

## **PSYCHOMETRIC PROPERTIES OF GRIT SCALE AND EMOTION REGULATION QUESTIONNAIRE FOR STUDENT TEACHERS**

Yin Nwe Aung<sup>1</sup>, Su Myat Aye<sup>2</sup>

### **Abstract**

The primary purpose of the study is to investigate the number of items and the dimensions of grit scale and emotion regulation questionnaire for student teachers. Descriptive survey research method was applied and quantitative data analysis was executed in this study. For grit scale, three instruments were used with 30 items. For emotion regulation questionnaire, two instruments were used with 42 items. A total of 1185 student teachers from teacher institutions (539 males and 646 females) were randomly selected. Student teachers in Sagaing Region, Mandalay Region, Shan State, Magway Region, Yangon Region, Kayin State and Mon State were examined. And then, exploratory factor analysis (EFA) was used to investigate the number of items and the dimensions of the scale. It was also used to reduce data to a smaller set of summary variables and to postulate that there is a smaller set of unobserved (latent) variables or constructs that underlie the variables that actually were observed. Confirmatory factor analysis (CFA) is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs. CFA was conducted to determine the existing structure of the scale and to test how the variables are related to underlying constructs. For grit scale, two subscales (perseverance of effort and consistency of interest) were used with 14 items. For emotion regulation questionnaire, two subscales (cognitive reappraisal and expressive suppression) were used with 21 items.

**Keywords:** grit, emotion regulation and student teachers

### **Introduction**

Modern technological advancements and the globalization of culture have profoundly altered people's lifestyles and raised the bar for success in life. With respect to Duckworth et al., (2007), a grit person is able to persevere through disappointments and failures in order to achieve a goal. Grit is viewed as a common quality across leaders and a critical prerequisite for success and genius in all areas (Duckworth et al., 2007; Duckworth & Yeager, 2015). In the educational community, grit reinforcement may be crucial for developing students' character and maximizing their potential. According to Gratz and Roemer (2004), emotion regulation is the term used to describe autonomic and cognitive processes that work together to affect the expression, intensity and duration of emotions. The capacity to manage one's experience and expression of emotions is known as emotion regulation (Gross, 2002). Due to their lack of participation in specific learning activities, student teachers may need to learn how to control a range of emotions in the classroom. The quality of life of student teachers can be significantly improved by their capacity to adjust to changes in their lives or deal with challenging circumstances.

### **Purpose of the Study**

The main purpose of the study is to investigate the number of items and the dimensions of the Grit Scale and the Emotion Regulation Questionnaire for student teachers.

### **Definitions of Key Terms**

**Grit.** Grit is defined as perseverance and passion for long-term goals (Duckworth et al., 2007).

**Emotion regulation.** Emotion regulation is a process through which people manage their thoughts and behaviours given an emotion-eliciting event (Gross & John, 2003).

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**Student teachers.** Student teachers are individuals engaged in a phase of supervised practice within their teacher preparation programs and implement theoretical knowledge in actual classroom environments to enhance their teaching abilities (Darling-Hammond, 2006).

## **Review of Related Literature**

### **Grit**

According to Duckworth and Quinn (2009), grit is the tenacity and enthusiasm combined with a desire to achieve long-term objectives. Two first-order characteristics, perseverance and passion, combine to form the higher order construct known as grit. Numerous students struggle in their courses and institutions due to a lack of persistence and/or a desire for long-term goals. Perseverance in effort was linked to learning strategies that encourage self-regulated, engaging academically, and university performance (Hodge et al., 2017); on the other hand, to be consistent interest was linked to a lower chance of major changes and a lower intention to change careers among university students (Akos & Kretchmar, 2017; Bowman et al., 2015). The person actively looks for other courses of action in response to setbacks and barriers. Put simply, over extended periods of time, a hardworking person strives to consistently advance in the direction of their area of great interest.

