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Validity and Reliability of the Short Grit Scale (Grit-S) among Medical Students in a Public University in Selangor, Malaysia

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ABSTRACT

Grit is defined as passion and perseverance for long-term goals and is associated with positive educational and psychological outcomes. The 8-item Short Grit Scale (Grit-S), a tool to measure grit, has yet to be validated among Malaysian medical students. Thus this study aimed to validate the Grit-S among this population. This cross-sectional questionnaire validation study included 200 medical students from a public university in Malaysia. The Grit-S consists of 8 items framed within two domains: consistency of interest (COI) and perseverance of effort (POE). Content, face and construct validity were assessed. The content and face validity were determined using the item-content validity index (I-CVI) and item-face validity index (I-FVI). The exploratory factor analysis using principal axis factoring with varimax rotation was used to assess the construct validity. The reliability was assessed using internal consistency and test-retest reliability. Both I-CVI and I-FVI were 1. Following factor analysis, item 2 from the POE domain was dropped due to poor factor loading of < 0.3. The final pattern matrix produced a 7-item Grit-S, framed within two domains. The COI domain contains four items (1, 3, 5, and 6) with a Cronbach's alpha of 0.73. The POE domain contains three items (4,7, and 8) with a Cronbach's alpha of 0.75. The overall Cronbach's alpha for the 7-item Grit-S was 0.73. The test-retest intraclass correlation for all items ranged from 0.62 (95% CI: 0.29 – 0.80) to 0.80 (95% CI: 0.62 – 0.90). The findings

demonstrated that the adapted 7-item Grit-S has two constructs similar to the original Grit-S. Grit-S is a valid and reliable tool to measure grit among medical students in Malaysia.

Keywords: *Grit, medical students, validity, reliability, Malaysia*

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INTRODUCTION

Going through medical school and a subsequent career as a medical doctor require tremendous physical and psychological strength. Perseverance is one of the critical factors in getting through challenges. Grit is a non-cognitive characteristic that has garnered much attention and has been extensively promoted as a significant predictor of success and performance (1,2). Grit is passion and perseverance for long-term goals, working hard toward obstacles, and retaining effort and interest despite failure and difficulties (2). Grit is a personal trait that represents the effort people put in while persevering and maintaining their interests to achieve their long-term goals (3).

In 2007, Duckworth et al. developed the original Grit Scale (Grit-O). It consisted of 12 items framed within two constructs. The confirmatory factor analysis showed a two-factor structure: the consistency of interests (COI) and perseverance of effort (POE). These findings were consistent with the theory and concept of grit, encompassing stamina in the dimension of interest and effort (1).

Duckworth et al. subsequently validated a shorter questionnaire to measure grit, namely the 8-item Short Grit Scale (Grit-S). The psychometric properties of Grit-S were tested among various cohorts, including undergraduate students from Ivy League Universities in the United States (US) (2). The Grit-S retained the two-factor structure like the Grit-O and demonstrated good construct validity and reliability (2). Since then, the Grit-S has been used to assess grit across various healthcare professionals and university students, including medical residents, surgeons, pharmacy, and nursing students (4-7). Among healthcare professionals, lower grit scores were associated with an increased drop-out rate among surgical trainees. In addition, grit has also been discovered to predict lower rates of burnout and depression among surgical residents (5, 8).

The role of grit in academic and psychological well-being has been extensively studied internationally. However, the literature regarding grit in Malaysia, especially among medical students, remains scarce. In order to study this, a reliable and valid tool is needed. Tan et al. validated the Grit-S among a cohort of Malaysian undergraduate university students, which has different curricula and learning methods compared to medical courses (9). Grit-S, however, has yet to be validated among medical students in Malaysia. Thus, this study aimed to determine the validity and reliability of the Grit-S among a cohort of undergraduate medical students in a public university in Malaysia.

