



Adaptation of DMQ 18 for Measuring Mastery Motivation in Early Childhood

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Abstract. Mastery motivation, related to a child's socio-emotional and cognitive growth, was measured using DMQ 18. It has not been adapted in Indonesia, making collaboration research difficult. This research aimed to demonstrate how the ITC Guidelines could be used for adaptation. The sample included 169 kindergarten children. Data analysis utilized the second-order confirmatory factor. The model fits the requirements. Results showed that the adaptation of DMQ 18 fulfilled validity and reliability.

Keywords: *validity, reliability, mastery motivation, preschool children.*

Introduction

Early childhood is a critical phase of development. During this period, children grow rapidly and develop cognitively, emotionally, and physically. However, the support from the surrounding environment is necessary for their development. One of its important aspects is intrinsic motivation. In early childhood, it is known as mastery motivation, and it explores and solves problems (Morgan et al., 1990).

Mastery motivation is a psychological force that stimulates an individual, in a focused and persistent manner, to solve a problem or master a skill, which is moderately challenging (Morgan et al., 1990). The level is indicated by a child's persistence and pleasure during an attempt to master a skill or solve a problem. Initially, it does not

require external reward since it is based on an intrinsic drive, which emerges from within (Busch-Rossnagel & Morgan, 2013; Morgan et al., 2017).

Even when a child cannot completely reach a goal, what indicates mastery motivation is trying to complete the required task (Morgan et al., 1990). Therefore, it affects the independent, persistent, and concentrated efforts of the children rather than their ability to complete the task. Shonkoff and Phillips (2000) in their US National Academy of Science report stated that it is a core aspect of development and should be a key part of their assessment. Mastery motivation is important since children that stick to difficult tasks become more competent later, even when they have not been able to master them earlier.

There is short and long-term evidence that predicts future skills in typical and atypically developing children. For example, Wang et al. (2016) reported that persistence at mastery tasks suggested both cognitive and fine-motor ability six months later in young children with global developmental delays. In addition, Józsa and Barrett (2018) reported that affective and social mastery motivation in preschool were the predictors of primary school success. Gilmore and Cuskelley (2017) provided strong evidence predicting self-regulation in adults with Down syndrome who were high on mastery motivation as children and adolescents.

Barrett and Morgan (1995) stated that those with a high degree of mastery motivation do not only persist in attempts to become proficient, but they may also show positive and negative affects when trying to solve challenging problems. Mastery pleasure is the term used for positive emotional expressions, such as smiling and vocalizations during or immediately after succeeding at a challenging task. Negative reactions include frustration or anger when failing to solve a problem, as well as shyness or shame. Since the parent report scales for negative reactions have not worked well, they are not included in this research. However, they are potentially important indicators of emotional behaviors.

Optimal achievement of developmental tasks is supported by a child's mastery motivation (Morgan et al., 2017). Even though they possess it from birth, the level varies, in young ones (MacTurk et al., 1995; Morgan, Liao, et al. 2017). Some seem to have lower levels because of developmental anomalies, these include children with cerebral palsy, physical handicaps, or other related problems (e.g., Jennings et al., 1988; Majnemer et al., 2010; Morgan, Liao et al., 2017; Salavati et al., 2018; Wang et al., 2016). In addition, those with risks, such as preterm birth history, generally have been reported to have lower mastery motivation, both persistence, and pleasure, on challenging tasks and when it is rated by their parents (Harmon et al., 1984; Morgan, Liao et al., 2017). Furthermore, other risk factors, such as maternal depression and low quality of interactions have been identified (Redding et al., 1990; Wang et al., 2014). Therefore, it plays an important role in early childhood for a variety of problems that need to be overcome. These deficits point to the urgency of developing appropriate measures.

It is very important to measure the mastery motivation of children to get an estimate of their success in acquiring skills and performing developmental tasks. Therefore, it is

critical to have a reliable and valid instrument or scale, and the type used in this research is the Dimensions of Mastery Questionnaire (DMQ 18). It was jointly developed in English, Hungarian, and Chinese (Józsa & Morgan, 2015). In addition, it has been translated into Turkish (Özbey, 2017), Persian (Salavati et al., 2018), and Bangla (Shaoli et al., 2019), with evidence of reliability and validity. This wide-spread use of DMQ 18 shows that it is a tool for research and collaboration in non-western countries. However, it has not been adapted in Bahasa Indonesia, limiting its communication of research with other countries.

