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# Psychometric Properties of the Iranian Version of the Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2)

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## ABSTRACT

**Background:** The Behavioral Regulation in Exercise Questionnaire (BREQ) and the BREQ-2 are the most commonly used measures of behavioural regulation in exercise psychology. The purpose of the study was to assess the validity and reliability of the Iranian version of the BREQ-2 on a sample of university students.
**Methods:** The BREQ-2 was translated into Persian by qualified experts and the psychometric properties of the instrument were assessed. Content validity was established, using a panel of 12 Iranian experts in the areas of health education, psychology, and exercise. Construct validity was assessed via confirmatory factor analysis (CFA), using LISREL 8.80 (N = 418). The reliability of the BREQ-2 was assessed, using a 2-week test-retest to establish its stability and Cronbach's Alpha to estimate its internal consistency.
**Results:** The Iranian version of the BREQ-2 was slightly modified to improve content validity. Primary results of confirmatory factor analysis did not fully support the 5-factor uncorrelated model. The model was modified; and the fit indices indicated that the 5-factor correlated model was the best fit. The scale was found to have acceptable internal consistency ($\alpha > 0.7$) and test-retest reliability (intra-class correlation coefficient [ICC] > 0.80).
**Conclusion:** The Iranian BREQ-2 has acceptable validity and reliability in the study sample and may be used in relevant studies to assess behavioural regulation in similar samples.
**Keywords***:* Validity, reliability, BREQ, Self-Determination Theory, Students, Exercise

## Introduction

Physical activity is important for physical, psychological and social health [1-2]. Despite these documented benefits, physical inactivity is a global concern [3]. Physical inactivity is not a problem restricted to Western countries and data from three national surveys among Iranian adults have shown that more than 80% of the Iranian population is physically inactive [4]. Physical activity declines with age and adolescence represents the largest decline in physical activity observed over the lifetime [5]. For these reasons, the health behaviors of young adults are of particular concern. A recent large scale survey of university students from 23 countries found that many were not sufficiently active [6] and local studies examining the physical activity behaviors of young Iranians have revealed similar patterns [7].

Given the high prevalence of inactivity, research focusing on the factors that will increase people's motivation towards adopting and maintaining an active life-

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style is essential. It is important for researchers and practitioners to address the question of why young adults do or do not participate in physical activity, and to explore motivational factors that might distinguish between those who are active and those who are inactive. In a review of several important theories of exercise behavior, the need for theoretically-based research on the motivational processes linked to the beginning and maintaining of physical activity was highlighted [8]. Such work should provide greater understanding of the mechanisms by which individual, social, and environmental factors influence physical activity adoption and maintenance.

One theory that has been applied to the study of exercise behavior is the Self-Determination Theory (SDT) [9-11]. The SDT is a continuum-based theory that distinguishes between intrinsic motivation (i.e., participation in an activity because of its inherent rewards of interest and enjoyment), extrinsic motivation (i.e., participation in order to gain external rewards or to satisfy an external pressure) and amotivation (i.e., the relative absence of intrinsic or extrinsic motivation) [11]. The SDT is appealing because it analyzes the various reasons for and meanings of behavioral engagement [8, 12]. In the long-term, this information could help us to understand the impact of endorsing different regulatory styles in the context of exercise and assist in the planning and development of interventions aimed at promoting physical activity interventions [13]. The SDT proposes three forms of motivation that cover the different degrees of self-determination in the context of a specific behavior [8], namely, extrinsic motivation, intrinsic motivation, and amotivation. All of the motivation types are determined by a series of regulatory processes, which can be values, rewards, self-control, interests, fun, and satisfaction [14]. Several questionnaires have been used in the self-determination literature to assess motivation in physical activity. For example, the Sport Motivation Scale (SMS) measures the three types of intrinsic motivation (i.e., to know, to accomplish, and to experience stimulation), the three forms of regulation for extrinsic motivation (i.e., identified, introjected, and external) and amotivation. It has been used in various studies to assess motivation in competitive sports [15-16]. However, concerns regarding the psychometric properties of the SMS have been identified in the literature [17-18]. Another scale is the 31-item Exercise Motivation Scale (EMS). The EMS covers eight facets of the exercise motivation construct (i.e., amotivation, external regulation, introjected regulation, identified regulation, integrated regulation, intrinsic motivation to learn, intrinsic motivation to accomplish tasks, and intrinsic motivation to experience sensations). Results from various analyses support the applicability of the EMS in the context of exercise [19].