METHODS

Study Design and Population

This cross-sectional validation study was conducted in two parts. Part 1 was the content and face validation, and part 2 was the recruitment of participants for the Grit-S psychometric analyses (construct validity and reliability). The study participants were fourth-year medical students in a Malaysian public university from the academic year of 2019/2020, aged 18 years old and older. This university divided the medical course into preclinical years (years 1 and 2) and clinical years (years 3, 4 and 5). The year-4 medical students were chosen because these students had already gone through one year of clinical training, which had different curricula and learning strategies from other undergraduate courses. The preclinical-year students were not chosen because the curriculum and learning style were almost similar to other undergraduate university courses. The exclusion criteria were students: (a) attending and receiving treatment for mental illness or (b) missing from class for one month or longer due to medical illness. Those missing from class for one month or more were excluded as this may affect their grit score.

Study Tool – The Short Grit Scale (Grit-S)

Duckworth et al. produced the shorter grit scale, the Grit-S. The validity and reliability of the Grit-S were tested among various cohorts in the US, such as military cadets and undergraduate students from highly distinguished universities. The Cronbach's alpha values from these cohorts ranged from 0.73 to 0.83. The construct validity was assessed using confirmatory factor analysis (CFA). In the CFA, the model-fit indices were assessed using the chi-square, the root mean square error of approximation (RMSEA), and the comparative fit indexes (CFI), demonstrating good model-fit. The indices among the cadets at the West Point were $\chi 2$ (19, N = 1,218) = 106.36, p <*0*.001; RMSEA = 0.061 (90% CI = 0.050 – 0.073); CFI = 0.95 (2). The eight items in the Grit-S were framed within two subscales: COI and POE. The items in the COI subscale were 1, 3, 5, and 6, while those in the POE were 2, 4, 7, and 8. Each item was answered on a 5-point Likert scale, ranging from 1 (disagree strongly) to 5 (agree strongly). The score of the Grit-S was determined by adding up all the points and dividing by 8. The highest score on this scale was 5 (extremely gritty), and the minimum score on this scale was 1 (not at all gritty) (2). The questionnaire developer had granted permission for the Grit-S to be validated among this study's cohort of medical students.

Content Validation

The content and face validation were conducted in the first part of this study. Six experts in psychology or medical education performed content validation. The panel included two university lecturers who were medical education experts, one psychologist, and three medical lecturers. The members were selected based on their expertise in medical education. The face-to-face approach was used for content validation. A panel meeting was arranged, and the head researcher facilitated the content validation process. The face-to-face method was chosen because it had been shown to produce the highest response rate (10, 11). The Grit-S and the content validation form describing the definition of the domains and the items representing each domain were distributed to the panel of experts. The experts scored each item independently according to a) its relevance to the domain and the overall scale and b) the clarity of the item. Then, the panel was encouraged to provide verbal comments to improve the relevance and clarity of the items. The outcome of these processes was used to refine the items.

The content validity of each item was determined using the item-content validity index (I-CVI) (11). The content experts rate each item's relevancy from 1 to 4. A 4-point Likert scale was used for the relevancy scale, and the responses included: 1= not relevant, 2= somewhat relevant, 3= quite relevant, and 4= highly relevant. Each item has its own I-CVI and was calculated based on the number of experts rating the item as 3 (quite relevant) or 4 (highly relevant) and divided by the total number of experts. The acceptable value of the I-CVI for a panel consisting of six experts is 0.83 or higher (11). The I-CVI was calculated using the following formula (11):

$$\text{I-CVI} = \frac{\textbf{Experts in agreement (number of experts rating the item as 3 or 4)}}{\textbf{Total number of expert raters}}$$

Figure 1: The proportion of content experts giving an item a relevance rating of 3 or 4 (I-CVI)

The experts were also asked to comment on the clarity of each item and suggest ways to improve them if necessary. The head researcher documented the comments from this session. The items were revised based on the comments from the panel.

Face Validation

Next, after the content validation, the Grit-S underwent face validation among 10 year-4 medical students eligible based on the inclusion and exclusion criteria. The face validation was conducted face-to-face. Their opinions were documented regarding the comprehension of the items, the contents, and the structure of the adapted Grit-S. The time to complete the questionnaire was also noted. The students were given the Grit-S and the rating form assessing the clarity and comprehension of each item. The responses were recorded on a 4-point Likert scale: 1= not clear and understandable, 2= somewhat clear and understandable, 3= clear and understandable, and 4= very clear and understandable. Upon completion, the raters were requested to provide their score for each item without consulting each other. The rating was given according to the clarity and comprehension of each item. The responses were submitted to the researcher once they had provided the scores for all items. The item-face validity index (I-FVI) was computed for each item by dichotomising the 4-point scale, with items scoring either 1 or 2 recoded as 0 and items with a score of either 3 or 4 recoded as 1 (12). The values (0 or 1) for each item were added up, and then the total value was divided by the total number of raters (11). Marzuki et al. suggested that for ten raters, the acceptable cut-off score of I-FVI was at least 0.83 (13). The I-FVI was calculated using the following formula (12):