It should be noted that the adaption needs to pay attention to the cultural differences between the countries where DMQ 18 was developed and Indonesia, due to the possibility of bias. He and van de Vijver (2012) stated that there are three common biases in cross-cultural studies, including construct, methodological-procedural, and item content. Construct bias occurs due to differences in conceptual definitions or in behaviors that are deemed indicative. Methodological-procedural bias happens when the assessment method causes an unfavorable difference between groups. Item content bias arises from poor translation or use of items that are not suitable in a particular cultural context (Byrne & Watkins, 2003; van de Vijver & Tanzer, 2004; Fajrianti & Zein, 2017). To avoid these biases, the translation and adaptation procedure in this study used the International Test Commission (ITC) Guidelines for Test Adaptation (2016) and assistance from the developers of the English and Hungarian DMQ 18.

Based on the importance of accurately measuring the level of mastery motivation in preschool children, a valid and reliable measurement tool was required. However, DMQ 18, which is commonly used in the world to measure mastery motivation, was not yet available in the Bahasa Indonesia. The purpose of this research was to develop a reliable and valid version of DMQ 18 in Bahasa Indonesia, using the ITC guidelines.

The research questions are:

1. Does the Bahasa Indonesia translation and adaptation fit the model of the five factors of the Dimensions of Mastery Questionnaire?
2. Does the Bahasa Indonesia DMQ 18 provide good evidence for reliability and validity based on the CFA loadings, the CR, AVE, and the Cronbach alphas?
3. Does the Bahasa Indonesia DMQ 18 provide adequate discriminant validity?

Method

Sample

The sample consisted of 169 kindergarten children (95 boys and 74 girls) aged 5 to 7-years-old with an average age of 5 years and 9 months. Data were collected from 28 kindergartens through mothers' reports.

Instruments

The DMQ is a scale to measure mastery motivation that Morgan and several colleagues have developed and refined since the 1980s. The current research uses five dimensions of DMQ 18, first published by Józsa and Morgan (2015). It includes the four dimensions of the instrumental or persistence aspect, which are cognitive, gross motor, social persistence with adults, and with peers, and one dimension of expressive aspect, which is mastery pleasure. Each of them has five items, therefore, it consists of 25 in total. The DMQ 18 uses five-point Likert scales, ranging from 1 (not at all like this child) to 5 (exactly like this child). Higher scores indicate higher mastery motivation. Józsa and Morgan (2015) reported an excellent internal consistency reliability for each dimension as follows: $\alpha = .93$ for cognitive persistence; $\alpha = .96$ for gross motor persistence; $\alpha = .91$ for social persistence with adults; $\alpha = .90$ for social persistence with peers, and $\alpha = .90$ for mastery pleasure. In addition, they reported that DMQ 18 also had acceptable test-retest, inter-rater reliability, and validity.

Study Procedure

This research applied the Guidelines for Test Adaptation by the International Test Commission (ITC, 2016). The ITC consisted of 18 guidelines are organized into six categories: Pre-condition, Test Development, Confirmation, Administration, Scoring, and Interpretation, and Documentation. This research conducted Pre-condition, Test Development and Confirmation phase of The ITC guidelines with steps illustrated in Figure 1, consisting of the following seven steps:

