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Reliability and construct validity of Turkish version of physical education activities scale

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This research was conducted to examine the reliability and construct validity of Turkish version of physical education activities scale (PEAS) which was developed by Thomason (2008). Participants in this study included 313 secondary and high school students from 7th to 11th grades. To analyse the data, confirmatory factor analysis, post hoc analysis and modification indices were conducted by AMOS Software 21.0 and internal consistency for reliability was tested by SPSS 13.0. Findings showed that GFI (.885), CFI (.923), RMR (.227), and RMSEA (.055) of four factor correlation model was best for representing Turkish version of PEAS factorial structure. Cronbach's alpha coefficients of the subscales (behavioral control: .74; social-norms: .75; physical education enjoyment: .85; self-efficacy: .50) and the Cronbach's alpha coefficient of the total scale (.90) proved that Turkish Version of Physical Education Activity Scale had internal consistency. As a result, Turkish version of PEAS including four subscales and 24 items was reliable and had construct validity to measure 13 to 18 years old adolescents' perceptions of environmental factors that influence their behavior directly or indirectly when they participate in physical activities in physical education classes.

Key words: Physical education activities scale, physical education, physical activity, enjoyment of physical education.

INTRODUCTION

Participation in physical education related to physical activity has become a highly important phenomenon recently since the obesity levels of children and adolescents increased (Lowry et al., 2001; Lowry et al., 2005). It was also found that obese adolescents had low level of physical activity (Bengoechea et al., 2010). According to Centers for Disease Control and Prevention (CDC), children and adolescents should do 60 minutes (1 hour) or more of physical activity each day. It helps improve overall health and fitness, and reduces the risk for many chronic diseases (CDC, 2012). Physical activity also reduces the risk of type II diabetes (Kriska et al., 2003) and increases bone density (Buell, 1999). "The physical education curriculum, in particular, should patterns and instill a general appreciation for physical promote skills essential for developing physical activity activity later in the adult years." (Goran et al., 1999). More physical education hours means increased level of physical activity especially for girls both inside and outside of school (Dauenhauer and Keating, 2011). Studies conducted in different countries also showed that during adolescence, especially girls' physical activity participation and levels decline (Singerland et al., 2011; Jaakkola and Washington, 2012). Girls also tend to participate less in physical activity if there is no physical education lesson (Dauenhauer and Keating, 2011).

In order to increase participation in physical education activities, students should feel successful (Portman, 1995, 2003). Portman (2003) suggested that the activity was not fun when students were not successful. As a

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result, it was recommended that high-skilled students should motivate low-skilled students in mixed team activities. Morrison and Nash (2012) stated that in secondary school settings pupils needed chance to increase their participation rates and enjoyment. According to Lowry et al. (2001) high schools should provide students with a number of physical activities to prepare them for a life-long habit. However, researchers also claimed that in US, high schools were not successful in providing students with an adequate physical education and physical activity opportunities. In order to increase exercise behavior in children and adolescents, great variety of exercise opportunities should be provided (Barkley et al., 2011; Zeng et al., 2011).

Physical education enjoyment is another critical element in participating in class and it maintains a physically active life style in elementary school (Prochaska et al., 2003), secondary school (Bernstein et al., 2011) and high school students (Hashim et al., 2008) and it is also important for increasing leisure-time physical activity (Bengoechea et al., 2010). Enjoyment of physical education is positively related to enjoyment of physical activity and it decreases as the duration of physical education decreases. The more adolescents enjoy participating in physical education classes, the more active they will be after school (Woods et al., 2012). In a longitudinal study it was found that lower percieved athletic competence was related with low enjoyment of physical education among girls (Cairney et al., 2012). Woods et al, (2012) claimed that older pupils and girls participated in physical education less than younger ones and boys. Bengoechea et al. (2010) found that younger adolescents had higher physical education enjoyment related to greater leisure-time physical activity participation than older adolescents. Both organized and unorganized physical activity were also related with physical education enjoyment.