### **Emotion Regulation**

According to Gross (2002), emotion regulation refers to the techniques we use to manage the feelings we feel, interact with and express. According to Gross (2001), emotion regulation refers to a person's ability to control the types of emotions they feel, recognize when they arise, and modify how they express themselves. The technique of managing and altering one's own or other people's emotions is known as emotion regulation. According to Huang and Guo (2001), this process involves a specific approach and method that results in a shift in the expression of behavior, physiological activity, subjective experience, and other aspects of emotion. As a result, the process of changing an emotion's latent period, its occurrence time, duration and manifestation in behavior, psychological experience, physiological response and other factors are all included in the regulation of emotions. This procedure is dynamic (Chen, 2016).

## **Method**

### **Research Design**

Simple random sampling method was used in this study.

### **Participants of Study**

A total of 1185 student teachers (539 males and 646 females) in Sagaing Region, Mandalay Region, Shan State, Magway Region, Yangon Region, Kayin State and Mon State participated in this study.

### **Instrumentation**

In order to study the Grit Scale of student teachers, the instrument adapted from the Grit Scale (Grit- O) developed by Duckworth et al. (2007), the Triarchic Model of Grit Scale (TMGS) developed by Datu et al. (2017) and the Multi-Dimensional Scale of Grit (MDSG) developed by Singh and Chukkali (2021) were used. Total number of items in the Grit Scale is 30 items.

In order to study the Emotion Regulation Questionnaire, the Emotion Regulation Questionnaire (ERQ) developed by Gross and John (2003) and the Difficulties in Emotion Regulation Scale (DERS) developed by Gratz and Roemer (2004) were applied. Total number of

items in the Emotion Regulation Questionnaire is 42 items. These items are measured on 4 point Likert scales such as 1 (Strongly Disagree), 2 (Disagree), 3 (Agree) and 4 (Strongly Agree).

### Procedure

Firstly, the related literature was studied through intensive reading from a variety of sources such as books, journals, thesis, research papers and internet sources. Next, research instruments were prepared under the guidance of the supervisor to collect data. In order to validate the prepared instruments, expert reviews were requested. According to the validation of the experts, pilot testing was carried out to assess the reliability coefficients of the respective questionnaires. After that, data collection was done and the researcher analyzed the received data.

### Exploratory Factor Analysis (EFA) of the Grit Scale

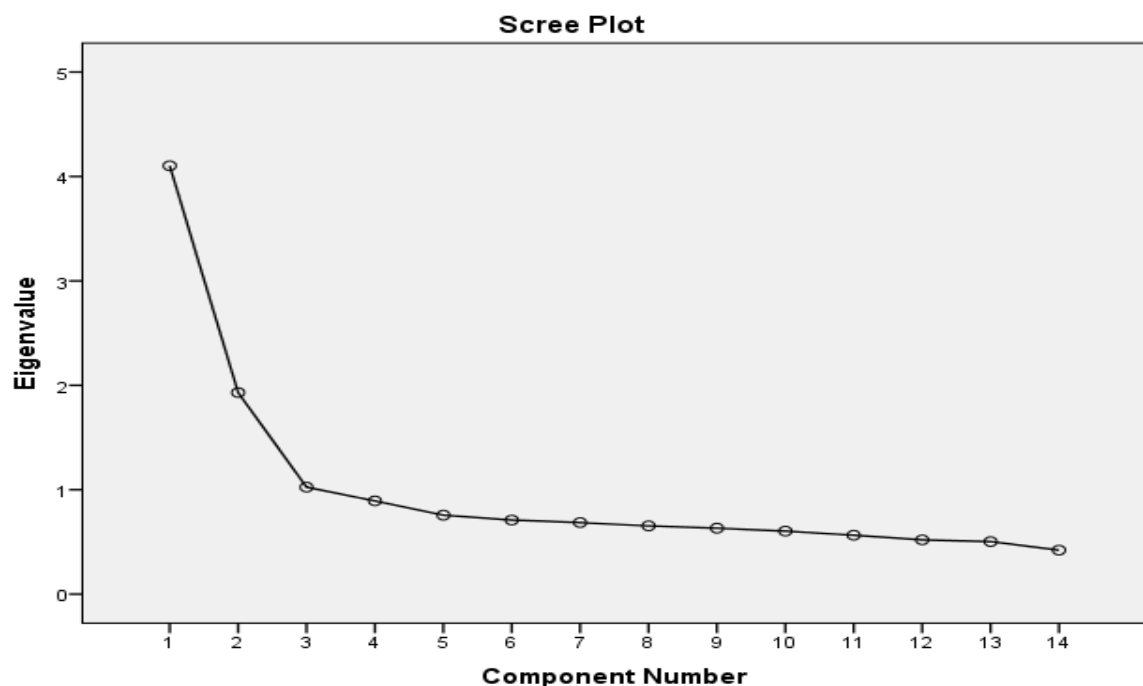
Firstly, exploratory factor analysis was conducted with 30 items for grit and some of the results in Extraction of Communalities were found unsatisfactory. Thus, 16 items were excluded from 30 items and 14 items were finally used to continue the subsequent procedures.

