatisfactory outcomes of the manual analysis, we conducted a parallel analysis, which Matsunaga (2010) identifies as highly accurate for determining factor structures in EFA. We maintained the factor loading criteria of > 0.4 and continued to exclude items loading onto multiple factors. Multiple EFAs suggested a three-dimensional structure of grit.

The parallel analysis results aligned with the scree plot inspection (Figure 1). Although eigenvalues >1 have traditionally served as criteria in many EFA studies due to their practicality, parallel analysis recommends considering several factors with eigenvalues > 0 when the number of factors is not predetermined (Matsunaga, 2010). Consequently, a higher-order grit with three-factor solutions emerged as the most appropriate construct for the PET Grit Scale.
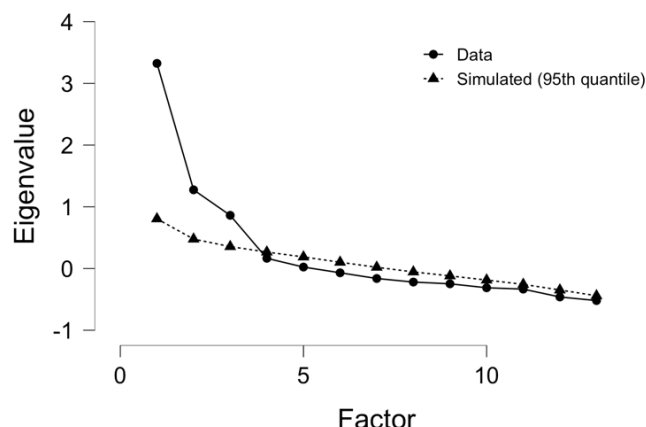
Figure 1. Scree Plot of PET-Grit Scale

Additionally, we qualitatively examined the items to ensure their alignment with the underlying theoretical constructs (Matsunaga, 2010). No items demonstrated cross-loading upon inspection. However, two items, Item 26 ('Setbacks that I encounter when doing teaching practice don't discourage me') and Item 27 ('I give up easily when faced with challenges related to my teaching practice'), contained similar content yet loaded onto different dimensions. We, therefore, excluded Item 26 from the final model based on two criteria: the content of Item 27 showed better alignment with other items in its category, and the factor loading of Item 26 (0.455) was lower than that of Item 27 (0.619).

Finally, the results of the preliminary analysis suggested a three-factor solution of PET-Grit scale. The three factors were Passion for Professional Development, Determination to Become English Teacher and Perseverance for Professional Development. Table 5 shows that the factor loading of the items (Table 5.) ranges from 0.430 to 0.898. These factor loadings indicated a strong association between items and the factors.

Table 5. Factor Loadings (EFA)

Factors	Factor 1	Factor 2	Factor 3	Uniqueness
Factor 1: Passion for Professional Development				
PET3. I am not as interested in learning English as I used to be.	0.698			0.530
PET4. I was highly passionate about learning English in the past but have lost interest recently.	0.848			0.290

Factors	Factor 1	Factor 2	Factor 3	Uniqueness
PET7. I have been highly passionate about a certain English teaching-related idea or concept, but later lost interest.	0.702			0.399
PET8. At times, I have lost interest in teaching English.	0.430			0.758
Factor 2: Determination to Become English Teachers				
PET19. I am a hardworking pre-service English teacher.		0.669		0.469
PET21. Nothing will stop me from pursuing my aspiration to be an English teacher.		0.808		0.320
PET24. Now that I have decided to become an English teacher, nothing can prevent me from reaching this goal.		0.898		0.220
Factor 3: Perseverance for Professional Development				
PET15. I don't put much time and effort into improving my English language weaknesses.			0.435	0.676
PET20. As a pre-service non-native English teacher, I do not invest lot of time and energy in improving my English teaching skill.			0.511	0.709
PET27. I give up easily when faced with challenges related to my teaching practice.			0.618	0.646
PET28. I rarely look for effective strategies to motivate students to learn English.			0.711	0.532

Note. Applied rotation method is oblimin.

