ORIGINAL ARTICLE

Cross-culture Adaptation and Validation of MMR Protective Motivation Scale in Indonesia

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ABSTRACT

Introduction: Parental decision on child vaccination is a particular case of a health-related decision that is highly important in terms of effects and expectations. Currently, no standardized instruments have been found that present items appropriate to the Indonesian culture, specifically to the Banten community. **Methods:** This study was applied cross-cultural validation and adaptation of an instrument using three stages: instrument translation, cultural adaptation, content validation, and equivalence. Protection Motivation Theory, which is consist of interpersonal characteristics, past experience, MMR information sources, threat appraisal, and coping appraisal. MMR protective motivation theory scale component structure was analyzed using confirmatory factor analysis (CFA) with maximum probability estimation. **Results:** The CVI was 0.90-1.00, the S-CVI for clarity was 0.99, and the S-CVI for understanding was 0.98. Most factors (>.50) had a high factorial weight within their own factor. The parallel analysis revealed five factors. The factor loadings for all 18 items are greater than 30%. Additionally, they account for 70.2% of the variance in the concept. The confirmatory factor analysis showed that the model with five linked components has good fit indices (CFI = 0.99; TLI = 0.99; RMSEA = 0.077 [90% CI 0.069-0.085]. There is a convergent and discriminant validity because five factors Cronbach's alphas were more significant than 0.70 for all sub-scales. **Conclusion:** The MMR protective motivation theory scale showed adequate internal consistency and validity. This instrument will enable us to assess the motivation to protect children from MMR in order to enforce projects aimed at increasing awareness of implementing preventive actions.

Keywords: Psychometric testing, Validation, MMR, Protective Motivation Theory, Indonesia

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INTRODUCTION

Mumps, rubella, and measles (MMR) are devastating infections that can lead to death of children (1). In 2018, more than 140,000 people died from measles worldwide (2). These deaths occurred as measles cases increased globally, causing devastation in every region. However, between 2000 and 2017, worldwide measles mortality decreased by 80%, averting an estimated 21.1 million deaths (2). It has been nearly 40 years since the introduction of the MMR vaccine, and many countries of the developed and developing world have not met the WHO's goal of 95 percent vaccination uptake (3). (4). By the end of 2018, 86% of children had received one dose of measles vaccine by their second birthday, and 69% had received two doses of measles vaccine according to national immunization programs (2).

Indonesia is one of ten countries worldwide with the highest number of measles cases (2). The Indonesian Ministry of Health announced in 2018 that there were 57,056 cases of measles and rubella between 2014 and July 2018. (8,964 for measles and 5,737 for rubella). Between 2011 and 2017, the measles incidence rate per 100,000 people in Indonesia decreased from 9.2 to 5.6 per 100,000 population. However, the incidence rate increased from 3.2 to 5.6 per 100,000 population between 2015 and 2017. Over three-fourths of all measles (89%) and rubella (77%) cases were reported in children under the age of 15. Patients with measles may develop diarrhea, meningitis, and even death as a result of these complications (Ministry of Health, 2018). Around one in every twenty measles patients develops

pneumonia, while one in every 1,000 develops a combination of brain inflammation. In addition, 1 in 10 people will get deafness or diarrhea as a result of an ear infection (5).

Vaccine hesitancy is a multi-faceted phenomena that is influenced by a variety of social and psychological factors. Several studies have related vaccine hesitation to prior vaccination beliefs (6,7), perceived vaccine advantages (8), attitudes towards vaccines (9), and whether the child has been previously vaccinated. Restricted information (10), threatening campaigns (11), social standards (12), and official approval (13). Vaccine-skeptical parents differ from non-skeptical parents in their understanding of vaccine hazards, adverse effects risk, and protective advantages.