Next, Kaiser-Meyer-Olkin (KMO) and Bartlett's test were used for data analysis.

**Table 1 KMO and Bartlett's Test of the Grit Scale**

|                                                        |                    |             |
|--------------------------------------------------------|--------------------|-------------|
| <b>Kaiser-Meyer-Olkin Measure of Sampling Adequacy</b> |                    | <b>.867</b> |
| <b>Bartlett's Test of Sphericity</b>                   | Approx. Chi-Square | 3753.885    |
|                                                        | Df                 | 91          |
|                                                        | Sig.               | .000        |

According to Table 1, the KMO value of 14 items was 0.867; it was greater than 0.60 that is indicating sufficient items for each factor. The Bartlett's test was found to be significant. This meant that the variables were highly correlated enough to provide a reasonable basis for factor analysis. Thus, the data from grit were appropriate to run EFA. To calculate eigenvalue, a scree plot method was used. The result was shown in the following Figure 1.



**Figure 1** Scree Plot of the Grit Scale

One of the reasons for running a factor analysis in this study is to reduce the large number of variables that describe a complex concept such as grit to a few interpretable latent variables (factor). Based on Figure 1, eigenvalues of two factors were found to be greater than one.

**Table 2 Factor Loadings for the Grit Scale**

| Item Numbers | Factor |      |
|--------------|--------|------|
|              | 1      | 2    |
| T_21         | .719   |      |
| T_7          | .693   |      |
| T_20         | .678   |      |
| T_16         | .674   |      |
| T_25         | .673   |      |
| T_8          | .658   |      |
| T_23         | .644   |      |
| T_28         | .630   |      |
| T_4          | .543   |      |
| T_17         |        | .654 |
| T_29         |        | .652 |
| T_30         |        | .600 |
| T_14         |        | .585 |
| T_18         |        | .576 |

After factor rotation, the number of items for each factor was determined. The first factor, Perseverance of Effort (P) included 9 items with factor loadings ranging from .72 to .54 and the second factor, Consistency of Interest (C) included 5 items with factor loadings ranging from .66 to .58. With these factor loading values of the items, the Grit Scale indicated a good result. If the factor loading value of the item is 0.5 or higher, it is an indicator of a good result (Taherdoost et al., 2014).