$$\text{I-FVI} = \frac{\textbf{Raters in agreement (number of raters giving face-validation rating of 3 or 4)}}{\textbf{Total number of raters}}$$

Figure 2: The proportion of raters giving an item a clarity and comprehension rating of 3 or 4 (I-FVI)

The research team reviewed the outcome of the face validation process and fine-tuned the Grit-S. This process produced the refined version of the Grit-S, which was ready for the next part of this study.

Sample Size Determination

The sample size was calculated using an item-to-subject ratio. The suggested ratio ranged from 1:3 to 1:20 (14). A sample of 150 was recommended as the minimum, or at least a 1:5 ratio (15). A minimum sample size of 150 was selected for this study. By adjusting for a 10% attrition rate, the study aimed to recruit 165 participants.

Student Recruitment, Sampling Method and Data Collection

The year-4 medical students were invited to participate upon finishing their class. An announcement was made that those who were involved in the face validity testing were not eligible to participate in this part of the study. The students who were interested were given the study information sheet. This sheet included important information regarding the study, such as the background, purpose, and benefit of the study. Information about the study procedure and the confidentiality status were also included. The students who were eligible and consented were recruited. Written informed consent was obtained.

The sampling was done in a lecture hall, where the students self-administered the questionnaire. Clear instructions were given, and the participants were encouraged to ask questions at any time should any query arise. They were also encouraged to answer each question based on what is true for them and not what they think others want them to say. Each questionnaire was checked for completeness before collection.

Data Collection for Test-Retest

Thirty participants were recruited from the same group of students two weeks later for a test-retest of the Grit-S (16). The same questionnaire was used for test-retest reliability analysis.

Statistical Analysis

Data entry and statistical analysis were performed using the Statistical Package for the Social Sciences Version 23 (IBM SPSS Statistics for Windows, Armonk, NY: IBM Corp, 2016). An assessment of the Grit-S's psychometric properties was conducted in four parts: a) determining the suitability of data for factor analysis assessment, b) performing factor extraction, c) performing factor rotation, and d) reliability assessment using internal consistency and test-retest reliability.

First, Kaiser-Meyer-Olkin (KMO) measurement was used to assess the sampling adequacy, and Bartlett's test of sphericity determined the appropriateness of data for factor analysis. A KMO value of >0.50 with a significant Bartlett's test of sphericity (*P*-value of <0.05) indicates that the data were suitable for factor analysis (15).

Exploratory factor analysis (EFA) using principal axis factoring (PAF) with varimax rotation was conducted. PAF was chosen because the scores for each item were not normally distributed according to the Shapiro-Wilk test (17). This study chose the Shapiro-Wilk test for normality testing because the sample size was less than 2000. Varimax rotation was chosen because both factors were uncorrelated, with a factor correlation matrix of ≤ 0.3. Kaiser's criterion, scree plot, and parallel analysis with Monte Carlo Principal Component Analysis (PCA) simulation were used to determine the number of factors to retain. Kaiser's criterion suggested retaining factors with eigenvalues of ≥ 1. Factors with eigenvalues of less than 1 were considered redundant as they would not explain much of the variance in the data (18). Based on the scree plot, the points above the inflexion (i.e., the elbow) were used to determine the number of factors to retain. The Monte Carlo PCA for parallel analysis was also performed to confirm further the number of factors to be retained (19). The computed eigenvalues from the parallel analysis were compared with those from the factor analysis to determine the number of factors to retain (15, 18, 20). Based on the parallel analysis, the factor was retained if the eigenvalue from factor analysis was more than the eigenvalue value from Monte Carlo PCA. The final factor structure was determined based on: a) items with a factor loading of more than 0.30, b) minimal cross-loading, and c) no factor with less than three items (17).