The Main Study

In this phase of the study, firstly, we conducted Confirmatory Factor Analysis (CFA) with MLR estimator further validated the three-factor solution measurement model of PET Grit (Figure 2). In this phase we analysed the model fit of PET-Grit scale. The results indicated that our proposed measurement model (Figure 2) demonstrated moderate fit indices (RMSEA = .081; CFI = .92; TLI = .89; SRMR = .079, RNI = .92) with a chi-square value of χ^2 = 81.077 (df = 41). The factor loadings ranged from 0.46 to 0.86.
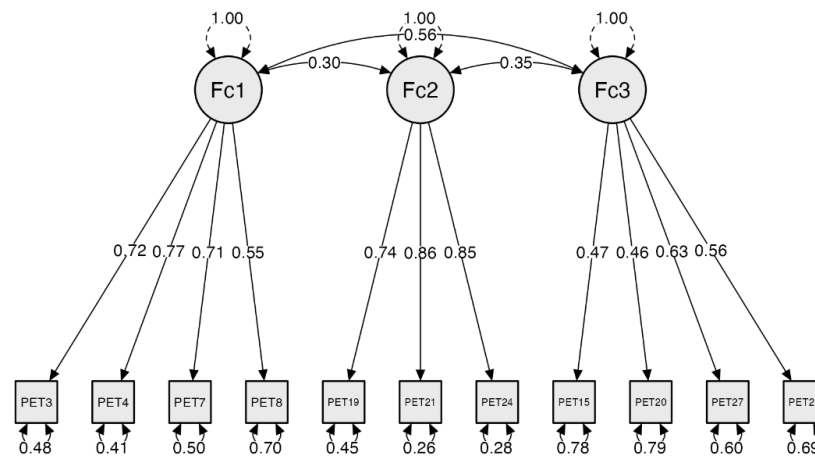
Figure 2. The Final Model of PET-Grit

Secondly, we assessed the reliability of the proposed scale by examining the scale's internal consistency through Cronbach's α and McDonald's ω values in JASP version 0.14.1. The unidimensional reliability analysis confirmed that the PET-Grit scale demonstrated sufficient internal consistency with Cronbach's α = .799 and McDonald's ω = .808. These values closely resembled the unidimensional reliability results for Grit-S in our dataset (Cronbach's α = .799; McDonald's ω = .749). Furthermore, the Cronbach's α values for PET-Grit subscales ranged from .60 to .86. The flowchart of the present validation study can be found in Appendix B.

Table 6. Reliability Estimates for PET-Grit Subscales

Constructs	Coefficient ω	Coefficient α
Passion	0.782	0.776
Determination	0.862	0.855
Perseverance	0.612	0.602
PET-Grit	0.808	0.799

Our final step in investigating the psychometric properties of the PET-Grit scale involved examining its validity. First, we evaluated concurrent validity, which can be assessed by comparing a newly developed context-specific instrument with a more theoretically established

measurement (Sudina, Vernon, et al., 2021). Since only univariate normality was fulfilled and multivariate normality of the sub-scales was not assumed, we conducted Spearman's rank order correlation between PET Grit and Grit-S. In L2 research, correlation coefficients of approximately .25 are considered small, .40 medium, and .60 large (Plonsky & Oswald, 2014). The correlation analysis revealed that PET Grit strongly correlated with Grit-S (Spearman's ρ = .565, $p < .001$), accounting for 34% of the total variance. This finding demonstrates that the PET Grit scale possesses good concurrent validity.

We then examined discriminant validity following Yabukoshi's (2024) recommendations. Discriminant validity indicates whether constructs are distinct from one another (Cheung et al., 2023). Our measurement model included inter-construct correlations (Figure 2) ranging from .30 to .56, below the cutoff value of .85, thus confirming sufficient discriminant validity for the proposed scale.

At last, we assessed the predictive validity by examining the relationship between PET-Grit and academic achievement (GPA). We performed Spearman's rank order correlation between GPA, PET-Grit, and each subscale (Table 8) using SPSS v. 29.0.2.0 (20) since only univariate normality was assumed.