Parental vaccination decision is a unique example of a health-related decision that is extremely consequential in terms of consequences and expectations (14). The goal, side effects, and efficacy of vaccination are important aspect being discussed among parents (15). Immunization decisions can be analyzed using a decision model in which states of existence and possible judgments are crossed to generate concept with distinct outcomes. One could argue that while making vaccination decisions, people tend to place a high premium on results, i.e. on subjective interpretations of outcomes. In other words, like other health-related decisions, immunization decisions are driven by results (16). The outcome of this decision (e.g., their child's well-being and health) is a crucial concern for parents while making this choice (17). Parental concerns about immediate side effects, such as blistering or inflammation, might be used to prevent a kid from being vaccinated (18).

Protective Motivation Theory (PMT) was originally developed by (19) in the context of the MMR vaccine. The theory combines social cognitive determinants with other behavioural theories such as the Health Belief Model (HBM), Reasoned Action Theory (RAT), and Planned Behaviour Theory (TPB) (20). The theory that the decision to prevent the negative consequences of a threat (e.g. sickness) motivates a preventative action (e.g. vaccination) (19). One protective motivation theory-based tool was used to predict intention to follow official MMR vaccination recommendations in Switzerland (21). There are currently no standardized instruments that offer elements relevant to Indonesian culture. The objective of this study was to cross-culture and examine the psychometric properties of the MMR Protective Motivation Scale in a Indonesian population.

MATERIALS AND METHODS

Study design

This study validated and adapted an instrument cross-culturally in three stages: instrument translation, cultural adaptation, and validation (22,23). This cross-sectional study was conducted in adult Indonesian from Banten Province, Indonesia. Data were collected using the non-probabilistic convenience sampling method between September and October 2020.

Sample

The inclusion criteria were: (1) parent (either mother or father) who dad children aged between 11 months and 3.5 years of age, (2) willing to participate in the study, and (3) age older than 18 years old.

Instrument

Protection Motivation Theory (PMT) scale consist of interpersonal characteristics, past experience, MMR information sources, threat appraisal, and coping appraisal developed by Camerini (21). A total of 18 items with Likert scale (with 1 indicating strong disagreement and 4 indicating strong agreement). Interpersonal traits are assessed using two social attitude and norm items. Previous measles and MMR side effects experience which distinguished between a child having had measles, parents or family members having had measles, and parents knowing someone who had MMR adverse effects. Parents were asked if they had actively sought MMR vaccine information from public health agencies, doctors, and the Internet. The threat perception scale is composed of two items: severity and susceptibility to measles. Coping appraisal was assessed with the use of eight questions pertaining to self-efficacy, response (vaccine) efficacy, and response cost.

Instrument translation

This instrument is being translated into Bahasa Indonesia and put through a pilot testing process for study purpose. They include forward and backward translation, pre-testing, and cognitive interviewing. First, two bi-lingual translators (T1 and T2) independently translated instrument to the Indonesian version. To address any discrepancies that may exist between the translated text and what the translators had to say, the second portion of the document includes the translations themselves (which was renamed "T-12"). The questionnaire was retranslated into English in a third phase by a translator who began with the T-12 version and was unaware of the original English version. Two native speakers worked together to complete the task of reverse translation. A panel of experts were conducted by invited expert in psychometric testing, health professionals, and linguists. They decided that the English and Indonesian versions should be equal in four areas: semantics, linguistics, experience equivalence, and conceptual parity. The documents were evaluated using a five-point Liker scale for linguistic clarity (5 being perfectly reading and understanding, 1 being absolutely unreadable and incomprehensible) and cultural equivalence (5-completely culturally relevant to not 1-culturally relevant). This grading method was

needed to look at how well each person answered the question and how culturally relevant it was to them.

Culture-Adaptation

Culture-adaptation was tested utilizing cognitive interviews with 10 parent to evaluate their perspective and the clarity of the translated items, answer types, and survey instructions (24). Those who took part were invited to provide recommendations for issues that they thought were confusing in addition to making them more readable and concise. Additionally, the questionnaire was examined by an expert panel comprised of ten pediatric nurses from a variety of backgrounds, including academia and clinical practice. They assessed each item's cultural relevance and acceptability on a four-point scale ranging from 1 (not relevant) to 4 (very relevant). A final MMR protective motivation theory scale was developed based on the expert panel's findings. A content validity index (CVI) was calculated for each item and the entire scale. The scale-CVI (S-CVI) score was calculated by averaging the I-CVI scores, and each item CVI (I-CVI) score was calculated by calculating the percentage of experts who ranked the item as 3 or 4. I-CVI values of 0.80 or higher are considered acceptable, whereas S-CVI values of 0.90 or higher are considered exceptional (25).

