



# Exploratory and Confirmatory Factor Analysis of PERMA for Indonesian Students in Mathematics Education Programmes

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**Abstract.** This study examined the validity and reliability of PERMA instruments to determine the nature of PERMA for Indonesian students in mathematics education programmes. A total of 274 students participated, selected by using cluster random sampling. A survey design was employed to investigate the factor structure of the PERMA. Quantitative data were analysed using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) using SPSS 23 and AMOS 18. EFA revealed similar structures from prior research and the present study. The CFA approach verified the questionnaire of PERMA was satisfactory for Indonesian students' context. This work concludes the PERMA of Indonesian university students have a five-factor structure. These findings imply the greater importance of validating and confirming the structure of students' PERMA relative to translating a construct into a different language.

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**Keywords:** *factor analysis, happiness, Indonesia, Mathematics education programmes, PERMA, validity.*

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## Introduction

Nowadays, people across the world are in the pursuit of happiness (Diener, 2000; Seligman & Csikszentmihalyi, 2000). Many ways are done to achieve happiness; training our brain of happiness, spending money to trigger happiness, and following the sign of. Most people consider that they understand what happiness is. However, many people do not know the actual elements on the promotion of happiness. Seligman's (2011) theoretical framework of happiness; Positive Emotion, Engagement, Relationship, Meaning, and Accomplishment (PERMA) helps people comprehend the elements of happiness and what to be done to achieve happiness in life. The model included five main domains of psychological well-being and happiness. Seligman made this model and believed the model help people achieve a life with fulfilment, happiness, and meaning (Seligman (2011). Surprisingly, some researchers reported that university students dissatisfied with their life (Ghazwin et al., 2016; Kumar, 2016), for example, engineering student have depression (25%), anxiety (32%) and stress (20%); social science students have depression (21%), anxiety (30%) and stress (17%); medical students have depression (25%), anxiety (34%) and stress (23%). Empirically, Kern, Waters, Adler, and White (2014) evidenced that someone who tend to have higher wellbeing factors (PERMA) are likely to hold greater physical health, life satisfaction, and professional thriving (job satisfaction and organizational commitment).

Forgeard, Jayawickreme, Kern and Seligman (2011) stated that the model settles some perspectives in regard to the measurement and theory on the wellbeing which brings together the domains of both eudemonic such as living a purposeful life and hedonic such as living a joy and pleasure. Even though every domain of PERMA can be achieved individually, the inter-correlation among the domains is significant for the model. A positive relationship can have a great contribution to feelings of positive emotions and achieving a sense of accomplishment in life can contribute to meanings. People can utilize PERMA to foster their sense of well-being by concentrating to feel good, live meaningfully, develop great relationships, accomplish purposes and be engaged with life (Jones, Scholes, Johnson, Katsikitis, & Carras, 2014). The interrelation of the PERMA domains addresses improvement to a higher order construct of well-being to predict flourishing.

Interestingly, Clarke (2013) stated that differences in cultural backgrounds are becoming progressively noticeable. Many studies about PERMA including the development of the framework emerged across time and places, the question of what exactly promotes well-being for happiness keeps open for discussion. Recent studies have updated the discussion and provided evidence on the validity and reliability issue related to PERMA in different setting (Baltzell, Akhtar, McCarthy, Hurley & Martin, 2014; Coffey, Wray-Lake, Mashek & Branand, 2016; Kern, Waters, Adler, & White, 2014). According to Chamberlin (2010), the current research indicates that the instruments predominantly employed in international comparative research to measure students' PERMA are generally based on

those of students from Western cultures. Much of the beginning studies had a unidimensional approach where researchers were keen to identify individual factors that were main indicators of well-being (e.g., Csikszentmihalyi, 2008; Fredrickson, 2001; Steger, Frazier, Oishi & Kaler, 2009). With that foundation, PERMA should be a basic model for another developmental framework in regards to cultural and social differences from one place to another place. Extant literatures indicate that a comparative study is important to test if the generally accepted instruments for PERMA are universal. Empirical research has also revealed that the reliabilities of PERMA instruments diverge across countries. To our knowledge, the reliability and validity of PERMA instruments for Indonesian context have not been tested. Therefore, the current research aimed to determine the validity and reliability of the PERMA-profiler instrument adopted from Butler and Kern (2016). The objective of the current study is to examine reliability and validity of PERMA instruments for Indonesian context. This study is guided by two research questions: 1. Does the six-factor correlated structure of the PERMA-profiler instrument optimally fit data in the Indonesian context? 2. Is the PERMA-profiler instrument reliable and valid for measuring students' PERMA in the Indonesian context?