Attitudes toward physical education have been a concern for specialists and teachers for years, because it enhances physical activity participation (Chung and Phillips, 2002). In a study conducted in Austria, Czech Republic, England and USA, it was found that Czech students had the highest level of attitudes and English students had the lowest. Study suggested that there were cultural differences in attitudes toward physical education (Stelzer et al., 2004). In terms of co-educational and vocational school settings, Koca et al. (2005) found that students from co-educational settings had more positive attitudes toward physical education. Zeng et al. (2011) claimed that students in grade 9 to 12th had positive attitudes toward physical education. According to Korkmaz and Haloğlu (2011) upper grades had higher attitudes toward physical education than the lower grades. Güllü et al. (2009) asserted that high school students had positive attitudes. Moreover, in their study it was found that participating in an activity in a sport club was positively related with the attitudes. Becoming a member in a school sports club may also influence students' attitudes in a positive way (Tomik et al., 2012).

As a result, it can be argued that adolescents' environment has many dimensions influencing physical education participation. In order to understand adolescents' perceptions of environmental factors in physical education settings in a broad sense Physical Education Activities Scale (PEAS) was developed by Thomason (2008). PEAS was originated from Bronfenbrenner's (1979) ecological model identifying four ecological-environmental system levels-the microsystem, mesosystem, exosystem and macrosystem include family, school, health status, culture, religion and laws (Bronfenbrenner, 1993). All concepts take place in the adolescent's environment and they are interrelated and they influenced each other (Thomason and Schepp, 2011). Each level has a direct or indirect contact with the person. The microsystem level includes students' parents, siblings, peers, friends, and school influencing physical education participation. Factors such as curriculum, programs and activities, teachers and peers may affect adolescent's participation in physical education activities. The mesosystem level includes interrelationship among peers, family, friends and school influencing adolescent's immediate environment. The exosystem level involves neighbors, school boards, policies and barriers affecting adolescent's behavioral control. The final level – macrosystem – includes culture, religious beliefs, and public policy influencing adolescent physical activity. Thus, based on this conceptual framework, physical education activities scale was developed to measure perceptions of adolescents including interests, values, beliefs, and attitudes towards school physical education activities (Thomason, 2008).

This research was conducted to examine reliability and construct validity of Turkish version of PEAS (Thomason, 2008) to measure adolescents' perceptions of environmental factors that influence their behavior directly or indirectly when they participate in physical activities in physical education classes. The instrument can be used with 13 to18-year old students. PEAS also helps to distinguish the differences between female and male perceptions and identify determinants of school physical education activities (Thomason and Schepp, 2011).

MATERIALS AND METHODS

Sample size

In Kirikkale, Turkey, 165 girls (52.7%) and 148 boys (47.3%) from secondary and high schools participated in this research in 2012. Research group consisted 7th grades (17.3%;N=54), 8th grades (24.0%;N=75), 9th grades (33.9%;N=106), 10th grades (9.3%;N=29) and 11th grades (15.7%;N=49) students.

Measures

PEAS was developed by Thomason (2008). This self-report questionnaire with responses ranging from (Disagree a lot) to

Table 1. Normality of variables.

Multivariate Normalized Estimate (Mardia's criteria)	Kurtosis	C.R.
	200,974	30,670