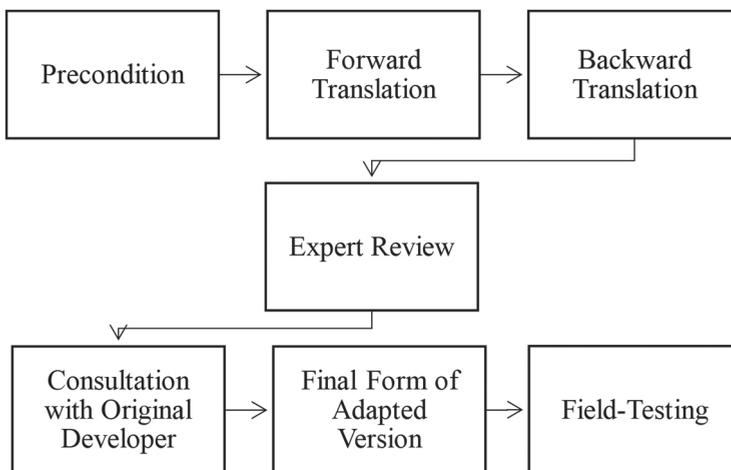


Figure 1. Steps in the ITC Scale Adaptation Process

Step 1: Precondition. In this phase there were three processes to be conducted: (a) Obtained permission from the original test developer to adapt DMQ 18 into the Indonesian language (Bahasa Indonesia) by using proper e-mail correspondence; (b) Three experts in early childhood psychology and education, conducted literature reviews on the concept of early childhood mastery motivation in Indonesia, in order to avoid construct bias; (c) Conducted Focus Group Discussion involving two kindergarten teachers and two parents for minimizing the influence of any cultural and linguistic differences.

Step 2: Test Development. There were five processes in this phase: (a) Forward Translation (FT) was the process of transforming DMQ 18 into Bahasa Indonesia by two translators that were fluent in the language and English, and they further understood the cultural characteristics of the research sample. (b) Backward Translation (BT) was the process of translating the synthesis of the two forward translations back into English. This was conducted to ensure that the translated version does not depart from the intended meaning of the original scale. This process was performed by two translators (different from the ones that conducted the forward translation) fluent in both English and the Bahasa Indonesia but without knowledge of the DMQ 18. (c) Expert review to provide evidence that instructions and item content have similar meaning for early childhood in Indonesia. This review was conducted by three psychologists, all experts in the field of education and child development. (d) Provide evidence that item formats and other procedures are suitable for Indonesian population. (e) Collecting Pilot data, confirming evidence about psychometric quality of the adapted test.

Reviewers' first task. They were asked to rate the comparability and similarity between original items and the BT synthesis. Comparability refers to the evaluation of the degree of formal conformity in language, phrases, terms, words, and sentences. Similarity concerns the assessment of the degree to which two versions of an item are semantically the same despite the use of different terminology. The expert review form was a rating scale, with a range of 1 to 7 (Jeanrie & Bertrand, 1999; Sperber, 2004). Items with identical meanings were given a score of 1. On the contrary, those with different meanings were assigned a score of 7. The form that the reviewers were asked to fill is shown in Table 1.

Experts' ratings allow the calculation of a dichotomous mean score in terms of linguistic and conceptual equivalence (Jeanrie & Bertrand, 1999). When the mean score is less than 4, it becomes a 1, indicating the items share linguistic and semantic similarities. Based on the calculation, no item of the Indonesian adaptation version of DMQ 18 was reported to have a mean score of comparability and similarity above 4. This implies that there were only marginal linguistic and semantic differences between the original scale and the adaptation version, regardless of the differences in some terminologies used. Table 2 summarizes the mean dichotomous scores for the Bahasa Indonesia versions.

Table 1

Expert Review Form to Evaluate Comparability and Similarity of the Original DMQ 18 Items With the Back Translation Items

No.	Original item	BT synthesis item	Comparability							Similarity						
			1	2	3	4	5	6	7	1	2	3	4	5	6	7
1.	Repeat a new skill until he can do it	Repeating new skills until they can do it														
2.	Smiles broadly after finishing something	Smiling widely after finishing something														
Etc.																

Table 2

Mean Scores of Comparability and Similarity

Comparability Mean Score		Similarity Mean Score	
Range	Total	Range	Total
1.00 – 2.00	1.51	1.00 – 2.00	1.47

Expert reviewer's second task. Content validity obtains results from the cultural context without changing the meaning of the original DMQ items. Therefore, content validity assessment was performed on the original, BT, and FT synthesis. Sireci and Faulkner-Bond (2014) reported that content validity refers to the degree to which a test is relevant to the measurement objective. This research used Content Validity Index (CVI), and it calculated each item in the DMQ18 by asking experts to rate each of them, from 1 to 4, in terms of their relevance, importance, and clarity (Polit et al., 2017). Relevance refers to the degree to which they are consistent with the construct being measured. Importance describes their degree of substantiality concerning the construct and research context. Clarity focuses on their distinctiveness and comprehensibility. Table 3 illustrates the rating form that the expert reviewers were asked to fill in.