### **Confirmatory Factor Analysis (CFA) of the Grit Scale**

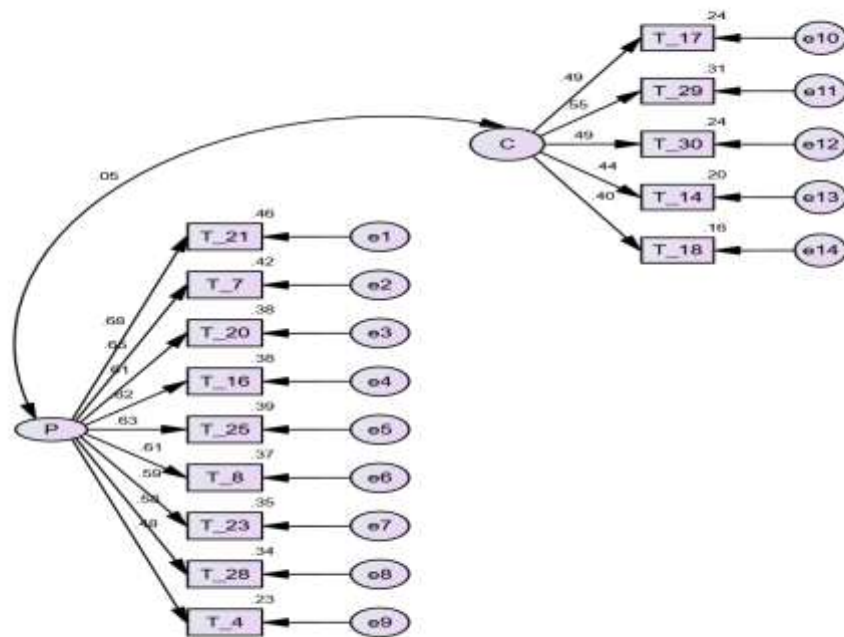
Confirmatory factor analysis (CFA) is a multivariate statistical procedure that is used to test how well the measured variables represent the number of constructs.

**Table 3 Model Fit Indices of Grit Factors**

| Chi-square | p-value | Df | CMIN/Df | CFI  | NFI  | GFI  | AGFI | RMSEA |
|------------|---------|----|---------|------|------|------|------|-------|
| 544.341    | < .001  | 76 | 2.894   | .925 | .912 | .907 | .905 | 0.047 |

If the CFI, NFI, GFI and AGFI values are higher than 0.9 (Schumacker & Lomax, 2004), the model fit is acceptable. If RMSEA value is  $\leq .06$ , it could be considered acceptable (Hu & Bentler, 1999), and the data fit to the model. If the CMIN/DF value is  $\leq 3$  it indicates an acceptable fit (Kline, 1998). If the CMIN/DF value is  $\leq 5$  it indicates a reasonable fit (Marsh & Hocevar, 1985) and similarly, CMIN/Df (Chi-square/Df) was not exceeded 3, the data fit to the

model (as cited in Al-Mamary, Shamsuddin, 2015). Therefore, the model fit psychological flexibility with 14 items for the measurement grit of student teachers. The confirmatory factor analysis of the Grit Scale was expressed in Figure 2.



**Figure 2** The Confirmatory Factor Analysis of the Grit Scale

And then, the evaluated fit indices were also calculated. These indices involved the unstandardized estimates (b), standard errors (S.E), critical ratio (C.R) and standardized estimates ( $\beta$ ). At the significant level of 0.05, the magnitude of C.R is higher than 1.96, it could be considered as significant (as cited in Arbuckle, 2012). The significant level ( $p$  values) and  $R^2$  values were also calculated.

### Convergent Validity of the Grit Scale

Convergent validity is also an evidence to test construct validity. To establish convergent validity, factor loadings of the indicator variables, composite reliability (CR) and average variance extracted (AVE) were used.

**Table 4** Composite Reliability (CR) and Average Variance Extracted (AVE) of Grit Scale

| Factors                 | Number of Items | CR   | AVE  |
|-------------------------|-----------------|------|------|
| Perseverance of Effort  | 9               | 0.81 | 0.37 |
| Consistency of Interest | 5               | 0.85 | 0.28 |

The AVE values range from 0.28 to 0.37. The CR values range from 0.81 to 0.85. According to Hunang et al. (2013), AVE should be above 0.5 and CR should be 0.7 and above. stated that if AVE values were below the acceptable minimum cutoff point of 0.5, convergent validity may be adequate because all latent factors had CR values above 0.7 (as cited in Hamid et al., 2017). So, grit scale was assumed that it was a valid instrument to measure the grit of student teachers.

### Discriminant Validity of the Grit Scale

Discriminant validity was used to show that the construct is actually differing from one another empirically. Discriminant validity was evaluated with square root of AVE with correlations of latent constructs.