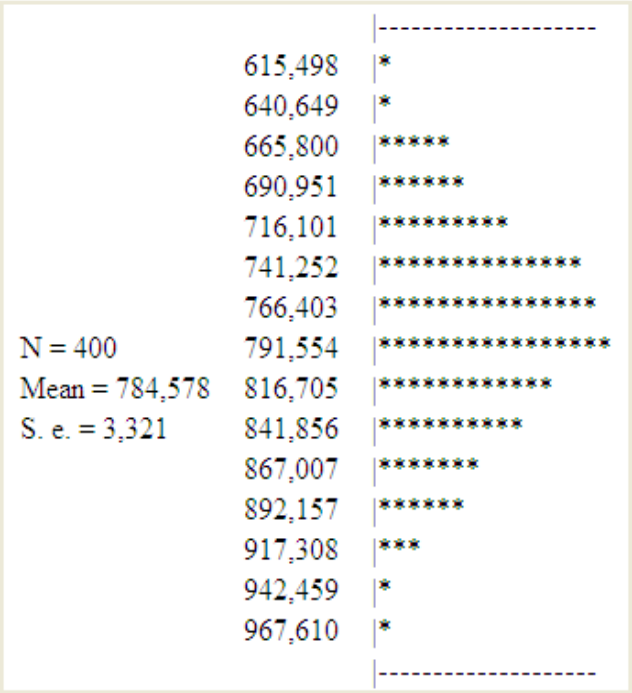

Figure 1. ML discrepancy (implied vs. sample) (4 factor correlation model).

(Agree a lot) scale summed across 41 items. Self-efficacy (SE) subscale items were 1,2,3,4,5, barriers (B) subscale items were 6, 7, 8, 10, 12, 16, 18, 20, 21, personal factors (PF) items were 29, 30, 31, 32, 33, 34, 41, Social Norms (SN) items were 13, 35, 36, 37, 38, 39, 40, PE enjoyment (PEE) items were 22, 23, 24, 25, 26, 28, and Behavioral Control (BC) items were 9,11,14,15,17,19,27. The questionnaire was translated by the researcher and the translated version was checked by two English instructors working at different universities. Translated items were checked again by the researcher and by two other physical education specialists. 13th item was removed from Turkish version of PEAS because it was not convinient for Turkish education system. After having agreed on the translated scale, questionnaire was given to 200 students to see if the Turkish version was understandable. Final version of the scale was given to 350 students. Students responds to 7-point-Likert-type scale ranges from "Strongly disagree" to "Strongly agree". Questionnaires having lacking answers were discarded and 313 questionnaire was evaluated for this study.

Data collection and analysis

In this research, survey method was used for data collection. Questionnaires were given to the students and they responded in 30 min. Students were informed about the questionnaire. To analyse the data, confirmatory factor analysis, post hoc analysis and modification indices were conducted by AMOS Software 21.0 and internal consistency for reliability was tested by SPSS 13.0.

RESULTS

Confirmatory factor analysis

The original Physical Education Activities Scale (PEAS) has six subscales (self-efficacy, barriers, personal factors, social-norms, physical education enjoyment, behavioral control).

First, the path diagram of the hypothesized model was drawn. Two critically important assumptions associated with Structural Equation Modeling (SEM), in the analysis of covariance and mean structures is the requirement that the data are of a continuous scale and have multivariate normal distribution (Byrne, 2010).

Bentler (2005) suggested that critical ratio values greater than 5.00 are indicative of data that are non-normally distributed. Mardia's normalized estimate of multivariate kurtosis value of 40 variables in this model was 30,670 (Table 1). In such cases, Byrne (2010) advised that bootstrapping method could be used.

In summary of the bootstrap iterations, 400 usable samples were obtained. Maximum likelihood (ML) discrepancy distributions of both the sample and population are shown in Figures 1 and 2.

Post Hoc analysis

The estimation of model 1 resulted in an overall x^2 value of 2334.316 with 725 degrees of freedom and a probability of .000. Goodness of Fit statistics related to model 1 is shown in Table 2. Findings revealed that GFI (.624), CFI (.633), RMR (.546) and RMSEA (.084) value of model 1 was under the acceptable cutoff point. Hu and Bentler (1999) suggested that values above .90 or higher for GFI, CFI and Browne and Cudeck (1993) proposed between .05 and .08 which is taken as an indicative of acceptable fit for RMSEA and RMR. Schumacker and Lomax (2010) claimed that RMR cutoff value can be defined by the researcher. Fit indices results of model 1 led us to test second order 6 factor model.