## Literature Review

To flourish in life is to have good feeling and to get functional in an effective way, both of which join to produce quality of well-being (Seligman, 2002). Huppert and So (2013) stated that to flourish is not only about problem free; flourishing is the antonym of mental disorder rather than only its absence. In the Authentic Happiness theory, Seligman placed that happiness (e.g., well-being) can be meant positive emotion, engagement, and meaning. Although this theory has been discussed in many empirical researches (e.g., Headey, Schupp, Tucci, & Wagner, 2010; Park, Peterson, & Ruch, 2009; Vella-Brodrick, Park, & Peterson, 2009), Seligman later added two additional factors to include in the theory which then is known as relationships and accomplishment (Seligman, 2011). He concluded that the aim of well-being theory is to enhance flourishing by encouraging five pathways involving positive emotion, engagement, relationship, meaning and accomplishment. Interestingly, as a latest model, the prior research has updated the discussion and provided robust evidence on the validity and reliability issue related to well-being theory's, PERMA model in different settings (see Butler & Kern, 2016; Coffey, Wray-Lake, Mashek & Branand, 2016; D'raven & Pasha-Zaidi, 2016; Kern, Waters, Adler, & White, 2014) since differences in cultural backgrounds are becoming progressively noticeable (Clarke, 2013).

The pathway of positive emotion is also used in authentic happiness theory and well-being theory (Seligman 2002, 2011). A component of the PERMA model which helps an individual in broadening available options to maximize resources and invite novel thoughts, activities and relationships (Seligman, 2011). Positive emotion is the feeling

of happiness, joy, cheer, and contentment. An appropriate level of good emotion could include feelings of intense pleasure. Having experience of good or positive emotions is the primary purpose of people all over the world (Diener, 2000). Smedema et al., (2015) in their study in college of disable students revealed that feelings of positive affect were significantly related to whole life satisfaction. In other words, college students' feeling of strong positive emotions are more likely to absorb a deeper learning. With the feeling of positive emotions and the absorb of a deeper learning, the students will result in a better academic achievement. Positive emotion assists to envision goals and challenges, open the mind to thoughts and problem-solving, protect health by fostering resiliency, generate attachments to significant others, lay the groundwork for individual self-regulation, and guide the behaviour of groups, social systems, and nations (Pekrun, Goetz, Titz & Perry, 2002).

Although the pathway of engagement is rarely defined with other variables (Brodie, Hollebeek, Juric, & Ilic, 2011), it refers to absorption and interest within the PERMA model (Kern, Waters, Adler & White, 2015; Seligman, 2011). Engagement is defined as the connection of someone's feeling to the activities that he/she does as well as feelings of being connected to the activities (Seligman, 2011). A high level of engagement in an activity is associated with the overall feeling of being in the spot of engagement. In many studies, engagement has been proven as the most powerful part in improving positive affect and satisfaction in life (Gabriele, 2008; Ruch, Harzer, Proyer, Park & Peterson, 2010; Vella-Brodrick et al., 2009). Engagement is considered to foster college students' academic process (DuPaul, Pinho, Pollack, Gormley & Laracy, 2015; Engeser, Rheinberg, Vollmeyer & Bischoff, 2005). Moreover, engagement may reflect an active approach to life (Kern, Waters, Adler & White, 2015) mentally and physically which could be psychological, cognitive and behavioural (D'raven & Pasha-Zaidi, 2016).

The pathway of relationship is a feeling socially integrated, cared about and supported by others, and satisfied with one's social connections (Seligman, 2011), feeling loved and valued (Forgeard et al., 2011) and feel a sense of belonging (Doyle, Filo, Lock & Funk, 2016). Positive relationship is defined as someone's feeling of being cared by other individuals (Seligman, 2011). It includes the feeling of being connected, loved by sharing emotions. Relationships in a close manner are aim to mark a fundamental need of well-being (e.g., Peterson, 2006). A study by Diener and Oishi (2000) informed that positive relationship with other people was the predictor of happiness. College students who positive relationships and who socialize well tend to become happier than the students who do not have the condition (Diener & Seligman, 2002).

The pathway of meaning has been defined in terms of believing that one's life is worthwhile and feeling connected to something greater than oneself (Seligman, 2011) or one's purposeful existence in the world (Damon, Menon, & Bronk, 2003; Lee, Krause & Davidson, 2017), which comes from strengths and engagement (Steger 2012). For Seligman (2011), meaning is the sense of valuable life and having connected to something

greater. People have to have meaning in life because of the sense of fulfilment it gives resulting a life worth living. A higher sense of meaning has been informed to have positive association with life satisfaction (e.g., King, Hicks, Krull & Del-Gaiso, 2006) as well as academic achievement for students (DeWitz, Woolsey, & Walsh, 2009).