Polit et al. (2007) suggested that good items have a score of 3 or 4, while those of 1 and 2 are tagged as bad. Based on this, content validity rating was divided into a dichotomous score of 1 (for items with a score of 3 and 4) and 0 (for items with a score of 1 and 2). The CVI was estimated by summing up the scores given and then dividing it by the number of reviewers. A minimum value of 0.78 is required for an item to be deemed good (Polit et al., 2007; Zamanzadeh et al., 2015). The results showed a score of 1.00, indicating a good CVI.

Table 3

Relevance, Importance, and Clarity Rating Form for the Expert Reviewers of DMQ 18

No.	Original item	BT synthesis item	FT synthesis item	Relevance				Importance				Clarity			
				1	2	3	4	1	2	3	4	1	2	3	4
1.	Repeats a new skill until he can do it	Repeating new skills until they can do it	Mengulang ke-trampilan baru sampai dapat melakukannya												
2.	Smiles broadly after finishing something	Smiling widely after finishing something	Tersenyum lebar setelah menyelesaikan sesuatu												
Etc.															

Step 5: Consultation with the original developer. This step was performed after the results were shared with the original developer of DMQ 18. Several revisions have emerged from online (email) correspondence. The goal was to achieve the same meaning between the original and the personalized elements, because the scale measured the note according to the objectives of the original composer. After obtaining the agreement, the adaptation of DMQ 18 was deemed to be appropriate and should be used as the final form.

Step 6: The final form of the adaptation version. This was administered to two parents of children aged 5 to 7-years to find out their level of understanding, following the objective of the measurement instrument. Parents' comments, which were considered to be representative of the sample, and it stated that items in the final form of the adaptation version were easy to understand.

Confirmation Phase. Empirical analyses of full-scale validity studies. The scale was ready for field testing and use in this study.

Data Analysis

This research used the same data analysis method, a second-order confirmatory factor for analysis (CFA) as in Hwang et al. (2017) for evaluating the validity and reliability of DMQ 18. The requirement followed the criteria specified by Hair et al. (2014), and it evaluates the model based on the criteria of having a p-value of the chi-square being greater than 0.05, RMSEA score of < 0.08, and the achievement of GFI, CFI, and AGFI greater than 0.9. The other criteria to be respected are the construct validity, which results from minimum factor loadings of 0.5; the ideal value should be greater than 0.7. Other calculations to consider are construct reliability (CR) score in the range of 0.60-0.70, and the recommended Average Variance Extracted (AVE) coefficient is at least 0.50, with the Cronbach alpha scores with a minimum coefficient of > 0.6. Discriminant validity needs

to fulfill the requirement that the AVE root square is greater than the correlation value between dimensions.