The internal consistency and test-retest analyses were used to measure the reliability of the Grit-S. Cronbach alpha values of 0.7 – 0.9 were deemed acceptable (21). The intraclass correlation coefficient (ICC) was used for test-retest reliability (22). Values of >0.7 suggest that the Grit-S scale is stable, values between 0.4 – 0.7 indicate fair stability and values of <0.4 indicate poor stability (23). Figure 3 outlines the overall conduct of the study.

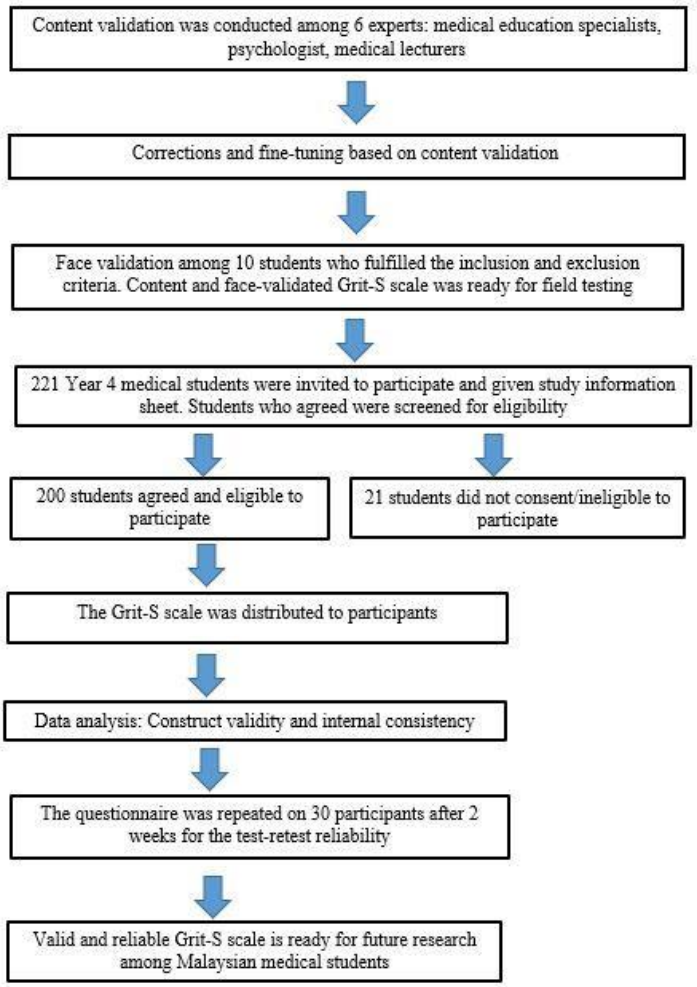

Figure 3: Flow chart of study

Variable Definition

The ethnicity of students from this university were Malays or other indigenous ethnic minorities. These indigenous minorities included the native race, locally known as *"orang asli"*, and other ethnic minorities from East Malaysia, such as Iban and Kadazan. For this study, the native race and the ethnic minorities from East Malaysia will be collectively called indigenous. The student's English language proficiency was categorised according to their Malaysian University English Test (MUET) scores (24). These scores were divided into six bands: Band 6 = very good user, Band 5 = good user, Band 4 = competent user, Band 3 = modest user, Band 2 = limited user, and Band 1 = extremely limited user (24).

RESULTS

Content Validation and Face Validation of the Grit-S

Regarding content validity, the expert panel found that the items were relevant to the measured construct. I-CVI was found to be 1 for each item. Therefore, all eight items were retained. The expert panel commented on the clarity of item 1 (New ideas and projects sometimes distract me from previous ones) and suggested removing the word "sometimes". The panel felt that this word implies that this trait only occurs "occasionally" and may cause confusion to the students.

As for item 4, a minor modification was made based on the panel's suggestion where 'I am a hard worker' was rephrased to 'I am hardworking'. The panel felt that the word "worker" might be misinterpreted as someone engaged in a paying job by the students. Furthermore, the panel felt that "I am hardworking" described the students' traits more accurately. These two items were refined for simpler and better understanding. The modification did not change the purpose and meaning of the items.