Accomplishment is a person's perception of having progress achieving his/her goal and the feeling of obtaining the achievement (Seligman, 2011), the desire of achieving something. Levasseur, Desrosiers, and Whiteneck (2010) informed that having sense of accomplishment in social participation was related to some number positive results; health, life quality, and well-being, and quality of life. Accomplishment is also about a sense of working toward and attaining goals, mastery, and efficacy to complete tasks (Butler & Kern, 2016), acquire knowledge, and experience self-efficacy (D'raven & Pasha-Zaidi, 2016). Interestingly, accomplishment is highly associated with meaning. Doyle et al., (2016) state that someone who experiences accomplishments is likely to derive an increased sense of meaning.

Studies supporting PERMA model is still in the basic steps with various results. The research still analyses PERMA's domain and relationship between factors (Arvig, 2006; Baltzell, Akhtar, McCarthy, Hurley & Martin, 2014; Coffey, Wray-Lake, Mashek & Branand, 2016; Kern, Waters, Adler, & White, 2014). Some present studies discussed the validation of structure with higher order of PERMA and its predictive validity through results in two kinds of research sample, college students and social communities. Both studies informed that PERMA stably predicted flourishing in either the student or communities (Coffey, Wray-Lake, Mashek & Branand, 2016). In research of role satisfaction which participants were coaches of high schools, three PERMA domains, positive emotion, engagement, and accomplishment were significant. However, positive relationships and meaning were not significant which can be understood that relationships and meaning were not related to the satisfaction of the coaching lives. This was a contradicting result with their previous qualitative result with the same participants which elaborated that their relationships with players delivered a positive impact of meaning and satisfaction (Baltzell et al., 2014).

Another study by Kern, Waters, Adler, and White (2015) revealed that positive association of significance between PERMA factors with health, satisfaction of life and job when the five domains were separately associated with flourishing. Previously, they analyzed only four out of five PERMA domains; meaning was not included in the study with teenagers as the respondents (Kern et al., 2014). The results emerged because the study was conducted with measurement limitation and the teenagers may gain meaning from other association. The finding was actually consistent with the previous findings by Arvig (2006) who addressed the study to persons with disabilities, which informed that engaging in meaningful relationships with providing the great deal of meaning. These results collectively contribute to the theoretical and practical understanding of the PERMA model of well-being and happiness in both a college setting and with a more

diverse community-based sample. In addition, the model should always be developed across time and culture within the setting. In order to enrich the model in the context of developing countries, this current research is offered aiming to determine the validity and reliability of the PERMA instrument of Indonesia.

## Methodology

**Participants and Procedure.** The current research follows a survey research design (Cohen, Manion, & Morrison, 2007; Creswell, 2012; Fitzgerald, Rumrill, & Schenker, 2004; Fraenkel & Wallen, 2009). Cross-sectional survey research designs are procedures in quantitative research that provide the opportunity to administer a survey to a sample or to an entire population of people to describe the attitudes, opinions, behaviours or characteristics of the population (Creswell, 2014). The population of the current research consists of students in a mathematics education programme in Indonesia. Given that the present study selects groups rather than individuals, cluster random sampling was suitable (Fraenkel & Wallen, 2009). The participants comprise 274 students in a mathematics education programme in Riau Province, Indonesia. Female participants were 257 (93.8%), and male participants were 17 (6.2%). Respondents were from 18 to 22 years old. The gender disproportion in the departments of the mathematics education programmes resulted in a large proportion of female participants. Targeted students included those from first to fourth year in 2017/2018. First year students numbered 24 (8.8%), second year participants were 141 (51.5%), third year students were 102 (37.2%), fourth year students were 4 (1.5%) and fifth year students were 3 (1.1%). All selected universities completed the survey during lecture hours which was voluntary. They also completed 15 items in PERMA questionnaire.

**Measures.** The questionnaire used was adopted from Butler and Kern (2016) consisting of five domains classified into positive emotion, engagement, relationship, meaning and accomplishment. Each sub-construct has three items per PERMA domain; positive emotion (example; in general, how often do you feel joyful?); engagement (example; How often do you become absorbed in what you are doing?); relationship (example; To what extent do you receive help and support from others when you need it?); meaning (example; in general, to what extent do you lead a purposeful and meaningful life?); and accomplishment (example; How much of the time do you feel you are making progress toward accomplishing your goals?). A ten-point scale ranging from 1 (never) to 10 (completely) was used in the PERMA-Profiler.