The Behavioral Regulation in Sport Questionnaire (BRSQ) is a new measure of competitive sport participants' intrinsic motivation, extrinsic motivation, and amotivation [20]. Lonsdale and colleagues found the BRSQ to have acceptable internal consistency, test–retest reliability, and construct validity [20]. However, further research is needed to clarify whether the BRSQ scores represent four or six levels of self-determined motivation [20]. The researchers suggested that the BRSQ is more appropriate for use with competitive sport participants and may not be applicable to studies interested in the assessment of motivation in regards to physical activity or physical education [21].

The Behavioral Regulation in Exercise Questionnaire (BREQ) is another tool that has been used extensively in exercise and sport psychology. It is a self-report measure developed to assess exercise regulations consistent with the SDT [22-25]. The questionnaire was developed to measure external, introjected, identified, and intrinsic regulation. The subscale, amoti-

vation, was included in a revised measure, known as the BREQ-2 [21]. Researchers have found the BREQ to have strong psychometric properties in terms of construct validity and relations with theoretically relevant constructs, exercise behavior, and motivational constructs [23].

Given that a significant number of people are sedentary or begin to engage in physical activity but do not possess the quality of motivation to maintain active living, the amount of amotivation is pertinent to both the quantity and quality of exercise involvement. Thus, it is important to examine motivational regulations by considering the different forms of self-determined motivation in regards to physical activity. However, most of the existing research has been done in western countries. Currently, there are no instruments in the literature that measure exercise behavioral regulation among individuals from the Asian subcontinent.

Thus, the present study was conducted to test the validity and reliability of the Iranian version of the BREQ-2 in a sample of Iranian college students.

## Materials and Methods

### *Participants*

Participants were 418 students (140 males, 278 females), majoring in a variety of degrees at the Guilan Medical University. They ranged in age from 18 to 30 years (mean 19.9 years, SD ± 3.0). Permission to conduct the study was obtained from the Research Ethics Committee at Tarbiat Modares University and all participants provided informed consent.

### *Instrument*

The Behavioral Regulations in Exercise Questionnaire-2 (BREQ-2) is a revised version of the original BREQ that was originally developed by Markland and colleagues [22]. Permission to use the original scale was obtained from the lead author. When the BREQ was first published, it contained four subscales that measured varying degrees of exercise regulations, namely external (e.g., I take part in exercise because my family/friends/ partner say I should), introjected (e.g., I feel guilty when I do not exercise), identified (e.g., It's important to me to exercise regularly), and intrinsic (e.g., I exercise because it is fun) regulations. The BREQ-2, however, includes an additional subscale that assesses amotivation (e.g., I think exercising is a waste of time). Each subscale contains four items except introjected regulation, which contains three items. Following the statement ''Why do you exercise?'', participants are asked to respond to each item on a 5-point Likert-type scale, ranging from 0 = not at all true for me to 4 = very true for me.

### *Procedure*

The BREQ-2 was translated using the methodology outlined by Banville et al. [26], to develop a culturally equivalent questionnaire. Two experienced bilingual health educators translated the questionnaire into Persian and another two bilingual health educators back translated them (without access to the original English version) independently. Similarly, the author back translated the instrument into English without referring to the original version. The three versions were compared, evaluated, and modified to reconcile any observed differences. A panel of 12 Iranian experts in the areas of health education, psychology, and exercise was formed to assess the linguistic appropriateness of the translated questionnaires (i.e., content validity). The panel members were asked to evaluate the instrument for its appropriateness and relevance of the items. Furthermore, the panel was asked to evaluate item wording and response format. The edited version of the questionnaire was pilot-tested with a group of 40 university students to evaluate item clarity and response variance and to estimate reliability. Examination of frequency distributions indi-

cated that the full range of responses was being used for questionnaire items.