For face validation, all 10 participants thought that the adapted questionnaire was generally easy to read and understand. They also felt it was straightforward and completed the questionnaire within 5 to 10 minutes. The I-FVI for each item was 1, which was higher than the minimum acceptable I-FVI for a total of 10 raters (≥0.83) (12).

Recruitment for Field Testing

Of 221 students invited to participate in the cross-sectional validation of the adapted Grit-S, 200 (90%) fulfilled the eligibility criteria and agreed to participate. Among 21 students who were excluded, four were not eligible (three students were attending and receiving treatment for mental illness, and one student was missing from class for longer than one month due to medical illness). 17 students did not consent to participate. Informed written consent was obtained, and these students completed the self-administered Grit-S.

Demographic Characteristics

More than half of the participants were females (76.5%), and most were Malays (97.5%). 99% of the students spoke Malay as their first language. Regarding educational qualifications, 77.5% attained an A for English in their Malaysian high school education certificate exam, locally known as the "*Sijil Pelajaran Malaysia*" (SPM) examination. The sociodemographic and academic characteristics of the participants are shown in Table 1.

Table 1: Sociodemographic and academic characteristics of the participants, (n=200)

Variables Frequency, n (%)	
Age (Years)	
Median (±IQR)	23 (± 0.0)
Gender	
Male	47 (23.5)
Female	153 (76.5)
Race	
Malay	195 (97.5)
Indigenous	5 (2.5)
Main language spoken at home	
Malay	198 (99.0)
English/Iban	2 (1.0)
Type of Secondary School	
Non-boarding	96 (48.0)
Boarding School	104 (52.0)
Malaysian University English Test (MUET) Band	
3	58 (29.0)
4	109 (54.5)
5	32 (16.0)
6	1 (0.5)
English Grade for Malaysian high school certificate exam	
A	155 (77.5)
B	43 (21.5)
C	2 (1.0)

Construct Validity

The KMO value for the Grit-S scale was 0.74, and Bartlett's test of sphericity was significant with a *P*-value of <0.05, indicating that the data were suitable for factor analysis. The PAF method with varimax rotation was used for factor analysis. Kaiser's criterion yielded two factors with eigenvalues of more than 1. This two-factor solution explained a cumulative 40.58% of the variance in the data. According to the scree plot, the number of factors to retain is the data points above the inflexion point. The point of inflexion of the scree plot (Figure 4) occurred at factor four, thus suggesting three factors to retain. The Monte Carlo PCA supported the retention of a two-factor solution. The possible factor solutions were two or three based on these three criteria. Both two-factor and three-factor solutions were explored. The two factor-solution with varimax rotation was deemed to be the most conceptually appropriate for the Grit-S, consistent with the priori factor structure. The total variance for both factors was 46.08%. Table 2 shows the rotated pattern matrix on the 8-item grit scale. According to the rotated factor matrix, items 1, 3, 5, and 6 are loaded onto factor 1, while items 2, 4, 7, and 8 are loaded onto factor 2.