Construct validity and reliability testing

Calculating the sample size for confirmatory factor analysis (CFA) is a complex operation since it is affected by the total number of factors and indicators and the degree of factor loadings (26). Other researchers suggest sample sizes ranging from 5 to 20 respondents per item (27). A total of 180 parents (with an average of 10 respondents each item) completed the online survey, resulting in an overall response rate of 80.7%. Our sample size was found adequate for MMR protective motivation theory scale factor analysis. MMR protective motivation theory scale component structure was analyzed using confirmatory factor analysis (CFA) with maximum probability estimation. The measurement fit indices recommended by Kline (28) were evaluated: RMSEA, SRMR, and CFI (29). A good fit has an RMSEA of less than 0.06 and an SRMR of less than 0.08. Good fit is indicated by CFI values greater than 0.9; adequate fit is indicated by CFI values less than 0.8. (30). The Average Variance Extracted (AVE) was employed to assess convergent validity, with values better than 50 being adequate (31). The AVE coefficients of the dimensions were compared to their correlation coefficients for discriminatory validity.

Reliability

Cronbach's alphas were used to determine the internal consistency of each subscale, with a score of 0.7 being considered the minimum threshold for good reliability (32).

The SPSS version 23 software and LISREL 8.80 (student) were used to conduct statistical analyses, with a significance level of 0.05 considered significant.

RESULTS

Cross-culture adaptation

Cognitive tests revealed that linguistic clarity was 85.5% and cultural relevance was 86%. Readability, comprehension and cultural relevance were all found to be acceptable by the panel of experts. Minor revisions were made in response to feedback obtained throughout the interviews. Statements such as item 4 (If my kid was not immunized against measles, he would be at risk of contracting the illness throughout his life) were updated and reworded to be more positive (If my child was immunized against measles, he would be protected throughout his lifetime).

Content validity results

From the six experts who were invited to participate in the item content review, only five finished the entire procedure, indicating that the process was efficient. The CVI was 0.90-1.00. Following an examination of the items (N = 18), the S-CVI for clarity was 0.99, and the S-CVI for understanding was 0.98 (Table I).

Construct validity

Psychometric testing was conducted to 180 parents in Banten Indonesia. The majority of them were aged 30 years old, had above secondary level of education, employed, had salary above minimum regional, and Muslim (Table II).

An exploratory factor analysis was conducted using data from a pilot sample, it was revealed that the five factors explained 65.4% of the variation in the construct. Most factors (>.50) had a high factorial weight within their own factor. Items 4 (0.43), 12 (0.39), and 13 (0.37) were strongly weighted by other criteria (Table III).

The parallel analysis (PA) revealed five factors. The factor loadings for all 18 items are greater than 30%. Additionally, they account for 70.2% of the variance in the concept. The confirmatory factor analysis showed that the model with five linked components has good fit indices (CFI = 0.99; TLI = 0.99; RMSEA = 0.077 [90% CI 0.069-0.085]. The data did not fit this unidimensional model (CFI = 0.92; TLI = 0.90; RMSEA = 0.0206 [90%CIl: 0.0199-0.213]) satisfactorily, despite the fact that other models had been eliminated.