**Data analysis.** Prior to further analysis, the current research also considered numerous issues related to data screening, such as handling missing data, multicollinearity and identification of outliers and normality using the Statistical Package for the Social Sciences (SPSS) 23.0 program. Outliers were identified by a box plot for each sub-

construct. For the univariate normality of a construct in a measurement model for a latent variable, the benchmark was that the skewness and kurtosis values for each item were in the range of -1.96 to +1.96 at 0.05 significance level (Hair, Black, Babin, & Anderson, 2010). Multicollinearity was noted if the correlation matrix with correlations was more than 0.90 (Kline, 2005). Subsequently, data in the present study were analysed in two steps. First, EFA was undertaken to determine the structure of the students' PERMA. Second, CFA was conducted to investigate whether the established dimensionality and factor-loading pattern fitted the Indonesian context.

EFA was performed using SPSS version 23.0 to explore how many factors are present, whether the factors are correlated and which observed variables appear to best measure every single factor (Schumacker & Lomax, 2010). This study identified the Kaiser–Meyer–Olkin (KMO) value, Bartlett's value, factor loading, eigenvalue, scree plot and varimax rotation. The KMO index lies between 0 and 1, with values greater than 0.50 considered appropriate for factor analysis (Chua, 2014), whereas scores over 0.80 were considered highly satisfactory (Frohlich & Westbrook, 2001). Bartlett's Test of Sphericity was significant ( $p < 0.05$ ). For Hair et al. (2010), an overall value of factor loading for each item over 0.50 was significant to confirm the meaningfulness of the questionnaire. Eigenvalue and scree plot also indicated the proportion of variance contribution extracted by each factor through factor analysis (Chua, 2014), where factors with an eigenvalue lower than 1.0 were removed from the factor list. To examine whether the established dimensionality and factor-loading pattern fitted the Indonesian context, CFA using AMOS 18.0 was applied to the second sub-sample. Awang (2012) indicated that goodness of fit was evaluated by employing chi-square ( $\chi^2$ ) ( $P > 0.05$ ), Comparative Fit Index ( $CFI > 0.90$ ), Tucker Lewis Index ( $TLI > 0.90$ ) and Root Mean-Square Error of Approximation ( $RMSEA < 0.08$ ). Cronbach's alpha coefficients, composite reliability (CR) and average variance extracted (AVE) were calculated to ascertain the reliability of the instrument (both total and sub-constructs) and the split-half correlations. Alpha values in the present study were not expected to be high. According to Hair et al. (2010) alpha values of 0.60–0.70 are satisfactory in exploratory research. At the same time, the CR should be more than 0.60 and AVE should be over 0.50 (Awang, 2012).

## Results

***Preliminary analysis.*** The amount of missing data in the current research varied from 0 to 0.5% per item. Missing data were completely random (MCAR) (Kline, 2005). The means, standard deviations, correlation matrix, skewness and kurtosis for all variables are shown in Table 1.

Table 1.

*Correlation matrix, means and standard deviations*

Variable	1	2	3	4	5
1. Positive Emotion	1	.543**	.477**	.441**	.482**
2. Engagement		1	.373**	.395**	.478**
3. Relationship			1	.412**	.344**
4. Meaning				1	.565**
5. Accomplishment					1
Skew	-0.294	-0.617	-0.720	-0.0601	-.0531
Kurtosis	-0.364	0.365	0.511	0.694	0.642
M	7.66	7.60	7.74	7.87	7.69
SD	1.147	1.156	1.368	1.26	1.21

Note: \*\*Correlation is significant at the 0.01 level (two-tailed).

Results of a preliminary analysis of all the items of positive emotion, engagement, relationship, meaning and accomplishment reached univariate normality (skewness and kurtosis values are in the range of -0.720 to 0.694) (Table 1). In terms of multicollinearity, inter-correlations among the five PERMA' sub-constructs ranged from 0.344 to 0.565. Such outcome indicated that the discriminant validities of the variables were reached because the correlation matrix with correlations was lower than 0.90 (Kline, 2005).

**Exploratory factor analysis.** We start the EFA by considering all the 15 items measuring five aspects PERMA, namely, positive emotion, engagement, relationship, meaning and accomplishment. Each aspect was measured by three items. The statistical criteria in this study were satisfied. The KMO value for PERMA was 0.868 > 0.70, which provided information about the availability of an adequate number of items for each factor. Moreover, the value of Bartlett's Test of Sphericity [ $\chi^2 = 2832.92$ ;  $p < 0.001$ ] was significant, rejecting the null hypothesis that the correlation matrix was an identity matrix. The next step was to identify the values of the extraction communalities, eigenvalues, percentage of variances and factor loading.

