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VALIDITY AND RELIABILITY OF THE SITUATIONAL MOTIVATIONAL SCALE (SIMS) INSTRUMENT: USING RASCH MODEL AND AMOS

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ABSTRACT

Self-determination theory (SDT) is a significant theoretical framework for investigating and comprehending student learning and motivation, which are crucial aspects of physical education. The purpose of this study is to identify the reliability and validity of the Malay language version of SIMS-14 items, as well as to determine the effect of four-week intervention teaching utilizing the flipped classroom method affects primary school students' situational motivation. A total of 421 students participated in this study. Reliability analysis based on the Rasch model found that the individual reliability value was 0.91 and the items reliability was 0.85. CFA analysis reported $\chi 2/df$ = 2.037, CFI = 0.969, GFI = 0.907 and RMSEA = 0.074 with internal validity for each variable based on Cronbach Alpha's (α) values ranging from 0.87 to 0.92. As for the value of Construct Validity (CR), the value of 0.88 to 0.95 is obtained by fulfilling the condition ≥ 0.60 and the value of Average Variance Extracted (AVE) is between 0.70 to 0.86. Therefore, the data collected using SIMS-14 items were analyzed with One-Way ANCOVA and the results affirmed that students from the experimental group exhibited an enhancement in situational motivation based on flipped classroom method better than the control group. Besides, the results of the study revealed that the SIMS-14 items consist of four factors that are consistent and prove the quality of psychometry. In addition, the SIMS-14 items instrument attempts to represent constructs of intrinsic motivation, identified regulation, external regulation, and amotivation that can be widely used for assessment in the context of PE.

Keywords: *Instruments, Validity and Reliability, Motivation, Physical Education, Psychometry*

INTRODUCTION

Physical Education (PE) is a learning process that involves physical activities to improve the fitness, skills, and attitudes of students to the optimum level. Learning achievement at this optimum level can be achieved by increasing self -motivation which is an internal factor that motivates, directs, and integrates student behavior to achieve a goal (Akina et al., 2014) and to improve knowledge competence and engagement as well as achievement in learning (Haris, 2017). Motivation is defined as a psychological process of a person's self-behavior that is considered important for the development of self-personality (Deci & Ryan, 2000; Sierra-Díaz et al., 2019). Behavioral changes can be observed following the passage of time in a person due to internal and external factors that influence the will and desire in performing a task (Vansteenkiste et al., 2009). The concept of motivation in the context of

education is frequently studied using self -determination theory (SDT) (Deci & Ryan, 1985, 2000, 2008) which examines the involvement of students in various types of activities in depth (Gillison et al., 2019). The basic principles of SDT theory state that motivation can operate at three different levels namely globally, contextually, and situationally (Vallerand, 1997, 2001). At the most general level, motivation describes how people interact with their surroundings (R. Vallerand & Rousseau, 2001). Contextual motivation refers to the tendency of motivation toward a specific context such as task, sport activities, or education and training (Vallerand, 1997), whereas situational motivation is the motivation encountered while engaging in a specific activity at that time (Vallerand, 1997). The main three types of motivation were categorized accordingly to three types of motivation continuum: intrinsic motivation, extrinsic motivation, and amotivation (Deci & Ryan, 1985, 1991).

Self-Determination Theory (SDT)