The estimation of model 2 yielded x^2 value of 1749.221, with 734 degrees of freedom. Values related to the CFI and RMSEA were .769 and .067, respectively. The other fit indices of model 2 for the GFI and RMR values were .771 and .492. The difference in fit between model 2 and model 1 was statistically significant ($\Delta x^2 = 585.095$). Also

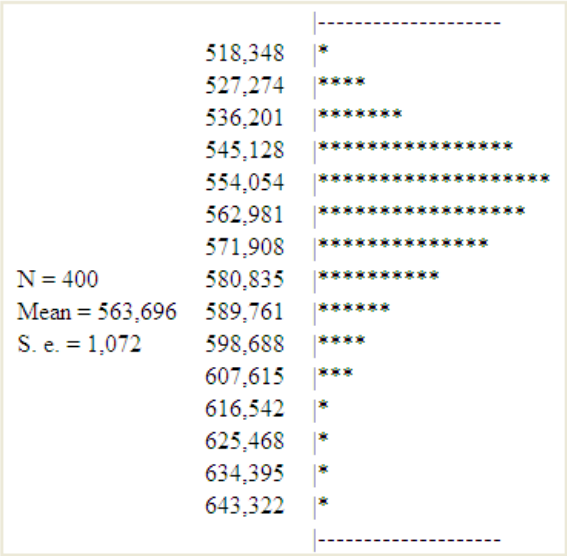

Figure 2. ML discrepancy (implied vs. pop) (4 factor correlation model).

Table 2. Fit indices of the analyzed models

	X^2	df	P	GFI	CFI	RMR	RMSEA
Model 1 (6 factor model)	2334.316	725	.000	.624	.633	.546	.084
Model 2 (Second order 6 factor)	1749.221	734	.000	.771	.769	.492	.067
Model 3 (Second order 5 factor)	898.726	429	.000	.843	.867	.353	.059
Model 4 (5 factor correlation model)	854.899	424	.000	.850	.878	.336	.057
Model 5 (Second order 4 factor)	500.819	248	.000	.880	.915	.244	.057
Model 6 (4 factor correlation model)	475.552	246	.000	.885	.923	.227	.055

Abbreviations: X^2: Chi-square, df: degree of freedom, P: significant value, GFI: Goodness of fit indice, CFI: Comparative fit indice, RMR: Root mean square residual, RMSEA: Root mean square error of approximation.

other fit indices values of model 2 revealed a statistically significant improvement in model fit between model 1 and model 2. However they were still not above the acceptable cutoff point. As parameter estimates for model 2 was examined, critical ratio values were significant except for Personal Factors (PF). Therefore, PF was eliminated from the Model 2. In sum, model 3 was conducted to test 5 factor second order design.

The x^2 value of Model 3 (Second order 5 factor) was 898.726 with 429 degrees of freedom. Values related to the CFI and RMSEA were .867 and .059, respectively. GFI and RMR values were .843 and .353. The difference in x^2 (Δx^2) values between model 3 and model 2 was 850.495 which indicated substantial improvement in model fit.

In order to see whether there was better improvement in model fit, five factor correlation model was conducted. The x^2 value of model 4 was 854.899 with 424 degrees of freedom. Fit summary of the model 4 was GFI (.850), CFI (.878), RMR (.336), and RMSEA (.57) respectively. Δx^2 values of model 4 and model 3 was 43.827 which meant a slight substantial improvement in model fit. Moreover, "barriers" subscale in model 4 resulted as not significant. As a result, by ignoring "barriers" subscale, model 5 (Second order 4 factor) was conducted. To obtain best x^2 value both second order and full-correlation 4 factor models were tested.

The differences in x^2 (Δx^2) values of model 5 and model 6 between model 4 were 354.080 (model 5 – model 4) and 379.347 (model 6 – model 4). Finally, model 6 most appropriately represented PEAS Turkish Version's factorial structure. Optimum fit indices values, observed in model 6, were GFI (.885), CFI (.923), RMR (.227), and RMSEA (.055). The comparison of fit indices of all models can be seen in Table 2.