Spearman's correlation analysis indicated a small positive correlation between PET-grit and GPA (ρ = .252, p = .002). This result suggested that the PET-Grit scale can predict academic achievement and demonstrating the scale's predictive validity.

Table 7. Correlation Analysis Results ($N = 149$)

			GPA	PET-Grit	Grit-S
Spearman's rho	GPA	Correlation Coefficient	1.000	.252[**]	.352[**]
		Sig. (2-tailed)	.	.002	<.001
	PET-Grit	Correlation Coefficient	.252[**]	1.000	.565[**]
		Sig. (2-tailed)	.002	.	<.001
	Grit-S	Correlation Coefficient	.352[**]	.565[**]	1.000
		Sig. (2-tailed)	<.001	<.001	.

**. Correlation is significant at the 0.01 level (2-tailed).

Among three subscales (i.e., passion, perseverance, and determination), determination has the strongest correlation with GPA (ρ = .302, $p < .001$), indicating a small but significant correlation between the variables. Additionally, the results suggested a small but significant correlation between passion and GPA (ρ = .201, p = .014). However a non-significant relationship

was observed between perseverance and GPA (ρ = .078, p = .344) suggesting no meaningful association between the two variables. These findings suggest that only determination dimension of PET-Grit may predict participants' academic achievement.

Table 8. Correlation Analysis Results for PET-Grit Subscales (N = 149)

			GPA	PAS	PER	DET
Spearman's rho	GPA	Correlation Coefficient	1.000	.201[*]	.078	.302[**]
		Sig. (2-tailed)	.	.014	.344	<.001
	PAS	Correlation Coefficient	.201[*]	1.000	.327[**]	.364[**]
		Sig. (2-tailed)	.014	.	<.001	<.001
	PER	Correlation Coefficient	.078	.327[**]	1.000	.318[**]
		Sig. (2-tailed)	.344	<.001	.	<.001
	DET	Correlation Coefficient	.302[**]	.364[**]	.318[**]	1.000
		Sig. (2-tailed)	<.001	<.001	<.001	.

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Discussions

Pre-service EFL teachers encounter challenges that are distinct from both pre-service teachers of other subjects and pre-service EFL teachers in non-L2 contexts. Unlike teachers of other subjects (e.g., mathematics, science) who primarily focus on teaching contents in their L1, EFL teachers in L2 settings must continuously demonstrate their L2 competence while simultaneously teaching it (Domke et al., 2022; Dzormeku et al., 2024; Zein, 2022). Further complicating this situation is the dual role pre-service EFL teachers must simultaneously act as L2 learners and future L2 teachers. In non-L1 English contexts, including Indonesia, issues of native-speakerism remain prevalent (Tupas, 2022), creating additional pressure to demonstrate L2 competence when using English as a medium of instruction (Hamid et al., 2015). This pressure is intensified within cultural contexts where even minor language inaccuracies can be viewed negatively (Hoang & Wyatt, 2021). Collectively, these circumstances present the pre-service EFL teachers in our study with distinctive challenges that differentiate their experiences from fellow pre-service teachers in Western, educated, industrialized, rich, and democratic settings. Amidst their challenging situations, grit can play a part in helping pre-service EFL teachers in navigating these complexities. However, existing grit scales either focus on general teaching (L2TGS) (Sudina, Vernon, et al., 2021), L2 learning (L2GS) (Alamer, 2021; Teimouri et al., 2021), or foreign language teaching broadly (FLTGS) (Soleimanzadeh et al., 2023), but none capture the specific challenges facing pre-service EFL teachers in their transitional identity development.

In the present study, we examined the psychometric properties of the PET-Grit scale, a newly designed instrument specifically measuring pre-service EFL teachers' grit in pursuing

careers as EFL teachers. Our investigation yielded three key findings: a three-factor structure comprising Passion for Professional Development, Determination to Become EFL Teachers, and Perseverance for Professional Development; adequate internal consistency (α = .799; ω = .808); and validity evidence supporting its concurrent, discriminant, and predictive properties.