SDT theory suggests that there are two basic types of motivation namely intrinsic motivation and extrinsic motivation (Deci & Ryan, 1985; Ryan & Deci, 2018). Intrinsic motivation occurs when a student voluntarily engages in activities for self-interest. Whereas extrinsic motivation occurs when there is influence and encouragement of external factors such as reward and social recognition that led to self-confidence (Bollók et al., 2011). However, the influence of both intrinsic motivation and extrinsic motivation is often questioned of its importance. Hollembeak and Amorose (2005) stated that doing something with inner will is better than being influenced by external factors. This is because being intrinsically motivated is better and provides more benefits than being extrinsically motivated expecting rewards. Thus, a student who behaves due to intrinsic motivation will feel pleasure, arousal, and satisfaction in the performed behavior that pleases him/her (Sari et al., 2015). The joy experienced in oneself leads to the construction of the character of the student who appreciates the value of the lesson which can be seen in the seriousness of the behavior (Pelletier et al., 2016). Vallerand (2004) in turn stated that if a student influences intrinsic motivation, then he/she is more likely to participate in activities vigorously even without the presence of rewards and reinforcement. Extrinsic motivation is different from intrinsic motivation, in the sense that extrinsic motivation requires an intermediate medium or reward such as material or verbal rewards so that the individual can experience satisfaction for himself. The satisfaction experienced is not from the performance of the activity itself but from external stimuli derived as a result of performing an activity (Deci et al., 1991; Ryan & Connell, 1989). Behaviors performed because of extrinsic motivation are not performed on their own but rather, solely to receive rewards or to avoid punishment because of the initial behavior (Pelletier et al., 1997). Although intrinsic and extrinsic motivation affects students' learning outcomes, there is another type of motivation that is amotivation. Amotivation refers to the absence of motivation in a person to participate in any activity. If the level of amotivation is high, the chances of dropouts in participation and learning are high (Huhtiniemi et al., 2019). In addition, Gillison et al., (2013) stated that the existence of amotivation in students will lead to behavioral changes that lead to disruption and reluctance in an activity that leads to rejection of learning. Therefore, awareness and emphasis on situational motivational factors in the teaching and learning process of PE should be emphasized to encourage active student participation in the teaching and learning process of PE.

Situational Motivational Scale (SIMS)

Guay et al., (2000) have developed the Situational Motivational Scale (SIMS) which assesses intrinsic motivation (IM), identified regulation (IR), external regulation (ER), and amotivation (AM). The validity of SIMS on the relationship between situational motivation and contextual motivation in the context of sports and games has been extensively reported. Blanchard et al., (2007) conducted a study among high school students aged between 13 to 18 years. The study reported the Cronbach's Alpha value for the SIMS instrument sub-scale was 0.70 in the first game and had increased to 0.82 assessed immediately after the second game. Subsequent validity of the study of Martin-Albo et al., (2009) who conducted a re-evaluation to validate the SIMS instrument. The internal consistency of the scale was assessed with Cronbach's Alpha. The results showed a value of 0.91 in the IM sub-scale, 0.78 in the IR sub-scale, 0.80 in the ER sub-scale, and 0.80 for the AM sub-scale. A study on motivation and performance in PE conducted by Moreno et al., (2010) using the SIMS instrument to assess the intrinsic

motivation of students aged 12 to 17 years found a Cronbach's Alpha value of 0.88. Since this instrument has not been validated in the context of PE learning in Spain, a validation factor analysis was performed and showed the accepted results: χ2 = 363; df = 5.60, p> .05; 2/d.f. = 2.80; CFI = 0.99; IFI = 0.99; TLI = 0.99; RMSEA = 0.07; SRMR = 0/01. Standard regression weights were obtained at 0.83, 0.81, 0.80, and 0.80. The study also showed that the regression values were 0.80 IM, 0.81 IR, 0.80 ER and 0.80 AM. The validity of the SIMS-16 items instrument by Østerlie et al., (2019) in the context of PE learning among primary school students aged 8,9,10 and 11 in Norway reported χ2 (98) = 295.43; p <.00001, χ2/df = 3.02, RMSEA = .085, p <.00001, SRMR = .088, CFI = .92, TLI = .90 on pre-learning assessment and χ2 (98) = 266.59; p <.00001, χ2/df = 2.72, RMSEA = 0.081, p <.00001, SRMR = 0.078, CFI = 0.93, TLI = 0.91 on assessment after 4 weeks of learning. Whereas, the validity of the revised version of the SIMS-14 items instrument showed a more consistent validity of the data on the pre-teaching assessment χ2 (71) = 155.52; p <.00001, χ2/df = 2.19, RMSEA =0 .065, p <.037, SRMR = 0.046, CFI = 0.96, TLI = 0.95), and χ2 (71) = 152.004; p <.00001, χ2/df = 2.14, RMSEA = 0.066, p <.037, SRMR =0 .045, CFI 0= .96, TLI = 0.95) after teaching for 4 weeks. The reported Cronbach's alpha values for the SIMS instrument sub-scales were 0.906 IM sub-scale, 0.792 IR sub-scale, 0. 797 ER sub-scale and 0.803 AM sub-scale. Paixao et al., (2017) translated the SIMS instrument into the Portuguese version using 409 respondents among undergraduate students who reported confirmation factor analysis = χ2 = 260,981, p <.001, RMSEA = .08, GFI = .91: X2/df = 3.68, CFI = .93. The study also reported the internal consistency of the SIMS instrument sub-scale compared to the original version with values of 0.80 (0.77) for the AM sub-scale, 0.73 (0.86) for the ER sub-scale, 0.77 (0.80) for the IR sub-scale and 0.89 (0.95) for the IM sub-scale.