Results

Goodness of Fit

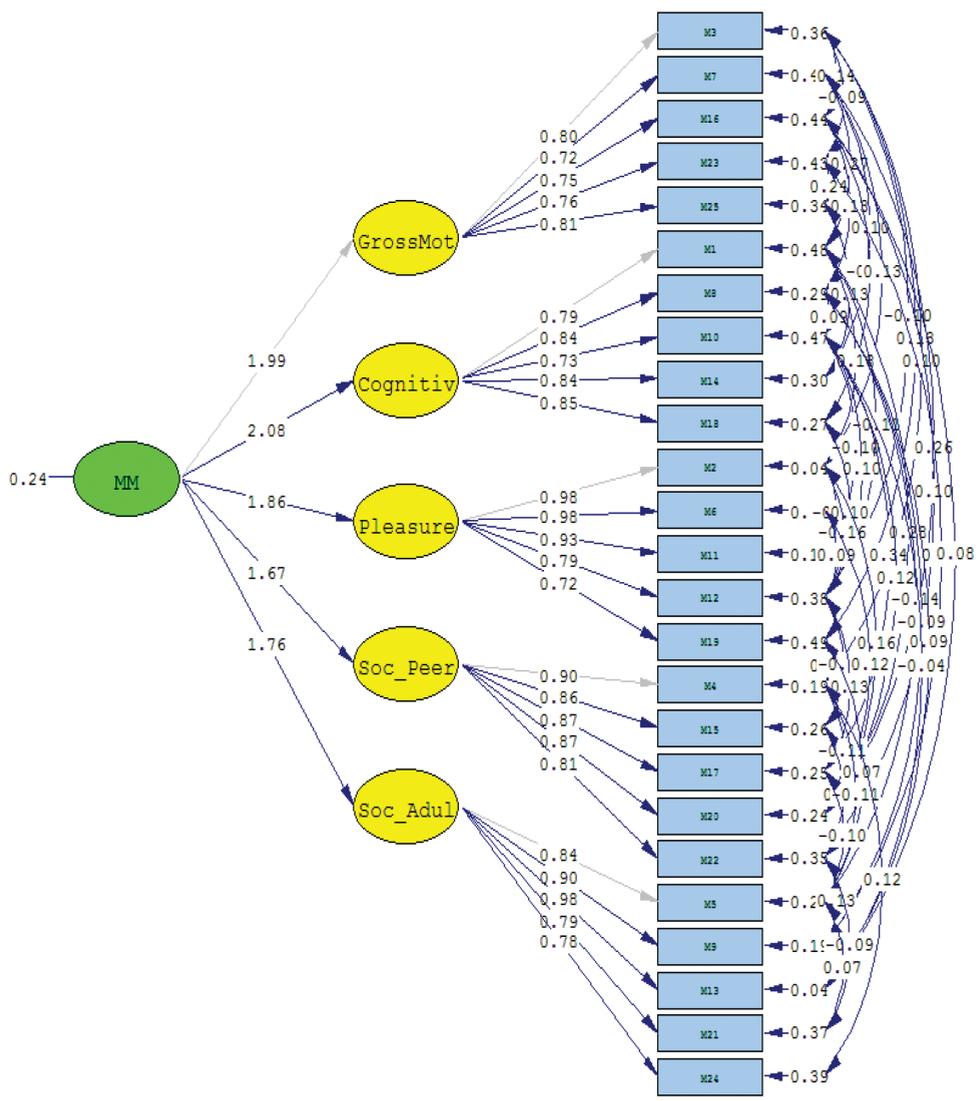
Results of CFA second order with LISREL 9.20 showed that the model was in line with the criteria of Hair et al. (2014), as shown in Table 4. Based on Table 4, the path diagram of the DMQ 18 adaptation is presented in Figure 2.

Table 4
Tests of Goodness of Fit for DMQ 18

	Fit indices required	Observed	Decision
p-Value	> 0.05	0.997	Good fit
RMSEA	≤ 0.08	0.052	Good fit
GFI	≥ 0.09	0.955	Good fit
CFI	≥ 0.09	0.987	Good fit
AGFI	≥ 0.09	0.890	Marginal fit

Validity and Reliability

As depicted in Figure 2, all items had factor loading greater than 0.7 which implies that construct validity has been fulfilled properly according to the required criteria. From the results presented in the path diagram, CR values were considered satisfactory since they were greater than 0.70. The calculation of AVE produced favorable results since the scores of the items were greater than 0.50. Furthermore, Cronbach's alpha values meet the requirements of above 0.60 (Hair et al., 2014). Factor loadings, Cronbach alphas, CR, and AVE of the DMQ 18 adaptation were presented in Table 5. The result of discriminant validity was presented in Table 6.