Convergent and Discriminant Validity

There is a convergent validity because five factors: interpersonal characteristic (AVE=0.63), treat appraisal (AVE=0.76), coping appraisal (AVE=0.81), past experience (AVE=0.68), MMR information sources (AVE=0.74) have an appropriate average variance

Table I : Content validity index

Item	V	
Interpersonal Characteristics	1	Valid
Most parents I know vaccinate their children against measles	1	Valid
The vaccination of my child helps to prevent the diffusion of measles in the population	0,9	Valid
Threat appraisal	1	Valid
Measles is an infective disease that can have severe consequences for one's health	1	Valid
If my child wasn't vaccinated against measles, he would be likely to suffer from the disease during the course of his life	1	Valid
Coping appraisal	1	Valid
I am confident about my ability to decide regarding the MMR vaccination of my child	1	Valid
I have the necessary skills to decide whether to vaccinate my child against measles	0,9	Valid
I trust my ability to make decisions regarding the MMR vaccination of my child	1	Valid
The vaccination against measles is not efficient enough for fighting the disease	1	Valid
It is possible to prevent measles by vaccinating during childhood	1	Valid
Only pharmaceutical companies can profit from the MMR vaccination	1	Valid
It is likely that my child will have side-effects from MMR vaccine	1	Valid
The side-effects of MMR vaccine can be severe	1	Valid
Past experience		
Parent had one's own child having previously been infected with measles	1	Valid
Parents or somebody else in the family having previously been infected with measles	1	Valid
Parents knowing somebody who experienced MMR side effects	1	Valid
MMR information sources		
Parents shall actively sought information about MMR vaccination from public health institutions	1	Valid
Parents shall actively sought information about MMR vaccination from doctors	1	Valid
Parents shall actively sought information about MMR vaccination from internet	1	Valid

Table II : Sociodemographic characteristics

Demographics	Pilot sample (n = 50)	Confirmatory sample (n = 180)
	n (%)	n (%)
Age (years old), Mean ± SD	30.23±7.09	31.23±6.46
Sex		
Woman	26 (65)	110 (61.1)
Man	14 (35)	70 (38.9)
Educational level		
Secondary and below	8 (20)	57 (31.7)
Above secondary level	32 (80)	123 (68.3)
Working status		
Employed	24 (60)	150 (83.3)
Unemployed	16 (40)	30 (16.7)
Monthly income		
Below minimum regional salary	26 (35)	63 (35)
Above minimum regional salary	14 (65)	117 (65)
Religion		
Muslim	35 (87.5)	150 (83.3)
Non-Muslim	5 (12.5)	30 (16.7)

extracted (AVE > 50) in the scale. There is a discriminant validity because AVE coefficients for the five factors are bigger than the correlation coefficients for the dimensions (Table V).

Reliability testing

Table III shows that Cronbach's alphas were more significant than 0.70 for all sub-scales (Table VI).

DISCUSSION

The MMR protective motivation theory scale is one of the first tools in Indonesia to assess motivation to protect against MMR, a global health issue that has resulted in the deaths of millions of children. There has been research conducted to examine the motivation to protect against MMR (21), however the psychometric features of these investigations have not been published. The Cronbach's alpha coefficients for the factors of the MMR protective motivation theory scale were greater than 0.70, indicating that the study had adequate internal consistency reliability. MMR's protective motivation theory can be expressed by five factors: interpersonal characteristics, treat appraisal, coping appraisal, past experience and MMR information sources from the Pilot sample findings of parallel analysis. Consider that the period of data collection effects the impression of danger assessment in each individual, hence it is advised that this consideration be applied to bigger sample sizes in future studies. There was sufficient homogeneity among all the items that remained on the scale, as evidenced by factor loadings ranging from 0.37 to 0.80. Structure validity was sufficient when all items accounted for more than 60% of variance, which was more than the required minimum (which is 50%) (33).