Moreover, Lonsdale et al., (2011) reported the reliability of the SIMS instrument in their study on the motivation of 11 to 16 -year -old students from secondary schools originating in the United Kingdom was 0.84 and originating in Hong Kong was 0.83. A study by Lee, (2016) which was conducted among 16 -year -old male secondary school students (35 students) in learning PE hockey games reported a value of 0.90 while Cronbach's Alpha value for 33 female students in learning PE hockey games was reported 0.82 (Lee et al., 2015). The reliability of the SIMS instrument among Spanish swimmers aged 14-16 years showed reliability between 0.80–0.82 (Fernandez-Rio et al., 2014) while Podlog et al., (2015) reported a reliability of 0.63–0.79 among Swedish junior elite skiers who are 15-20 years old. Paixão et al., (2017) in their study reported the reliability of the SIMS instrument was 0.79. based on respondents among university students. Khalid & Zainuddin (2020) in their study reported a Cronbach's Alpha value of 0.9 and above for the internal consistency of the instrument sub-scale in studying the readiness and motivation of learning situations among students using gamification game technology integration. Evidence of validity and reliability from previous studies provides confidence in using the SIMS instrument as a tool to measure intrinsic motivation, extrinsic motivation (identified regulation and external regulation), and amotivation as it can measure a student's situational motivation in the context of PE and physical activity learning (Clancy et al., 2017). Nevertheless, all the studies mentioned above refer to the English version validation article by Guay et al., (2000).

However, Ary et. al (2010) argued that instrument's validity and reliability are not portable. The instrument may be valid for the use with one population or setting but not another. A consideration is to design an instrument that is both brief enough for young children to accurately complete it and long enough to still be reliable is important. Besides that, a review of the literature by researchers found that the Malay version of SIMS has not been confirmed for use in primary school students in the context of PE and physical activities in the country. By considering the above discussions, as SIMS-14 items has not been validated with the local population, the use of SIMS-14 items among Malaysians could be questionable. Therefore, this study aimed to evaluate the adaptation and validation of the revised version of the SIMS-14 items instrument (Østerlie et al., 2019) in the Malay language in the context of PE.

AIM OF STUDY

Given this, the present study has four research aims (a) to verify the adaptation of the Malay language version of SIMS-14 items; (b) to verify the reliability of the instrument by Rasch Model analysis, (c) to

verify construct validity through Confirmatory Factor Analysis (CFA) and (d) to identify the effect of flipped classroom teaching on students' situational motivation based on handball game learning.

METHODOLOGY

Participants

A total of 421 students (Rasch Analysis: 51 students aged 10 years, Amos-CFA: 193 students aged 11 years, One-Way ANCOVA: 177 students aged 10 years) from 7 different schools who follow PE learning in primary schools were selected as the sample in this study. Intact sampling was used to select all pupils from schools randomly selected from the list of schools. All schools involved in this study have conducted 5 on 5 handball match activities where students are given SIMS-14 items instruments after the competition.

Instrument

The revised version of the SIMS instrument (Østerlie et al., 2019) used in this study had 14 items assessing why individuals perform a particular activity or task, guided by four sub-scales representing motivational dimensions as defined by SDT theory. SIMS-14 items were represented by the IM subscales (item 1, 5, 9, and 13), IR (item 2, 6, and 14), ER (item 3, 7, and 15), and AM (item 4, 8, 12, and 16) in certain situations. Items 10 and 11 were removed in SIMS-14 items when compared to SIMS-16 items. Each item answers the question: "Why are you performing this task/activity at the moment?" The study sample assessed the extent to which each item matched the reason they performed a particular activity using a 7 -point scale from a scale of 1 = Does not correspond at all, 2 = Corresponds very little, 3 = Corresponds a little, 4 = Corresponds moderately, 5 = Corresponds enough, 6 = Corresponds a lot, 7 = Corresponds exactly.