**Table 5 Square Root of AVE with Correlations of Latent Factors of the Grit Scale**

| Factors                 | Perseverance of Effort | Consistency of Interest |
|-------------------------|------------------------|-------------------------|
| Perseverance of Effort  | <i>0.61</i>            |                         |
| Consistency of Interest | 0.017                  | <i>0.53</i>             |

The diagonal numbers *in italic* are the square root of AVE values

According to Table 5, all the square root of AVE values was greater than 0.5 and these values were greater than all the inter-latent factor correlations for all factors in the relevant rows and columns. Thus, the results of the discriminant validity of grit were congruent with Hair et al. (2011). Overall, discriminant validity can be accepted for the measurement model and the discriminant validity between the constructs.

### Reliability Coefficients of Grit Scale

**Table 6 Number of Items and Reliability Coefficients in Each Subscale of the Grit Scale**

| Subscales               | Number of Items | Cronbach's Alpha |
|-------------------------|-----------------|------------------|
| Perseverance of Effort  | 9               | .823             |
| Consistency of Interest | 5               | .769             |
| Total                   | 14              | .854             |

Based on Table 6, reliability coefficient of each subscale ranged from 0.769 to 0.823. Thus, the Grit Scale was reliable to measure the grit of student teachers.

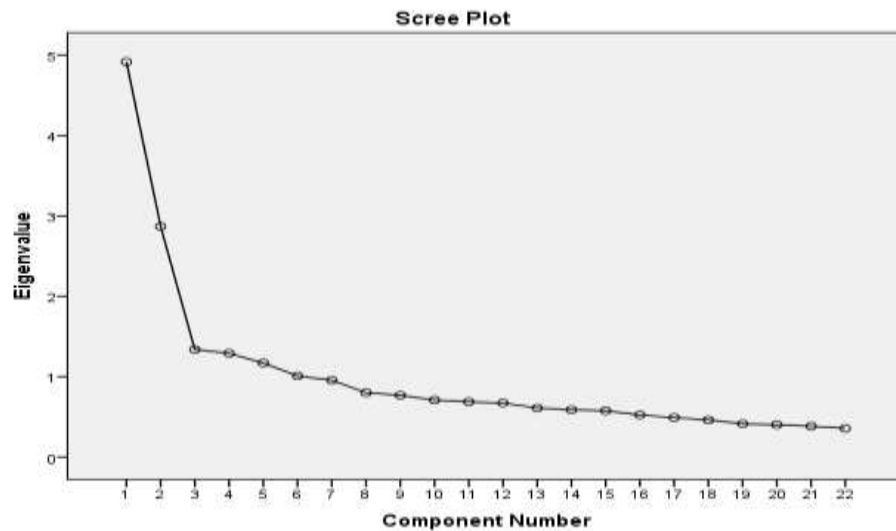
### Exploratory Factor Analysis of the Emotion Regulation Questionnaire

Exploratory factor analysis was conducted with 42 items for emotion regulation and some of the results in Extraction of Communalities were found unsatisfactory. Thus, 20 items were excluded from 42 items and 22 items were finally used to continue the subsequent procedures.

**Table 7 KMO and Bartlett's Test of the Emotion Regulation Questionnaire**

|                                                 |                    |          |
|-------------------------------------------------|--------------------|----------|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy |                    | .843     |
| Bartlett's Test of Sphericity                   | Approx. Chi-Square | 6765.380 |
|                                                 | Df                 | 231      |
|                                                 | Sig.               | .000     |

The KMO value of the 22 items, as shown in Table 7, was 0.843; it was higher than 0.60, suggesting that there were enough items for each factor. It was determined that the results of the Bartlett's test were significant (Chi-square=6765.380, Df = 231,  $p < .05$ ). This indicated that there was sufficient correlation between the variables to give factor analysis a plausible foundation. Therefore, the emotion regulation data were suitable for running EFA. The scree plot approach was applied in order to compute the eigenvalue. Figure 3 below displayed the outcome.



**Figure 3** Scree Plot of the Emotion Regulation Questionnaire

Based on Figure 3, eigenvalues of six factors were found to be greater than one.