The emergence of a three-factor structure, rather than the anticipated two-factor model, suggests that pre-service EFL teachers' grit is more complex than general domain grit due to their simultaneous roles as L2 learners and future L2 teachers. All items adapted from Consistency of Interest were grouped into one factor, namely, 'passion.' Similarly, items related to Perseverance of Efforts fit into the same categories. However, unlike the general Grit-S with its single Perseverance of Efforts factor (Duckworth & Quinn, 2007), our domain-specific PET-Grit scale yielded two related factors: 'perseverance' and 'determination.' The distinction between these factors lies in their scope of sustained effort. Items on 'determination' address eagerness and sustained efforts to overcome general obstacles to becoming English teachers (e.g., "I am a hardworking pre-service English teacher"). Meanwhile, 'perseverance' concerns sustained efforts to improve specific skills necessary for becoming a future English teacher (e.g., improving L2 competencies and mastering L2 teaching techniques). 'Determination' underscores the challenging process of becoming a pre-service L2 teacher in non-native settings. While teaching itself presents significant challenges (Robertson-Kraft & Duckworth, 2014), and L2 learning involves unpredictable difficulties (Liu et al., 2023), engaging in both simultaneously compounds these challenges.

The variability of PET-grit scale's dimensional structure echoed findings of other domain-specific grit scales (e.g., three-factorial models (Triarchic Model of Grit Scale; Datu et al., 2017), four-factorial models (ELT-context specific grit scale; Ebadi et al., 2018), and bi-factorial models (L2GS; Alamer, 2021). The data of these grit scales that happened to be collected in L2 settings, could be an indication of the context-specific dependence of grit models. One of the factors contributing to this variability could be cultural contexts, which has been acknowledged as an influential factor in shaping grit (Datu et al., 2017). Specifically concerning PET-Grit scale within the Indonesian EFL context, the emergence of a separate 'determination' factor may reflect the heightened pressures and cultural expectations placed on non-native English teachers to demonstrate both linguistic competence and pedagogical expertise. The collectivist nature of

Indonesian society, where professional identity is closely tied to social acceptance and family expectations, may intensify the need for unwavering determination to persist despite these additional pressures.

The differential relationships between subscales and academic achievement reveal important insights about which aspects of grit matter most for academic success. The moderate correlation between PET-Grit and academic achievement (ρ = .252) suggests that domain-specific grit explains approximately 6.35% of the variance in academic performance, which is practically meaningful for psychological constructs in educational settings. The fact that 'determination' (ρ = .302) and 'passion' (ρ = .201) significantly predicted GPA while 'perseverance' (ρ = .078) did not suggests that overall commitment to becoming an EFL teacher and sustained interest in professional development are more academically relevant than specific skill-improvement efforts. This pattern implies that academic success for pre-service EFL teachers may depend more on maintaining motivation and career commitment than on persistent skill practice. The strong concurrent validity with Grit-S (ρ = .565) confirms that while PET-Grit measures a conceptually related construct, it captures domain-specific variance not addressed by general grit measures.

The PET-Grit scale offers several practical applications for teacher education institutions and researchers. Teacher training programs can implement this instrument to identify students who may need additional support during challenging phases of their preparation. The scale's predictive validity with academic achievement also makes it valuable for early identification of students at risk of academic difficulties or program attrition.

This study addresses a critical gap in L2 teacher psychology literature by providing the first validated instrument specifically designed for pre-service EFL teachers' grit. Previous measures either focused on general teaching contexts without considering L2-specific challenges or L2 learning without teaching considerations. The PET-Grit scale uniquely captures the intersection of L2 learning and teaching development that characterizes pre-service EFL teachers' experiences. Theoretically, our findings contribute to the ongoing debate about domain-specificity in grit research (Teimouri et al., 2021) by demonstrating that highly specialized populations may require factor structures that deviate from the traditional passion-perseverance dichotomy. The three-factor model suggests that when individuals navigate multiple complex

domains simultaneously, grit may fragment into more specific dimensions that reflect different types of sustained effort and interest.