Chi-Square=248.70, df=223, P-value=0.11420, RMSEA=0.040

Figure 2. Path Diagram of the DMQ 18 Adaptation

Table 5

Factor Loading, CR, AVE, and Cronbach's alpha for Each DMQ 18 Scale

No.	Statement	Factor loading	CR	AVE	Cronbach's Alpha
Gross Motor Persistence			0.88	0.60	0.720
3	Tries to do well at motor activities	0.79			
7	Tries to do well in physical activities	0.70			
16	Repeats jumping/running skills until can do them	0.84			
23	Tries hard to get better at physical skills	0.74			
25	Tries hard to improve throwing or kicking	0.80			
Cognitive Persistence			0.91	0.66	0.655
1	Repeats a new skill until he can do it	0.91			
8	Tries to complete tasks, even if takes a long time	0.93			
10	Tries to complete toys like puzzles	0.85			
14	Works long to do something challenging	0.65			
18	Will work a long time to put something together	0.69			
Mastery Pleasure			0.91	0.68	0.76
2	Smiles broadly after finishing something	0.97			
6	Shows excitement when is successful	0.95			
11	Gets excited when figures out something	0.76			
12	Is pleased when solves a challenging problem	0.61			
19	Smiles when makes something happen	0.79			
Social Persistence with Peers			0.90	0.65	0.63
4	Tries to do things to keep children interested	0.78			
15	Tries to understand other children	0.81			
17	Tries hard to make friends with other kids	0.76			
20	Tries to get included when children playing	0.91			
22	Tries to keep play with kids going	0.78			
Social Persistence with Adults			0.89	0.62	0.71
5	Tries to keep adults interested in talking	0.82			
9	Tries hard to interest adults in playing	0.85			
13	Tries hard to get adults to understand	0.90			
21	Tries to figure out what adults like	0.72			
24	Tries hard to understand my feelings	0.60			
Total			0.98	0.64	0.88

Table 6
Discriminant Validity of the Five DMQ 18 Scales

	1	2	3	4	5
Gross motor persistence	0.813				
Cognitive persistence	0.519	0.776			
Mastery pleasure	0.479	0.227	0.786		
Social persistence with peers	0.475	0.223	0.588	0.807	
Social persistence with adults	0.569	0.411	0.471	0.567	0.824

Discussion and Conclusion

This research aimed to test the validity and reliability of the Indonesian adaptation of DMQ 18. In some cross-cultural research, the biggest mistake in test adaptation practice had been the failure to follow up the translation process with a compilation of empirical evidence to support the intended uses of the test scores in the target languages and cultures. The focus of the current adaptation was on the cross-cultural conceptual equivalence, rather than on linguistic/literal equivalence. Recent criticism of some translated scales highlighted the singularity of focus on linguistic equivalence, albeit with little to no regard for equivalence of the measured constructs, the relevance of item content, familiarity with item format, and insufficient rigor of the methodological strategy. This leads to serious biasing effects that ultimately yielded a multiplicity of complexities in cross-national research and practice (Byrne, 2016; Rios & Hambleton, 2016). It was thus imperative to employ methodological rigor in establishing measurement equivalence or invariance for all populations of interest (Rios & Hambleton, 2016).

Test adaptation requires that a whole collection of activities be carried out to make a test or survey psychologically, linguistically, and semantically equivalent for respondents in multiple languages and cultures (Hambleton, 2005). A well-established method to achieve this goal uses the ITC Test Guidelines (2016). According to the *International Test Commission Guidelines for Translating and Adapting Tests* (2016), researchers need to compile both test translation evidence as well as empirical evidence to support the use of tests in multiple languages and cultures.

The current study contributed by providing a comprehensible and feasible instrument for application in Indonesia to assess mastery motivation in children. The evaluation of conceptual and item equivalences led to the translated and cross-culturally adapted version of the DMQ 18 that is viable and practical for measuring mastery motivation in Indonesia. The content and internal structure of DMQ 18 were found to be adequate. The expert committee and the test and pre-test users found the understanding of the items to be satisfactory. The adapted DMQ 18 was found to be valid and reliable for measuring mastery motivation in the cultural context of Indonesia.

Based on acceptable factor loadings, CR, AVE, and Cronbach alpha coefficients, and discriminant validity, we conclude that the adaptation satisfied the requirements. These statistics were no doubt improved since this research used the international standard translation and adaptation procedure recommended in the ITC Test Guidelines (2016). In addition, the quality of the translation was improved since it involved the original developers of DMQ 18. Although, direct encounter was not possible, extensive communication was conducted via e-mail. Because the research obtained evidence of good validity and reliability, the Indonesian DMQ can be used to measure the mastery motivation in children; hopefully, both those developing typically and those developing atypically.