**Table 8** Factor Loadings for the Emotion Regulation Questionnaire

| Item Numbers | Factor |      |
|--------------|--------|------|
|              | 1      | 2    |
| E_35         | .685   |      |
| E_19         | .637   |      |
| E_37         | .631   |      |
| E_16         | .631   |      |
| E_11         | .628   |      |
| E_13         | .625   |      |
| E_33         | .597   |      |
| E_8          | .592   |      |
| E_18         | .580   |      |
| E_29         | .575   |      |
| E_24         | .573   |      |
| E_7          | .548   |      |
| E_31         | .525   |      |
| E_3          |        | .595 |
| E_14         |        | .569 |
| E_20         |        | .567 |
| E_39         |        | .566 |
| E_25         |        | .546 |
| E_4          |        | .531 |
| E_38         |        | .523 |
| E_23         |        | .507 |
| E_5          |        | .502 |

After factor rotation, the number of items for each factor was determined. The first factor, Cognitive Reappraisal (C) included 13 items with factor loadings ranging from .69 to .53 and the second factor, Expressive Suppression (E) included 9 items with factor loadings ranging from .60 to .50. The factor loading values of the item is 0.5 or higher, emotion regulation questionnaire is an indicator of a good result (Taherdoost et al., 2014).

### Confirmatory Factor Analysis of Emotion Regulation Questionnaire

Confirmatory factor analysis (CFA) is a statistical technique used to verify the factor structure of a set of observed variables.

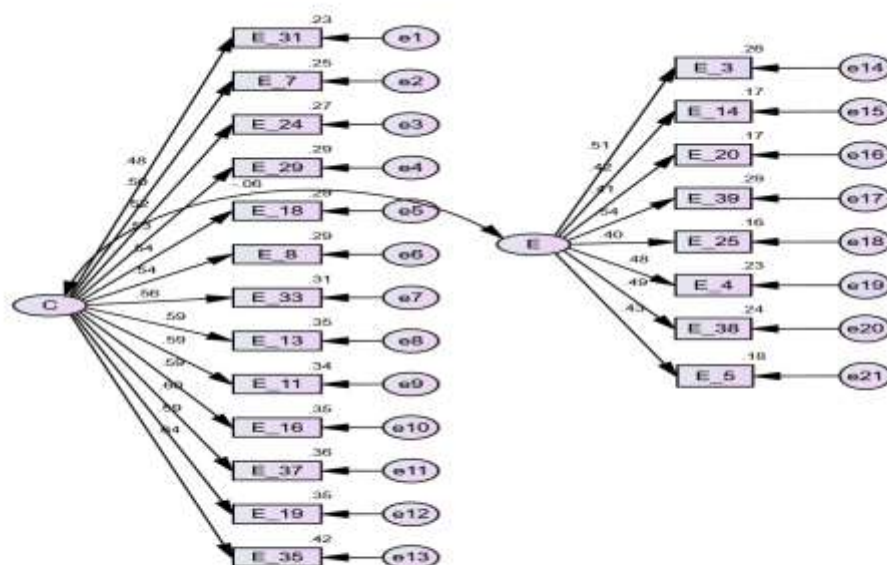
**Table 9 Model Fit Indices of Emotion Regulation Factors**

| Chi-square | <i>p</i> -value | Df  | CMIN/Df | CFI  | NFI  | GFI  | AGFI | RMSEA |
|------------|-----------------|-----|---------|------|------|------|------|-------|
| 2255.015   | < .001          | 228 | 2.978   | .862 | .811 | .849 | .873 | 0.044 |

If the CFI, NFI, GFI and AGFI values are higher than 0.90 (Hooper et al., 2008; Sumer, 2000) and CMIN/Df (Chi-square/Df) was not exceeded 3, the data fit to the model (as cited in Al-Mamary & Shamsuddin, 2015). Because of the above values of CFI, NFI, GFI and AGFI were low; the data do not fit to the model. However, Hooper et al. (2008) expressed that it is good to remove the items with low  $R^2$  values (less than 0.2) from the analysis to improve a better model fit. In the present analysis, one item that  $R^2$  value was less than 0.2 were removed from the study. Therefore, the Emotion Regulation Questionnaire included 21 items and the next model fit indices were shown in Table 10.