Table 2 presents the detail of factor loading, communalities, eigenvalues and percentage of variances explained by the sub-constructs of PERMA. Firstly, the values of the extraction communalities represent the variance in each item calculated before and after the factor analysis. The values of such communalities for each item which were less than 0.50 were dropped from further analysis (Hair, Black, Babin, Anderson, & Tatham, 2006). Small values (<0.50) of the extraction communalities indicate that less than half of the variance in the item was considered in identifying the latent construct. In the current research, all item communalities ranged from 0.637 to 0.900, which exceeded the 0.50 level for adequate explanation. Next, a five-factor solution with eigenvalues over 1



emerged from the EFA, explaining 80.74% of the variance in total. The PERMA factors and their contributions were as follows: meaning, 45.32%; accomplishment, 11.32%; positive emotion, 10.16%; engagement, 7.15%; and relationship, 6.79%. The component matrix after varimax rotation was employed to identify the items that were more related to each factor. In the present study, all suggested 15 items for measuring PERMA were registered by high loading factors ranging from 0.668 to 0.898 (>0.50).

Table 2.

*Factor Loadings, Communalities, Eigenvalues and Percentage of Variances For PERMA*

Factor	Dimen- sions	Items	Communi- calities	Eigen- value	% of Variance	Components				
						1	2	3	4	5
PERMA	Positive Emotion	P12	0.866	1.524	10.159			0.859		
		P11	0.814					0.805		
		P13	0.650					0.731		
	Engagement	P22	0.764	1.072	7.148				0.801	
		P21	0.796					0.781		
		P23	0.777					0.836		
	Relationship	P31	0.763	1.019	6.791					0.840
		P32	0.637						0.668	
		P33	0.865						0.898	
	Meaning	P41	0.820	6.799	45.323	0.830				
		P42	0.868				0.868			
		P43	0.850				0.852			
	Accom- plishment	P51	0.897	1.698	11.322		0.829			
		P52	0.900				0.868			
		P53	0.842				0.859			

Another method to select the correct number of factors to be extracted is to investigate a scree plot (Figure 1). As shown in Figure 1, the scree plot suggests five factors that can be determined.

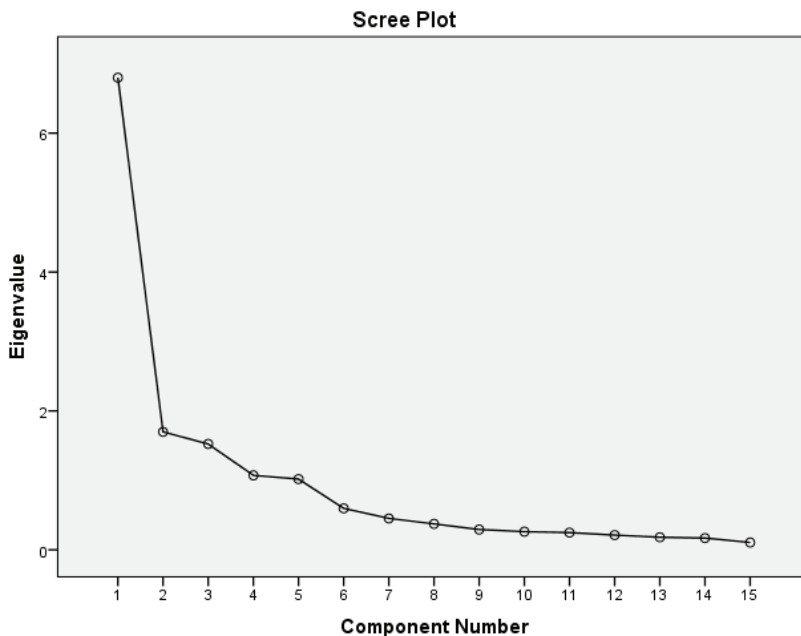


Fig 1. Scree plot of the 15 items for PERMA

**Confirmatory factor analysis: Testing the measurement models.** In this study, the EFA suggested a five-factor structure for PERMA, which were positive emotion, engagement, relationship, meaning and accomplishment. CFA was conducted to verify the factorial validity of the PERMA. CFA can provide further evidence regarding the fitness of the suggested model regarding the structure of the factors identified via EFA. The models were compared using chi-square ( $\chi^2$ ), CFI, TLI and RMSEA. Table 3 presents the model specifications for the post hoc CFA.

Table 3.

*Model Specifications for the Post Hoc Confirmatory Factor Analysis*

Parameter	Coefficient
$\chi^2$	153.116
$\chi^2/df$	1.914
RMSEA	0.058
TLI	0.966
CFI	0.974

Note.  $\chi^2$ : Chi-square goodness of fit; df: Degrees of Freedom; CFI: Comparative Fit Index; TLI: Tucker-Lewis fit index; RMSEA: Root Mean Square Error.