The current study tested the psychometric properties of Indonesian version of DMQ 18 in a sample of 169 children of 5–7 years of age in Indonesia. CFA was examined and convergent and discriminant validity was tested. The result showed a model similar to the original DMQ 18 model developed by Morgan, et al. (2017).

The literature cited in the introduction supports the US National Academy of Sciences Report by Shonkoff and Phillips (2000), which emphasized the importance of children's mastery motivation, both those showing typical and atypical development. One limitation of this study was that we did not validate the DMQ for those with atypical development or at an age other than kindergarten. Therefore, it will be desirable in the future to perform research in this regard, especially for younger preschool children and those with atypical development.

The mastery motivation literature includes a wide range of cultures and languages in developing countries such as Bangladesh and Indonesia. Although the great majority of children in this current study were considered to be developing typically, there is evidence from previous research in other countries, such as Taiwan and Iran, that a well-developed, reliable, and valid DMQ 18 can be a useful instrument to assess mastery motivation in children developing atypically (Morgan, Liao et al., 2017; Salavati et al., 2018). Future research in Indonesia should provide an adaptation of the DMQ 18 to assess not just typically developing kindergarten children, but also those in need of interventions. The pre-school intervention study in Sabah province in Malaysia was based on the DMQ, (Hashmi, Soek, and Halik, 2017). That study was useful since it provided hints about helping children to reach their full potential.

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Meistriškumo dimensijų klausimyno (DMQ18) pritaikymas meistriškumo motyvacijai ankstyvoje vaikystėje įvertinti

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Santrauka

Meistriškumo motyvacija yra svarbi, nes leidžia įgyti įgūdžių, reikalingų užduotims plėtoti, be to, yra susijusi su vaiko socialiniu-emociniu ir pažintiniu augimu. Meistriškumo motyvacijos matavimas buvo atliktas naudojant meistriškumo dimensijų klausimyną (angl. *Dimensions of Mastery Questionnaire, DMQ 18*) JAV, Taivane ir Vengrijoje. Šis klausimynas nebuvo pritaikytas Indonezijoje, o tai apsunkino bendradarbiavimą atliekant tyrimus su kitų šalių mokslininkais. Šio tyrimo tikslas buvo sukurti DMQ 18 versiją Indonezijoje oficialia Indonezijos kalba.

Šiuo tyrimu buvo siekiama parodyti, kaip tarptautinės testavimo komisijos (angl. *International Test Commission ITC*) gairės galėtų būti naudojamos kaip kultūriškai tinkamos priemonės modeliui sukurti.

Tyrimė dalyvavo 169 ikimokyklinio amžiaus vaikai, kurių amžiaus vidurkis buvo 5 metai ir 9 mėnesiai. Meistriškumo motyvacija buvo pamatuota pagal vaiko motinos įvertinimus. Be to, siekiant sukurti antros eilės patvirtinamąjį faktorių modelį, duomenų analizė buvo atlikta LISREL 9.20. programa. Sukurtas modelis atitiko reikalavimus ($p = 0,997$, RMSEA = 0,052, GFI = 0,955, CFI = 0,987 ir AGFI = 0,890). Visų kintamųjų faktorių svoris buvo didesnis nei 0,5. Cronbacho alfa, CR ir AVE gauti duomenys taip pat tenkino. Taigi, šis tyrimas pateikė įrodymų apie DMQ 18 pritaikymo Indonezijoje pagrįstumą ir patikimumą. Dėmesys buvo sutelktas į tarpkultūrinių konceptualų ekvivalentiškumą, o ne į kalbinį / pažodinį ekvivalentiškumą. Nustatyta, kad DMQ 18 turinys ir vidinė struktūra yra tinkami.

Esminiai žodžiai: *pagrįstumas, patikimumas, meistriškumo motyvacija, ikimokyklinio amžiaus vaikai.*

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