**Table 10 Next Model Fit Indices of Emotion Regulation Factors**

| Chi-square | <i>p</i> -value | Df  | CMIN/Df | CFI  | NFI  | GFI  | AGFI | RMSEA |
|------------|-----------------|-----|---------|------|------|------|------|-------|
| 1970.390   | < .001          | 188 | 2.693   | .948 | .925 | .912 | .911 | 0.041 |



**Figure 4** The Confirmatory Factor Analysis of the Emotion Regulation Questionnaire



Next, calculations were made for the assessed fit indices. The critical ratio (C.R.), standard estimates ( $\beta$ ), standard errors (S.E) and unstandardized estimates (b) were included in these indexes. When the coefficient of determination (C.R.) is greater than 1.96 at the 0.05 level of significance, it may be deemed significant (as stated in Arbuckle, 2012). Also computed were the  $R^2$  values and the significant level ( $p$  values).

### **Convergent Validity of the Emotion Regulation Questionnaire**

To prove convergent validity, factor loadings of the indicator variables, composite reliability (CR) and average variance extracted (AVE) were used.

**Table 11 Composite Reliability (CR) and Average Variance Extracted (AVE) of the Emotion Regulation Questionnaire**

| Factors                | Number of Items | CR   | AVE  |
|------------------------|-----------------|------|------|
| Cognitive Reappraisal  | 13              | 0.81 | 0.34 |
| Expressive Suppression | 8               | 0.74 | 0.29 |

According to Table 11, Fornell and Larcker (1981) stated that if AVE values were below the acceptable minimum cutoff point of 0.5, convergent validity may be adequate because all latent factors had CR values above 0.7 (as cited in Hamid et al., 2017). So, the Emotion Regulation Questionnaire was assumed that it was a valid instrument to measure the emotion regulation of student teachers.

### **Discriminant Validity of the Emotion Regulation Questionnaire**

Discriminant validity was evaluated with square root of AVE with correlations of latent constructs.

**Table 12 Square Root of AVE with Correlations of Latent Factors of the Emotion Regulation Questionnaire**

| Factors                | Cognitive Reappraisal | Expressive Suppression |
|------------------------|-----------------------|------------------------|
| Cognitive Reappraisal  | <i>0.58</i>           |                        |
| Expressive Suppression | 0.018                 | <i>0.54</i>            |

AVE values was represented by the diagonal numerals that are italicized.

Table 12 showed that for every factor in the pertinent rows and columns, the square root of the AVE values was larger than 0.5 and exceeded the inter-latent factor correlations for every component. As a result, both the measuring model's and the constructs' discriminant validity can be acknowledged.

### **Reliability Coefficients of the Emotion Regulation Questionnaire**

**Table 13 Number of Items and Reliability Coefficients in Each Subscale of the Emotion Regulation Questionnaire**

| Subscales              | Number of Items | Cronbach's Alpha |
|------------------------|-----------------|------------------|
| Cognitive Reappraisal  | 13              | .841             |
| Expressive Suppression | 8               | .734             |
| Total                  | 21              | .855             |

Based on Table 13, reliability coefficient of each subscale ranged from 0.734 to 0.841. Thus, the Emotion Regulation Questionnaire was reliable to measure the emotion regulation of student teachers.

### Conclusion and Suggestion

This study tried to investigate the psychometric properties of the Grit Scale with 30 items and the Emotion Regulation Questionnaire with 42 items for student teachers. These items are analyzed and reduced by calculating exploratory factor analysis and confirmatory factor analysis. After running these, 14 items were finally left in the Grit Scale and 21 items were left in the Emotion Regulation Questionnaire. The instruments for grit and emotion regulation are valid instruments to measure. And then, this study adapted the instruments which are reliable to find out the grit and emotion regulation of student teachers in Myanmar societies. So, these instruments should be used in the future researches of educational psychology fields.

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