Table 3 shows that the CFA results using AMOS 18.0 program for the hypothesised five-factor model are excellent. The factor structure achieved acceptable model fit for the Indonesian context. The measurement model of PERMA in this study indicated acceptable model fit,  $\chi^2 = 153.116$ ,  $\chi^2/df = 1.914$ , RMSEA = 0.058, TLI = 0.966 and CFI = 0.974. Therefore, the model of CFA presented in Figure 2 is the finalised measurement model that indicated the structure of PERMA in the Indonesian context.

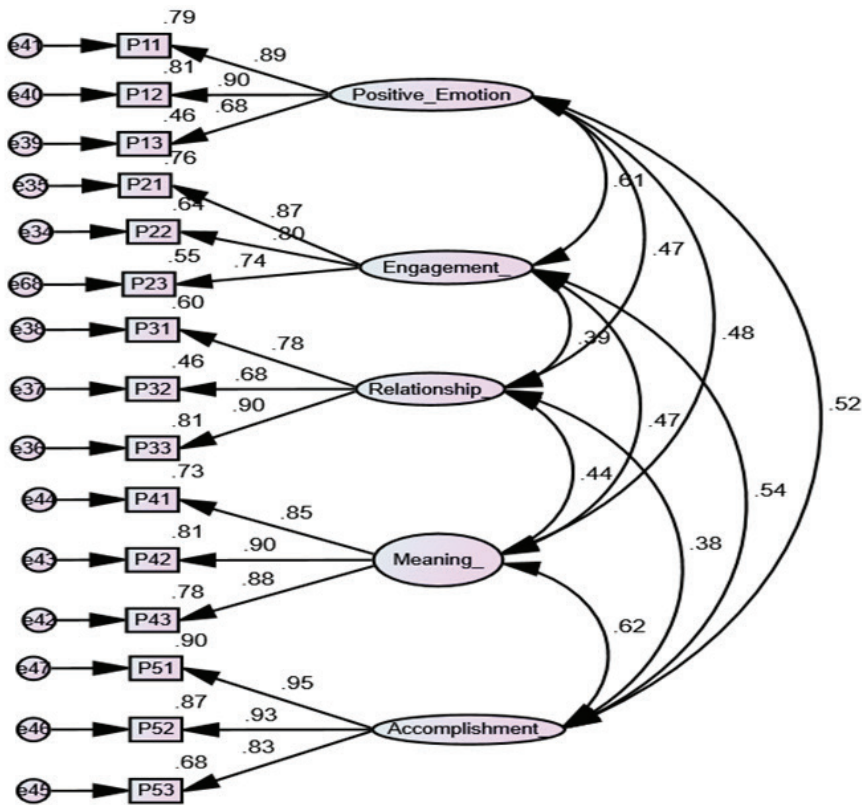


Fig 2. Finalised measurement model of CFA

Figure 2 illustrates that the finalised measurement model of PERMA differentiates between observed and latent variables using AMOS 18.0 program. All factor loadings of the five PERMA' sub-constructs ranged from 0.68 to 0.93. Results showed that the factor loadings exceeded the desirable standard of 0.50 (Hair et al., 2010), which exhibited acceptable convergent validity. Moreover, correlations among the five PERMA' sub-constructs ranged from 0.38 to 0.62, which exhibited acceptable discriminant validity. The finalised model became the baseline model for our next analyses related to cross-validation.

**Confirmatory factor analysis: Testing of a second-order factor.** A hierarchical factor structure in the current research was also hypothesised and examined. The second-order latent variables can be situated as an explanatory variable to an endogenous variable such as positive emotion, engagement, relationship, meaning and accomplishment. Figure 3 illustrates the results of the hypothesised second-order factorial structure for PERMA.