Modification indices

Regarding to the "modification indices" results in mode l 6, although "Behavioral Control" and "Social Norms"

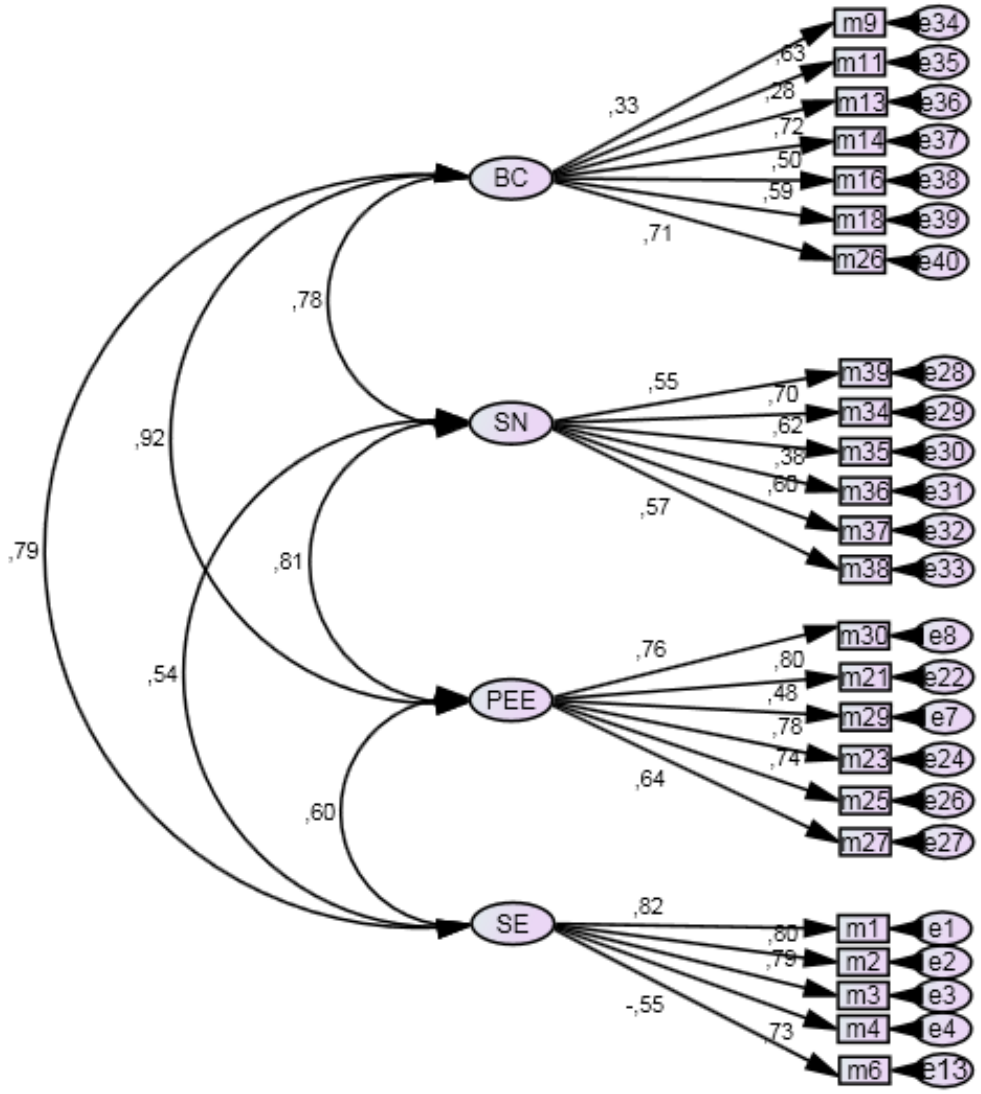

Figure 3. Hypothesized model of factorial structure for the Turkish version of PEAS (Four factor correlation model). p<0.001

subscale structure did not change, "Physical Education Enjoyment" and "Self-efficacy" subscale structure changed. In model 6, "*Having the PE teacher choose activities for class is something I usually like*" and "*Participating in PE activities is something I like to do*" items were excluded from "Personal Factors" and put under "Physical Education Enjoyment" subscale. Likewise, "*I would be able to participate more in school PE activities if I could choose the activities*" item was included under "Self-efficacy" subscale which was formerly under "Barriers" subscale. On the other hand, "*I think it is boring to participate in PE activities*" and "*When I participate in PE activities, I worry about what others think of me*" items were excluded from "Physical Education Enjoyment" subscale and "*I feel most PE activities are too hard for me to do and do not participate in those activities*" item were excluded from "Barriers" subscale according to "modification indices" results. Consequently, the final hypothesized model of factorial structure for the Turkish version of PEAS is as it is seen in Figure 3.