Research Procedures

In this study, the SIMS instrument has gone through the process of adoption, adaptation, and translation into the Malay language which has been given to experts in the field of physical education for validation before being used in the pilot study. Expert validation was performed by four experts having doctorates in the field of physical education. Linguists with a doctorate in the field of Malay language have conducted validation for back-to-back translation twice before being used during the pilot study. For the first validation, the linguist corrected the language on the SIMS-14 items instrument and then gave it to the field expert. After obtaining the confirmation of the field experts, the linguists reviewed the results of the translation of the SIMS-14 items instrument from English to Malay and ensured that the meaning of the translation did not change from the English version. The study instrument was tested with 93 respondents in a school after the end of a 5-on-5 handball game competition. The results of the pilot study found that students have difficulty answering the instrument. The results of interviews with students found that students were confused with some statements as well as in choosing the answer scale which consists of a 7 -point Likert scale. Therefore, the original version of the SIMS-14 items instrument was adopted and adapted by retaining 14 items, but the Likert scale was changed from 7 points to 5 points of the Likert scale and re-through the back-to-back translation process. The Likert scale of the revised version consists scale of 1 = Does not correspond at all, 2 = Corresponds a little, 3 = Corresponds moderately, 4 = Corresponds a lot, 5 = Corresponds exactly. The new version of the SIMS 14-items instrument went through a revalidation process with 51 students in the Year 4 PE class. The researcher found that students could answer the instrument faster and students stated that they could choose answers more easily.

Data Analysis Procedure

The WINSTEPS program version 3.68.2 (Linacre, 2009) was used to run all the Rasch analyses. Rasch model analysis was used in measuring the reliability and validity of the SIMS-14 items instrument which had been modified using 51 students. This is because the analysis of the Rasch model provides a more

accurate and detailed methodology to identify an instrument at the items level (instrument items level) and latent trait (the ability of the student). Fit statistical analysis was used to test the assumptions in the Rasch Model that is whether the study data collected met or fit with the expectations of the model. Table 1 displays overall information on the extent to which the study data showed an acceptable fit by the Rasch Model for 14 items and 51 respondents (nonextreme scores) for the SIMS-14 items instrument among 10 -year-old respondents.

As a second step, confirmation factor analysis (CFA) was conducted on a hypothesized four-factor model using AMOS graphs to assess the suitability of the SIMS-14 items measurement model. This analysis depends on several suitability indices such as (a) the minimum value of discrepancy between the observed data and the hypothesis model according to the degree of freedom (CMIN/df) <5.0, (b) the Goodness Fit Index (GFI)> 0.90, (c) Fit Comparison Index (CFI))> 0.90, (d) Tucker-Lewis coefficient Index (TLI)> 0.90, and (e) root mean square estimate error (RMSEA) <0.08 (Awang,2015). Therefore, a model that meets the coefficient criteria for the analysis of validation factors proposed by Awang (2015) will not be rejected. CFA analysis was performed using AMOS software version 24, aimed to test the existence of incidence for each item of the SIMS-14 items instrument construct. A total of 193 primary school students aged 11 years (year 5) were given the instrument to be answered after the end of the 5 on 5 handball competition session.

Finally, the validated SIMS-14 items instrument was used to seek how a four-week flipped classroom intervention teaching affected the situational motivation of primary school children. A One-Way ANCOVA analysis was employed to analyze the data collected among 177 students.

RESULTS

Rasch Model Analysis

The SIMS-14 items instrument that had been modified to a 5-point Likert scale was analyzed using Rasch Model analysis which showed the overall information of Fit Model and Mean Measure as in Table 1.