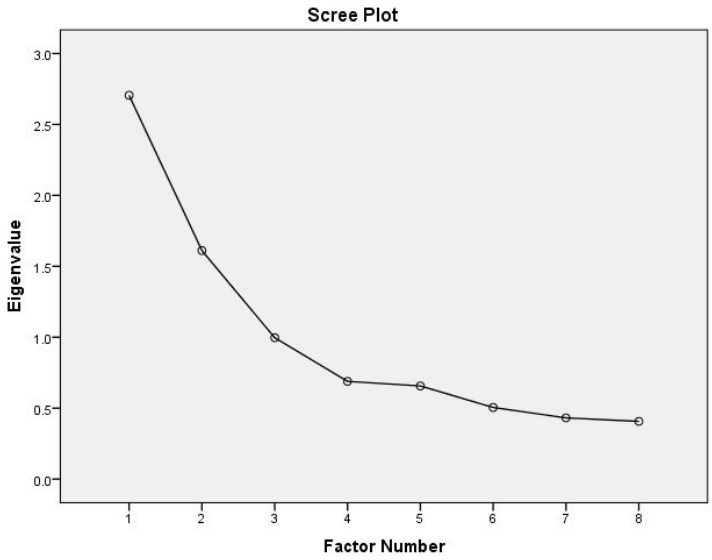

Figure 4: Scree plot

Table 2: Rotated factor matrix on the 8-item Grit Scale

Item	Item Description	Factor	
		1	2
Item 6	I have difficulty maintaining my focus on projects that take more than a few months to complete	**0.74**	0.29
Item 3	I have been obsessed with a certain idea or project for a short time but later lost interest	**0.60**	
Item 5	I often set a goal but later choose to pursue different one	**0.60**	0.14
Item 1	New ideas and projects distract me from previous ones	**0.58**	
Item 8	I am diligent	0.10	**0.76**
Item 7	I finish whatever I begin	0.20	**0.69**
Item 4	I am hardworking		**0.65**
Item 2	Setbacks don't discourage me		0.16

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization

Item 2 had poor factor loading and was removed. After item 2 (Setbacks don't discourage me) was removed, the EFA process was repeated. The final EFA was conducted using principal axis factoring with varimax rotation and yielded a two factor-solution, explaining 46.08% of the total

variance. Four items were loaded on factor 1 and three on factor 2. There were no cross-loading items. Factor 1, consisting of items 1, 3, 5, and 6, was labelled COI. Factor 2, consisting of items 4, 7, and 8, was labelled POE. Table 3 shows the final rotated factor matrix following the removal of item 2.

Table 3: Rotated factor matrix after removal of item 2

Item	Item Description	Factor	
		1	2
Item 6	I have difficulty maintaining my focus on projects that take more than a few months to complete	**0.73**	0.30
Item 3	I have been obsessed with a certain idea or project for a short time but later lost interest	**0.59**	0.16
Item 5	I often set a goal but later choose to pursue different one	**0.59**	0.07
Item 1	New ideas and projects distract me from previous ones	**0.58**	-0.02
Item 8	I am diligent	0.08	**0.78**
Item 7	I finish whatever I begin	0.19	**0.69**
Item 4	I am hardworking	0.07	**0.64**

Extraction Method: Principal Axis Factoring.

Rotation Method: Varimax with Kaiser Normalization.

Reliability

Table 4 shows the reliability analysis for Grit-S. For Factor 1 (COI), Cronbach's alpha was 0.73, whereas, for Factor 2 (POE), Cronbach's alpha was 0.75. The overall Cronbach's alpha for Grit-S was 0.73. The ICC values ranged from 0.62 to 0.80, indicating that the Grit-S scale was stable over time.

Table 4: Cronbach's alpha values for each factor and intraclass correlation coefficients (ICCs)

Component	Item	Number of items	Cronbach's α	Corrected Item-Total Correlation	Cronbach's α If Item Deleted	Intraclass Correlation Coefficient, ICC (95% CI)
Consistency of interest	Item 1	4	0.73	0.47	0.69	0.62 (0.29 –
	Item 3			0.49	0.68	0.67 (0.38 –
	Item 5			0.51	0.67	0.68 (0.40 –
	Item 6			0.60	0.61	0.72 (0.47 –

Perseverance of effort	Item 4	3	0.75	0.55	0.70	0.67 (0.38 –
	Item 7			0.58	0.67	0.80 (0.63 –
	Item 8			0.61	0.63	0.80 (0.62 –
Overall			0.73			

DISCUSSION

The Grit-S has consistently been shown to have strong psychometric properties in numerous validation studies involving various cohorts of participants, such as the National Spelling Bee competitors in the US, cadets at the US Military Academy, as well as among university students (2). Among students in Poland, China and the Philippines, this questionnaire has also been proven to be a valid and reliable tool for assessing grit (25-27). The Grit-S was created to evaluate the perseverance and passion for long-term goals, and its validation study was conducted among various cohorts of students (28-30). However, the literature on grit among medical students was scarce, especially in Malaysia.

In her validation study among Military Academy cadets, high school students and National Spelling Bee competitors in the US, Duckworth et al. confirmed a two-factor structure for the Grit-S (2). In our study, the EFA revealed a two-factor structure of the Grit-S, named COI and POE. The two-factor structure was also consistent with prior validation studies in Poland (26), Russia (31), China (27,32), Spain (28), and Mexico (33). All these studies supported Duckworth's two-factor model, consisting of COI and POE (2). The Grit-S two-factor structure is consistent across many cultures, implying that it is universal (34).