PMT was first proposed by Rogers (19) to explain how people respond to fear messages in the health domain, but it has since expanded to explain how people respond to a broad range of events (for instance, environmental sustainability and political aspects) (19). The fundamental concepts of threat appraisal in PMT in the context of the MMR vaccine are parents' perception of the danger of measles and their assumption that their child is susceptible to the disease. The perception of disease severity and vulnerability is thought to be linked to a person's desire to stay healthy (34). Self-efficacy and response effectiveness are two components of coping

Table III : Exploratory Factor Analysis Using Confirmatory Sample

Items	Factor loadings				
	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5
IC 1	0.80				
IC 2	0.64				
TA 3		0.56			
TA 4		0.43			
CA 5			0.71		
CA 6			0.82		
CA 7			0.80		
CA 8			0.65		
CA 9			0.59		
CA 10			0.67		
CA 11			0.70		
CA 12			0.37		
PE 13				0.58	
PE 14				0.63	
PE 15				0.71	
MIS 16					0.67
MIS 17					0.73
MIS 18					0.80
% Of variance explained	0.654	0.538	0.602	0.497	0.523
Cumulative % of variance	0.645	0.628	0.781	0.815	0.619
Overall MSA	0.951				
Bartlett's test of sphericity	χ =41 684		df=31.	P<0.01	

Abbreviations: IC: interpersonal characteristics; TA: treat appraisal; CA: coping appraisal; PE: past experience; MIS: MMR information sources

Table IV : Model Fit Indices

Models	χ^2	df	P	TLI	CFI	RMSEA (90% CI)	SRMR
Model 1	356.41	143	.000	0.97	0.98	0.068 (0.051-0.103)	0.038
Model 2	3187.14	165	.000	0.98	0.93	0.198 (0.119-0.304)	0.165

Abbreviations: Model 1, model with 5 related factors; model 2, unidimensional model; χ2; df=degrees of freedom; SRMR= standardized root mean square residual; TLI=Tucker-Lewis Index; CFI=Comparative Fit Index; RMSEA=root mean square error of approximation.

Table V : Convergent and Discriminant Validity

	Interpersonal characteristic	Treat appraisal	Coping appraisal	Past experience	MMR information sources
Interpersonal characteristic	0.63 [a]				
Threat appraisal	0.33 [b]	0.76 [a]			
Coping appraisal	0.24 [b]	0.15 [b]	0.81 [a]		
Past experience	0.17 [b]	0.19 [b]	0.23 [b]	0.68 [a]	
MMR information sources	0.21 [b]	0.33 [b]	0.24 [b]	0.27 [b]	0.74 [a]

[a]Average variance extracted.

[b]Square root of the correlation coefficients of the dimensions.

Table VI : Reliability Cronbach's alpha

Instrument	Total item	Cronbach alpha
Interpersonal characteristic	2	0.854
Threat appraisal	2	0.801
Coping appraisal	5	0.901
Past experience	3	0.850
MMR information sources	3	0.795

evaluation, which is an assessment of the adaptive threat reaction. Efficacy has lately been acknowledged as a sub-dimension of psychological management in the context of MMR vaccine decision-making, which is a relatively new concept (35). In the context of the MMR vaccine, perceived reaction effectiveness is defined as the level of trust that parents have in the vaccine's ability to protect their children against disease. The perceived efficacy of vaccination has previously been linked to intent and vaccination status (Camerin, 2019).

There has been research to examine parental decision making on MMR preventive behaviors; however, they use multivariable model of numerous components and examining every item separately (36). In one study, protective motivation theory was used to predict parents' intention to follow MMR advice by stimulating threat and coping appraisal systems (21). The five-factor model utilized in the scale can offer a comprehensive knowledge of the perception of protective motivation and be used to various age ranges owing to its simple method of explanation and total of items.

There are a number of limitations to this study, including the fact that the data collection was accomplished via digital methods considering the current COVID-19 pandemic, under-representative of younger individuals (less than 30 years old) and women, the partially invariant of the scale according to age or sex was not assessed, and the reliability of the tool over time thru a test-retest was not examined.

CONCLUSION

In conclusion, the MMR protective motivation theory scale showed adequate internal consistency and validity. Moreover, the 5-factor model was preferred over the unidimensional model. This instrument will enable us to assess the motivation to protect children from MMR in order to enforce projects aimed at increasing awareness of implementing preventive actions and targeting the most disadvantaged people, thus also increasing the children health.

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