Table 1:
Overall Information of Model Fit and Mean Measure Instrument SIMS-14 items

		Total Score	Measure	INFIT		OUTFIT	
				MNSQ	ZSTD	MNSQ	ZSTD
Person	MEAN	41.5	-0.18	1.00	-0.18	0.99	-0.20
	S. D	1.2	0.22	0.07	0.22	0.07	0.21
	MAX	56.0	2.55	2.35	2.86	2.31	2.80
	MIN	21.0	-4.03	0.08	-4.00	0.08	-4.01
Items	MEAN	151.1	0.00	1.00	-0.08	0.99	-0.11
	S. D	2.8	0.14	0.07	0.39	0.06	0.39
	MAX	175.0	0.75	1.33	1.62	1.35	1.73
	MIN	136.0	-1.20	0.37	-4.28	0.38	-4.27

Rasch Model analysis shows the mean for individuals is -0.18 lower than the mean for items 0.00. The mean values of Infit and Outfit MNSQ for individuals are 1.00 and 0.99 and for items are 1.00 and 0.99 respectively, which is the same as the ideal value expected by the model, the closer to 1.00 the better it is (Sumintono & Widhiarso, 2014).

In addition, the mean values of individual Infit and Outfit ZSTD are -0.18 and -0.20 while the mean values of Infit and Outfit ZSTD items are -0.08 and -0.11 approaching the ideal value expected by the model which is 0.00 indicates the quality of the item is improving (Sumintono & Widhiarso, 2014). Negative values indicate that individuals and items are overfitted on average. In other words, the data obtained fit the model better than expected (Green & Frantom, 2002). The individual ZSTD SD Infit

value is 0.22 while the item ZSTD SD Infit value is 0.39 indicating that the data is within the logical calculation range which is at the cut-off value |2.00| (Sumintono & Widhiarso, 2014). In conclusion, the evidence of the research data has shown an acceptable fit as a whole and in accordance with the Rasch Model.

Rasch Model analysis can also determine the validity of the rating scale used (Sumintono, 2018). Table 2 shows the results of the analysis output for the five-category rating scale.

Table 2:
Category Frequency and Average Measure for the Five Category Rate Scale

Category Label	Observed Count	Observed Average	Andrich Threshold
1	34	-3.10	NONE
2	180	-1.28	-3.84
3	296	-0.21	-1.21
4	187	1.26	0.96
5	17	1.81	4.09

The mean measures of category 1 were NONE, category 2 was -3.84, -1.21 for category 3 while 0.96 and 4.09 for categories 4 and 5 respectively indicated that the average "agreeability" estimate for individuals. The average of the measurements is functioning as expected because the moving measurements increase one-way (monotonically) and orderly from NONE, negative to positive values from -3.84 to 4.09. Based on Sumintono & Widhiarso, (2014), the Andrich Threshold Value Index which is the distance between the rating scales should be in the range of 1.0 logit to 5.0 logit. Thus, the pattern of response patterns for the respondents is quite normal and shows the uniformity in which the given scale categories are already valid for the respondents.

In addition, the ability of an instrument to assess a wide range of attributes determines its unidimensionality (Muslihin et al., 2022) which is vital to verify that the instrument used can measure in just one direction and that the study's results are not confusing.

Table 3:
Standardized Residual Variance (in Eigenvalue Units)

	Empirical			Modeled
Total raw variance in observations	28.46	100.0%		100.0%
Raw variance explained by measure	14.45	**50.8%**		50.7%
Raw variance explained by persons	9.13	32.1%		32.0%
Raw variance explained by items	5.33	18.7%		18.7%
Raw unexplained variance (total)	14.00	49.2%	100.0%	49.3%
Unexplained variance in 1st contrast	3.27	**11.5%**	23.3%	
Unexplained variance in 2nd contrast	2.76	9.7%	19.7%	
Unexplained variance in 3rd contrast	1.71	6.0%	12.2%	
Unexplained variance in 4th contrast	1.33	4.7%	9.5%	
Unexplained variance in 5th contrast	1.21	4.2%	8.6%	

Table 3 shows that the value of Raw Variance Explained by Measures for the SIMS-14 items instrument is 54.3%, not far from the expectations of the Rasch model which is 50.8%. According to Ramdani et al., (2020), if the measures can explain the raw variation to a ≥ 20 %, it shows there is an argument that can be made for unidimensional measurement. The following are the interpretation criteria: sufficient if the percentage is between 20% and 40%, good if the percentage is between 40% and 60%, and very good if the percentage is over 60%. The value recorded is above the minimum value of 40% thus it is proven that the SIMS-4 items instrument has a strong unidimensionality whereby it can measure the construct which intends to be measured in the study. The 'unexplained variance' value for the first contrast was less than 11.5%, not exceeding the 15% control limit, while the unexplained variance in the contrast of residuals from the 2nd to 5th is 9.7%, 6.0%, 4.7%, and 4.2% respectively (Sumintono & Widhiarso, 2014).