Most of the Grit-S validation studies retained all eight items of the scale (30,35). However, similar to our study, several other studies found item 2, "Setbacks don't discourage me", problematic (9, 36-38). These studies were conducted among US high school students and Malaysian undergraduate students (9, 37, 38). In their study, Tan et al. conducted a CFA among a cohort of Malaysian undergraduate students. The CFA supported the elimination of item 2 (9), which was similar to the findings from Muenks et al. (37). Other research looking at the structure of the Grit-S in different cultures had found this item to be troublesome (36). In Hachimonji et al.'s study, item 2 loaded on a different factor than the original Grit-S (36). Item 2, which originally belonged to the POE domain, loaded onto the COI domain when tested among a cohort of Latino high school students (36). In the present study, this item was eliminated since it had a factor loading of less than 0.30. The medical students, whose first language was Malay, might have interpreted item 2 differently from a native English speaker. Item 2 contains the word 'setbacks', which may make it difficult for non-native English speakers to understand its meaning and nuance. This item also contains two opposing words in 'don't discourage', which could have made it difficult for the students to understand. A recent local publication, however, reported that the Malay-translated item 2 remained problematic when tested among Malaysian undergraduate students. This item was cross-loaded onto both factors; thus, the author recommended removing it from the Malay-translated Grit-S (38). The finding from this study demonstrated that translation to Malay did not improve the psychometric properties of item 2. As a result of these findings, we recommend either rewording or modifying the structure of this item to make it easier for respondents to understand.

The Grit-S scale is reliable from previous studies conducted in various cohorts, such as adolescents in China, university students in Spain, and university students in Germany, with Cronbach's alpha values ranging from 0.75 to 0.80 (27, 28, 30). In this cohort of medical students, the reliability of the 7-item Grit-S scale was assessed using internal consistency and the test-retest reliability. Item 2 loaded onto

the POE subscale. Including item 2 in the internal consistency analysis for this subscale resulted in a lower Cronbach α (0.63) than when this item was removed (α= 0.75). Furthermore, the analysis showed an improved internal consistency for the overall scale after removing item 2, with a Cronbach α of 0.73. The Cronbach α for the initial 8-item scale (with item 2) was 0.69, thus, supporting the removal of item 2.

Strength, Limitations, and Implications for Future Research

This study produced a valid and reliable 7-item Grit-S, which can be used for future research in Malaysia. This validated scale can be used to assess grit among university students in Malaysia, especially medical students. Grit is associated with academic success, medical training retention, and other positive psychological outcomes, such as protecting against burnout (5, 8, 39). Thus, future research may utilise this scale to determine the association between grit and these positive outcomes among medical students in Malaysia. Grit is a trait that can be enhanced (3); thus, future studies may look at factors associated with grit. Studying these factors would allow targeted intervention to improve grit and achieve positive educational and psychological outcomes. This study hypothesised that item 2 was dropped, most likely due to poor wording and structure. Thus, future studies should consider rephrasing this item. Following this, the validity of the Grit-S should also be reassessed.

This study had several limitations. This study only included year-4 medical students from one institution, where most participants were of Malay ethnicity, which would limit the generalizability of the findings to other university students in Malaysia as they have a more varied population. Our study utilised EFA to determine the construct validity. EFA is generally used to discover the factor structure of the questionnaire. CFA and Rasch Model Analysis could not be performed to further support the findings of this study due to the need for a bigger sample size and the limited time frame given to complete this study. This study's findings should be further confirmed with CFA and Rasch Model Analysis in future research.

CONCLUSION

The two-factor solution with seven items was the best structure for the Grit-S when tested among Malaysian medical students. This 7-item Grit-S is a valid and reliable tool to measure the level of grit among medical students in Malaysia, whose Malay is the first language.

ACKNOWLEDGEMENTS

The authors would also like to thank the participants for their willingness to participate in this study.

ETHICAL APPROVAL

This study was conducted following the Declaration of Helsinki. Ethical approval was obtained from the Research Ethics Committee of Universiti Teknologi MARA (600-TNCPI (5/1/6). The authors obtained informed consent from all participants involved in the study.

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