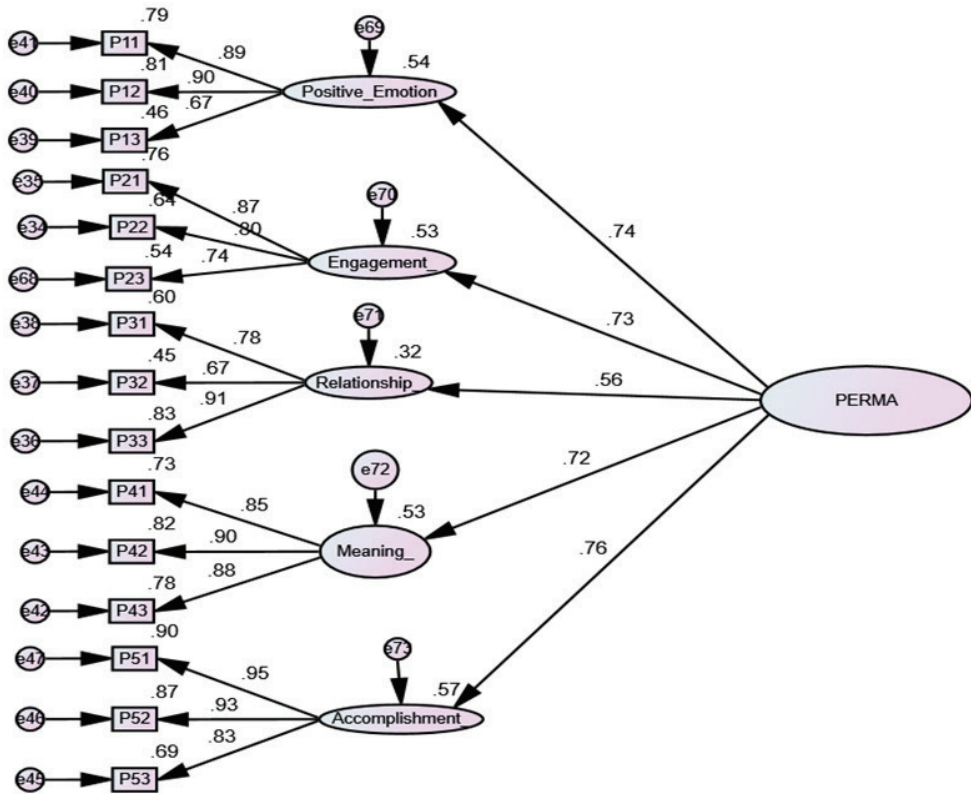


Fig 3. Second-order measurement model for PERMA

Although both models resulted in different values, Figure 3 shows that a second-order measurement model for PERMA met the criteria for good fitting models. The path coefficients for PERMA in the hierarchical model varied among sub-constructs: positive emotion (0.74), engagement (0.73), relationship (0.56), meaning (0.72) and accomplishment (0.76). A second-order measurement model for PERMA also indicated acceptable model fit,  $\chi^2 = 172.865$ ,  $\chi^2/df = 2.034$ , RMSEA = 0.062, TLI = 0.961 and CFI = 0.969. Table 4 lists the model fit statistics comparing the first- and second-order measurement models for PERMA.

**Reliability of the PERAMA-Profiler scales.** Reliability means the stability and consistency of the scores obtained (Creswell, 2012; Fraenkel & Wallen, 2009). Scores should be almost identical when researchers administer the instrument multiple times at different periods. In the current study, degree of internal consistency or reliability, construct reliability (CR) and AVE were calculated. A measure of reliability as internal consistency is the Cronbach's alpha, frequently referred to as the alpha coefficient of reliability, or simply the alpha (Cohen, Manion & Morrison, 2007). Acceptable values of Cronbach's alpha range from 0.70 and above (Lim, 2007), CR should be more than 0.60 and AVE must be over 0.50 (Awang, 2012). The reliability values of some scales exceeded the desirable standard of 0.70: positive emotion,  $\alpha = 0.85$ ; engagement,  $\alpha = 0.84$ ; relationship,  $\alpha = 0.82$ ; meaning,  $\alpha = 0.91$  and accomplishment,  $\alpha = 0.93$ . Cronbach's alpha reliability coefficient was found to be 0.91 for the entire sub-construct. At the same time, all the CR values for the sub-constructs of PERMA exceeded the desirable standard of 0.60, which indicated high internal consistency. Moreover, the AVE for the five latent variables exceeded the common cut-off value of 0.50, demonstrating that this study had acceptable discriminant validity. The elaboration of the findings recommended as the most appropriate factor structure for Indonesia identified by the of EFA and CFA. The suitability of the questionnaire for measuring PERMA was examined using CFA. The reliabilities of PERMA-Profiler were also accepted.

## Discussion

This study examined a reliable and valid instrument of the PERMA-Profiler for Indonesian students in mathematics education programmes. EFA indicated that the students' data involved a five-factor structure: positive emotion; engagement; relationship; meaning; and accomplishment. The structure also conforms to the original five-factor structure of the PERMA-Profiler. The obtained factors are distinguishable in the current research. The findings of this work are consistent with those of previous study (Arvig, 2006; Baltzell, Akhtar, McCarthy, Hurley & Martin, 2014; Coffey, Wray-Lake, Mashek and Branand, 2016; Kern, Waters, Adler, & White, 2014). The present research also employs the framework of Butler and Kern (2016), which involves positive emotion, engagement, relationship, meaning, and accomplishment. We concluded that the similarities of the current study and the previous research on the sub-constructs of PERMA arise from having samples from the higher education level, which entail compound idea. In addition, differences in cultural backgrounds are not only confined to how strongly students have different perceptions, but also to what the absolute perception constructs are (Bofah & Hannula, 2015).