While the present study provides valuable insights into pre-service EFL teachers' grit, several limitations warrant acknowledgment. Firstly, the perseverance factor comprises only negatively worded items, which emerged organically through EFA but may introduce response bias (Soleimanzadeh et al., 2023). Future refinements of the PET-Grit scale could address this limitation to enhance its psychometric properties. Secondly, although sufficient for this study, the marginally adequate fit indices and validity metrics (Matsunaga, 2010; Nye, 2022) suggest that preliminary confirmatory factor analysis should be conducted before utilizing the scale in future research contexts to ensure proper data fit. Thirdly, while this study contributes perspectives from the underrepresented context of pre-service EFL teaching in Indonesia, cultural variations may necessitate additional validation studies in diverse educational settings.

Considering the future works, the association between pre-service EFL teachers' grit and their other psychological constructs, such as resilience, self-efficacy, and enjoyment, is under-explored. Findings from future investigations on this topic are important since they will situate the role of grit in building pre-service EFL teachers' performances. These positive psychology constructs play significant roles in shaping teachers' competence and performance and contribute to students' L2 learning experience and achievement. For example, previous studies indicated that grit was positively associated with foreign language enjoyment (Lee, 2020) and negatively associated with foreign language anxiety (Liu et al., 2021). Therefore, exploring its relationship with other positive psychology variables can shed light on pre-service EFL teachers' grit position in applied linguistics. Furthermore, future works may benefit from utilizing more advanced quantitative analysis, such as Exploratory Structural Equation Modelling (ESEM) (Alamer & Marsh, 2022) or Confirmatory Composite Analysis (Alamer et al., 2024) to draw a more comprehensive picture of the relationships among the variables. Besides, future studies on grit may also consider utilizing a longitudinal method such as Longitudinal Confirmatory Factor Analysis (LCFA; Shirvan, Taherian, et al., 2021) or Repeated Measure Analysis of Variance to track pre-service EFL teachers' grit development over time. Cross-cultural validation studies in diverse EFL contexts would enhance the scale's generalizability while revealing how cultural factors influence pre-service teacher grit.

Conclusion

To conclude, the present study contributes to enhancing current understanding on pre-service EFL teachers' grit in the Indonesian context. By providing a reliable and valid scale, this study offers valuable insights and tool for future investigations into factors that enhance pre-service teachers' grit to become EFL teachers. The present initial development study established the foundational three-factor structure comprising Passion for Professional Development, Determination to Become EFL Teachers, and Perseverance for Professional Development. While the preliminary validation presented here provided adequate evidence for the scale's structure and reliability, Arfiandhani & Takeuchi (2025) subsequently reported improved psychometric properties (RMSEA = 0.041; CFI = .988; TLI = .983; SRMR = .041) in a confirmatory analysis with an independent sample, in their Structural Equation Modelling study employing PET-Grit scale.

Teacher education institutions can implement the PET-Grit scale to measure pre-service EFL teachers' perseverance levels, enabling evidence-based evaluation of pedagogical interventions and curriculum effectiveness through pre- and post-treatment comparisons. Practically, teacher educators can integrate dimension-specific interventions: for pre-service teachers scoring low on passion, implementing reflective portfolio assessments that help them reconnect with their initial motivation for EFL teaching and discover meaningful purposes in their ELF related activities; for those lacking determination, providing structured mentoring programs that offer personal development and related professional identity development; and for those with low perseverance, designing additional activities during microteaching and teaching practicum that build resilience when facing challenges in their classrooms. The scale's practical applications extend to identifying students who may need additional support, developing targeted interventions for each grit dimension, and conducting longitudinal research on teacher development. For example, teacher educators can use pre-service teachers' PET-Grit scores to assign group compositions and school placements that suit their individual needs: those with low PET-Grit scores can be paired with supportive peers and provided with additional mentorship to help them thrive during teaching practicum. As research in this domain continues to evolve, a more nuanced understanding of how grit interacts with other psychological factors

will further enhance our ability to prepare resilient, committed, and effective language educators for diverse global contexts. The present study reported and documented the initial development of the scale, which can be utilized in future study on pre-service EFL grit in L2 settings.

Acknowledgements

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