Table 4:
Reliability Index and Separation Index

	Reliability Index	**Separation Index**
Person	0.91	3.09
Item	0.78	1.89
Cronbach's Alpha (KR-20) value	0.92	

Table 4 displays the findings of Rasch analysis for the SIMS-14 items instrument giving a person reliability value, which is 0.91, and the items reliability is 0.78. Sumintono and Widhiarso, (2014) stated that the person reliability index and item reliability index exceeding 0.81 confirm that it is a strong accepted reliability value.

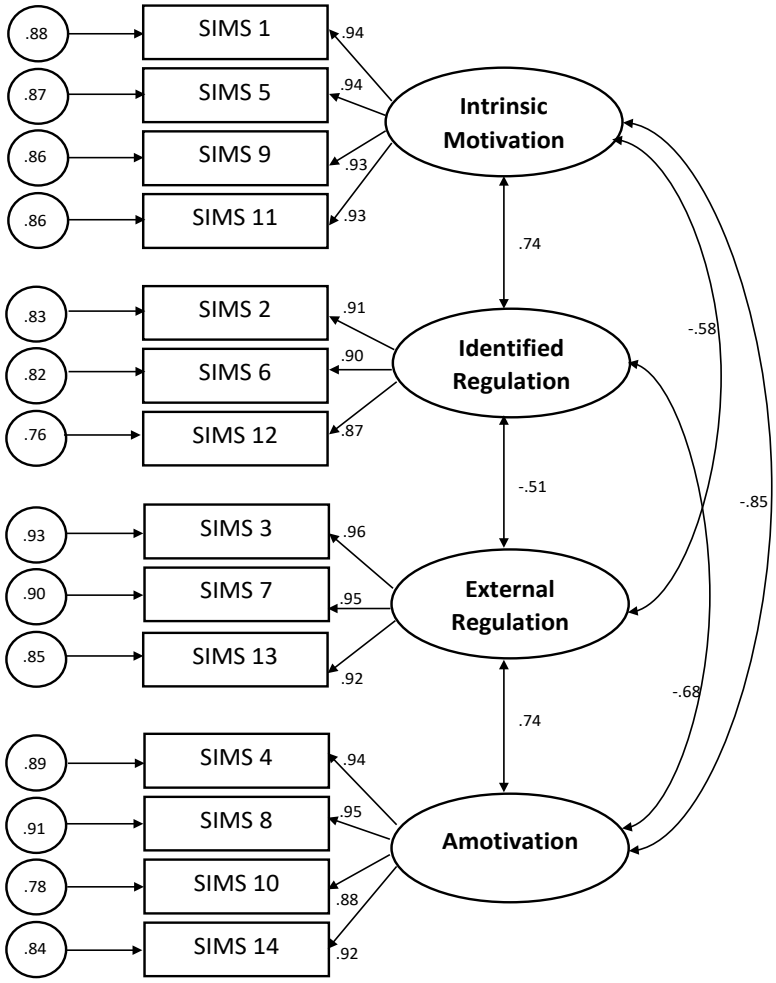
For person reliability, the tested items can distinguish the ability of one individual from another individual for a variable measured while for items reliability shows the items are equivalent even though given the same items to another group of individuals that has the same characteristics (Bond & Fox, 2015). As for the separation index, the values for person and item were 3.09 and 1.89, respectively. Values above 2.0 indicate a good and acceptable index (Bond & Fox, 2015).

In addition, the analysis also showed that the Cronbach's Alpha (KR-20) value for the SIMS-14 items instrument is 0.93 which is very high reliability (Sumintono & Widhiarso, 2014). These findings indicate that the items of the SIMS-14 items instrument can differentiate individuals according to ability and able to separate items according to the difficulty level.