Reliability

The reliability of Physical Education Activity Scale (Turkish Version) was determined by analyzing Cronbach's alpha coefficients. Cronbach's alpha coefficients of the subscales (behavioral control: .74; social-norms: .75; physical education enjoyment: .85; self-

Table 3. Cronbach's alpha coefficients of the subscales and total scale

Scale	Cronbach's alpha
Behavioral control	.74
Social norms	.75
Physical education enjoyment	.85
Self-efficacy	.50
Total scale	.90

efficacy: .50) and the Cronbach's alpha coefficient of the total scale (.90) proved that Turkish Version of Physical Education Activity Scale had internal consistency (Table 3).

DISCUSSION

Adolescent students' perceptions in physical education setting is a subject which should be examined in a wide-ranging scale. In addition to other researchers, Thomason (2008) developed a questionnaire to help teachers and academicians to understand and examine that problem. Although there has been some research on perceptions of students in physical education classes in Turkey, Turkish version of PEAS was thought to be helpful for further studies.

The present study results revealed that PEAS could be a very useful tool for measuring the perceptions of adolescents' physical activity behaviors in physical education classes in Turkey. After confirmatory and reliability analyses, Turkish version of PEAS consists of 4 subscales and 24 items. Self efficacy, behavioral control, social norms and physical education enjoyment subscales can be used to measure adolescents' perceptions of physical activities in physical education classes. Since in this study "barriers" and "personal factors" subscales had to be discarded from the scale, further research might be needed to understand the barriers of physical activities within perceptions in physical education classes.

Conclusion

In the analysis of the data GFI (.624), CFI (.633), RMR (.546) and RMSEA (.084) value of model 1 was under the acceptable cutoff point. Then, model 2 (second order six factor model) was conducted. In model 2 error correlation e41= - .016 under "behavioral control" subscale resulted in that solution was not admissable. Because regression weight for PEAS in the prediction of "barriers" subscale was not significant, that subscale was extracted and model 3 (second order five factor model) was conducted.

However, regression weight for PEAS in the prediction of "personal factors" was not significant again. Therefore, "personal factors" were omitted. In model 4 (second order four factor model) under "behavioral control" subscale e41= -.015 meant that solution was not admissable. As a result, by ignoring "barriers" subscale, model 5 (five factor correlation model) was conducted. Model 5 showed high chi-square (X^2= 854.899) and low CFI (.878) and GFI (.850) scores. Four factor correlation model (model 6) was conducted to have significant values.

Model 6 was preferred because CFI and RMSEA values were above cut off point and model was identified. Although GFI was under .900 it had acceptable level. Model 6 fitted the data exceptionally well. According to the findings from the estimation all of those alternative models, model 6 was well-fitting than the others. Goodness-of-fit indices related to model 6 showed a further statistically significant drop in the chi-square value from other models (X^2= 475.552). It was clear that from model 6 with respect to both RMSEA (.055) and CFI (.923) were acceptable.

Cronbach's alpha values of the subscales (behavioral control: .74; social-norms: .75; physical education enjoyment: .85; self-efficacy: .50) and the overall value of the scale (.90) showed that Turkish Version of Physical Education Activity Scale was reliable.

The remaining subscales and items from the translated version of PEAS were Self Efficacy (SE) subscale items:1,2,3,4,6; Behavioral Control (BC) items: 9,11,13, 14,16,18,26; Social Norms (SN) items: 34,35,36,37, 38,39; and Physical Education Enjoyment (PEE) items: 21,23,25,27,29,30. As a result, Turkish version of PEAS included 4 subscales and 24 items.

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