In the current research, we supposed that the best and correct factor structure for the Indonesian sample was identified by the combined use of EFA and CFA. The CFA method confirmed the suitability of the questionnaire for measuring PERMA. The current result coincides with the findings of Butler and Kern (2016) which showed the hypothesized PERMA model fit in United States, United Kingdom, Canada, Central/S. America, West Europe, N. Europe, S/E. Europe, Middle East, Africa, India/SE Asia, Asia, and Australia/New Zealand. The results offer farther evidence that the generally accepted PERMA-Profilers instruments are really universal. Therefore, the Indonesian version of PERMA-Profiler questionnaire may be utilized to measure students in mathematics education programmes in Indonesia. The reliabilities of PERMA-Profiler for the Indonesian sample were largely acceptable as well. However, the hypothesis about a reliable and valid PERMA-Profiler instrument for elementary and secondary school students in Indonesia must be examined in upcoming study since it has different settings.

## Conclusions

All in all, the present study finds that the PERMA of Indonesian students in mathematics education programmes comprise a five-factor structure: positive emotion; engagement; relationship; meaning; and accomplishment. The reliabilities of PERMA for the Indonesian sample are also generally acceptable. Both the differences and similarities obtained between the current and previous studies are indicative of dramatic cultural diversity. Moreover, to determine the PERMA of students' mathematics education programmes is much more vital for researchers and teachers in Indonesia in term of gaining the quality of mathematics education. The current research suggests the importance of validating the structure of pupils' PERMA using EFA and confirming it through CFA rather than translating a construct into a different language. This suggestion is attributed to the progressively noticeable differences in cultural backgrounds. Moreover, the hypothesis about a reliable and a valid PERMA instrument for elementary and secondary school students in Indonesia must be tested in the future. Other factors, such as socioeconomic issues or level of achievement, should likewise be investigated further.

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## Tiriamoji ir patvirtinamoji Indonezijos studentų psichologinės gerovės (PERMA) faktorinė analizė matematikos mokymo programose

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### Santrauka

Šiame tyrime nagrinėjamas PERMA instrumentų validumas ir patikimumas nustatant Indonezijos studentų PERMA pobūdį matematikos mokymo programose. Iš viso tyrime dalyvavo 274 studentai, atrinkti taikant klasterinės atsitiktinės atrankos metodą. Siekiant ištirti PERMA faktorių struktūrą, buvo pasitelktas klausimynas. Kiekybiniai duomenys buvo analizuojami taikant tiriamąją faktorinę analizę (TFA) ir patvirtinamąją faktorinę analizę (PFA), naudojant SPSS 23 ir AMOS 18. TFA atskleidė struktūras, panašias į ankstesnių tyrimų. PFA buvo patvirtintas PERMA klausimyno tinkamumas Indonezijos studentams. Šis tyrimas atskleidė, kad Indonezijos studentų PERMA matematikos mokymo programose sudaro penki faktoriai: teigiami emociniai išgyvenimai (angl. *positive emotion*), įsitraukimas (angl. *engagement*), pozityvūs santykiai su kitais (angl. *relationship*), prasingumas (angl. *meaning*) ir pasiekimai (angl. *accomplishment*). PERMA patikimumo rodikliai Indonezijos imčiai yra tinkami. Tiek šio ir ankstesnių tyrimų skirtumai, tiek panašumai rodo ryškią kultūrinę įvairovę. Indonezijos mokslininkams ir dėstytojams yra svarbu nustatyti besimokančiųjų matematikos PERMA rodiklius, siekiant pagerinti matematikos mokymo kokybę. Šis tyrimas rodo, kad svarbu yra ištirti mokinių PERMA struktūrą taikant TFA ir patvirtinti ją taikant PFA, o ne vien tik išversti konstrukta į kitą kalbą. Šis pasiūlymas paremtas kultūriniais skirtumais, kurie palaipsniui

atsiskleidžia. Ateityje turi būti patikrinta hipotezė apie patikimą ir validų PERMA instrumentą Indonezijos pradinių ir vidurinių mokyklų mokiniams. Reikėtų išnagrinėti ir kitus veiksnius, tokius kaip socialinės ir ekonominės problemos, pasiekimų lygis.

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**Esminiai žodžiai:** *faktorinė analizė, laimė, Indonezija, matematikos mokymo programos, PERMA, validumas.*

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