Confirmation Factor Analysis (CFA)

The findings of the confirmation factor analysis are Chi-square/df = 1.877, CFI = 0.982, GFI = 0.915 and RMSEA = 0.68. RMSEA values below 0.08 and GFI values> 0.9 indicate the model is at a good level of matching validation for the model in Figure 1 shown below.

Figure 1:
Results of the confirmatory factor analysis for SIMS-14 items



Furthermore, the results of the confirmation factor analysis are summarized based on Table 5 on factor loading, Cronbach's Alpha Value, Construct Validity (CR) and Average Variance Extracted (AVE).

Table 5:
Confirmation Factor Analysis (CFA) Instrument SIMS-14 items

Construct	Item	Loading Factor	Cronbach Alpha	CR	AVE
Intrinsic Motivation	SIMS 1	0.94	0.92	0.96	0.87
	SIMS 5	0.94			
	SIMS 9	0.93			
	SIMS 11	0.93			
Identified Regulation	SIMS 2	0.91	0.90	0.92	0.80
	SIMS 6	0.90			
	SIMS 12	0.87			
External Regulation	SIMS 3	0.96	0.95	0.96	0.89
	SIMS 7	0.95			
	SIMS 13	0.92			
Amotivation	SIMS 4	0.94	0.92	0.96	0.85
	SIMS 8	0.95			
	SIMS 10	0.88			
	SIMS 14	0.92			

Table 5 shows that the internal validity for each variable with Cronbach's Alpha values ranged from 0.90 to 0.95. This criterion satisfies the set condition that the value is ≥ 0.70. As for the value of Construct Validity (CR), the value is between 0.92 to 0.96 and qualifies with a value of ≥ 0.60 and the value of Average Variance Extracted (AVE) is between 0.80 to 0.89 and this means that the output from CFA meets the criteria that have been set that is ≥ 0.50 (Awang, 2015). Overall, the validation factor analysis met the set criteria. Besides, by referring to Table 6, can be justified that the subscales of SIMS 14-items have a strong significant correlation between the sub-scales.

Table 6:
Correlation between sub-scales of SIMS-14 items

			Estimate	S.E.	C.R.	P-Value	Interpretation
IM	<-->	IR	0.651	0.087	7.474	0.001	Significant
IR	<-->	ER	-0.503	0.087	-5.819	0.001	Significant
ER	<-->	AM	0.940	0.123	7.644	0.001	Significant
IM	<-->	ER	-0.668	0.102	-6.563	0.001	Significant
IM	<-->	AM	-0.966	0.116	-8.300	0.001	Significant
IR	<-->	AM	-0.663	0.094	-7.064	0.001	Significant

One-Way ANCOVA Analysis

A one-way ANCOVA test was conducted to determine the difference in student situational motivation based on the teaching group where the pre-test was a covariate. The normality test shows that the data is normally distributed where the Shapiro-Wilk value for the pre-test of the control teaching group is 0.181 and the flipped classroom teaching group is 0.990. The situational motivation post-test for the control teaching group is 0.102 and for the flipped classroom teaching group is 0.156 showing a non-significant value which means the data is normally distributed. This means that the situational motivation pre-test was the same across the experimental and control teaching groups. Prior to the One-Way ANCOVA Analysis, the study groups were checked for homogeneity of equal variances using Levene's Test of Equality of Error Variances to ensure a lower Type I error rate. Levene's test showed the same variance between the treatment and control groups with a value of F = 0.180, sig = 0.672 (p>0.05).

Therefore, a one-way ANCOVA test can be conducted to determine the difference in student situational motivation based on the teaching group where the pre-test is a covariate. The results of the one-way ANCOVA test are as follows.

Table 7:
One-Way ANCOVA Analysis

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Pre-Motivation	2.672	1	2.672	1.108	0.294	0.006
Teaching Groups	435.176	1	435.176	180.412	0.001	0.509
Error	419.710	174	2.412			

Based on Table 7, a one-way ANCOVA test shows that there is a significant difference in post-situational motivation based on teaching groups with a value of F = 180.412, sig = 0.001 (p<0.05). The mean post-situational motivation of students in the flipped classroom teaching group (M=7.137) shows a higher score compared to the post-situational motivation of students in the control teaching group (M=3.994) as in table 8. The ETA value of 0.506 indicates that there is a large effect of interaction.

Table 8:
Mean Post-Motivation of Teaching Groups

Teaching Groups	Mean	Std. Error	95% Confidence Interval	
			Lower Bound	Upper Bound
Control	3.994[a]	0.166	3.667	4.321
Flipped Classroom	7.137[a]	0.165	6.811	7.462

Table 9:
Pairwise Comparison between Teaching Groups

(I) Teaching Group	(J) Teaching Group	Mean Difference (I-J)	Std. Error	Sig.[b]	95% Confidence Interval for Difference[b]	
					Lower Bound	Upper Bound
Flipped Classroom	Control	3.143*	0.234	0.000	2.681	3.604

Table 9 displays the results of pairwise comparison on post situational motivation score test between the teaching groups after controlling Type 1 error using the Bonferroni method. Results indicated that there was a statistically significant difference in the situational motivation of the flipped classroom teaching group - control teaching group comparison pair, (I-J) =3.143, $p<0.05$.

DISCUSSION

Overall, the purpose of the study was to validate the SIMS-14 items of the Malay language version showed high validity and reliability in the context of the use of PE. The results of the overall analysis report show that SIMS-14 items have good psychometric properties, and the suitability of their use is acceptable for respondents from primary schools. Analysis of the Rasch Model based on Andrich Threshold also confirmed that the change in the original instrument from a Likert scale of 7 points to 5 points is still able to measure and evaluate the situational motivation of the student after physical activity which is the 5 on 5 handball competition. Moreover, the value of variance for the component recorded which is 54.3% proved that the SIMS-14 items instrument has a high ability and unidimensionality to correctly measure the motivational construct that intends to be measured (Sumintono & Widhiarso, 2014). In addition, the separation and reliability of scale and person items were satisfactory.

For construct validity, CFA results support four sub-scales, which reflect the constructs of motivation theory, namely intrinsic motivation, identification regulation, external regulation, and amotivation (Deci & Ryan, 1985). The findings of this study are consistent with other researchers' validation studies (Blanchard et al., 2007; Guay et al., 2000; Martín-Albo et al., 2009; Moreno et al., 2010; Østerlie et al., 2019; Paixão et al., 2017). In addition, this study has space to be explored by testing SIMS-16 items and SIMS 14 items for psychometric comparisons and measuring abilities for situational motivation for primary school students which are thought to be critical to maintaining student engagement in PE learning and permanent physical activity actively.

In addition, the use of SIMS 14 items is suitable to be administered among primary school students to obtain data based on situational motivation. Nevertheless, some limitations should be taken into consideration. This study of the Malay version of the SIMS-14 items included schools' student aged 10 years old. With this limitation, the researchers recognize the extent to which chosen methodology limits the scope, accuracy and generalization of the research conducted. Thus, the present results cannot be generalized to younger children nor to older adolescents. Therefore, the researchers suggest other researchers to extent the study to a wider group of students and focusing on other tasks. However, the researchers are cautiously optimistic that the findings will be both valuable and applicable to the assessment of situational motivation in PE class for Malaysian year four primary students. Added, it was

found that the flipped classroom teaching method was able to increase students' situational motivation in learning the handball game compared to the control group that followed traditional teaching methods.

CONCLUSION

This study evaluates the psychometric properties of SIMS-14 Malay language version items for use among 10-year-old primary school students by evaluating the reliability and validity of the construct. SIMS-14 items showed good reliability and high construct validity. As a result, the Malay language version of SIMS-14 items appears appropriate and can be used to assess situational motivation in the context of PE, which represents intrinsic motivation, identification regulatory motivation, external regulatory motivation, and amotivation constructs among primary and secondary school students. The findings of this study also give an overview of how student motivation differs, as well as guidance for teachers. To optimize students' situational motivation in PE classes, the design and implementation of learning models, as well as the management of learning environments, must be extensively examined.

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With the right citation, other researchers may use the Situational Motivation Scale (SIMS) in the Malay version presented in this work. No written consent from the authors is necessary.

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