In order to establish construct validity, 418 college students were recruited from Guilan Medical University. The students completed the survey without difficulty in understanding. Students completed the paper-and-pencil measures in a classroom setting, which was staffed by research assistants who were available to answer the questions if necessary. The approximate time necessary to complete the instrument was 10 min. Forty subjects from the original sample were randomly selected to complete the BREQ-2 two weeks after the initial assessment in order to obtain test-retest reliability (stability).

***Statistical analysis***

The reliability of the Iranian BREQ-2 was estimated by calculating its internal consistency and test-retest stability. Internal consistency for each scale was estimated, using Cronbach's Alpha and a reliability coefficient of ≥ 0.70 was consi - dered satisfactory [27]. The test-retest reliability/stabilityof the instrument was assessed, using intra-class correlation (ICC), over a 2-week period. To establish instrument consistency over 2-week period, intra-class correlation coefficients were calculated between Time 1 and Time 2 assessments for each of the 5 factors. An ICC score≥ 0.75 indicates excellent test - retest reliability.

Confirmatory factor analysis (CFA), using LISREL 8.8 was performed to establish construct validity [28]. CFA is generally based on a strong theoretical and empirical foundation that allows the investigator to specify a hypothesized factor structure in advance and then test it [27, 29]. Thus, CFA can determine how well the proposed model fits the data [27]. In CFA, the researcher specifies a certain number of factors, whether the factors are correlated or not, and how the factors are measured [30]. In this study, we calculated a CFA model to examine the latent structure of the translated scale responses. We conducted dimensionality analyses to compare the CFA correlated five-factor model with a uni-dimensional model, a five-factor uncorrelated model, and a hierarchical model to determine which model fits the data the best. There is little agreement among researchers about the best index of the overall fit in CFA [31]. Consequently, to achieve a comprehensive evaluation of the fit, a range of different indices were employed. Chi-square tests the absolute fit of the hypothesized model with the population covariance matrix. It is well known that this index is sensitive to sample size and data distribution [32]. To control this possible sensitivity, the Chi-square/degree of freedom index was also employed [33]. Global fit was assessed by examining 1) the goodness of fit index (GFI), which is based on a ratio of the sum of the squared discrepancies between the observed and population variance, 2) root mean square error of approximation (RMSEA), which assesses the mean discrepancy between the observed covariances and those implied by the model per degree of freedom, 3) comparative fit index (CFI), which measures improvement in fit of the hypothesized model compared with a completely independent model, and 4) the degree to which the a priori structure that reproduces the data was evaluated, using the standardized root mean residual (SRMR) [34].

All fit indices have limitations, and some work better than others under certain conditions such as various types of misspecification and non-normality. For example, RMSEA and CFI are the most sensitive to mis-specified factor loadings, whereas SRMR is most sensitive to errors in the structural components of models, so a combination of these indices provides a more comprehensive sense of model fit than any one index alone [35]. An RMSEA of ≤.05 was considered a good fit; >0.05 to ≤ 0.08, a reasonable fit; >0.08 to ≤ 0.10, mediocre; and >0.10, poor [36]. Compara-

tive fit index values equal to or greater than 0.90 were considered a good fit [36]. Standardized root mean residual values less than or equal to 0.08 were considered a good fit [37]. Normed fit index (NFI) and non-normed fit index (NNFI) are also reported.

## Results

Demographic characteristics of the participants are shown in Table 1. Mean age was 19.47 years (SD ± 2.3). Mean BMI was 22 (SD ± 3.56). All participants were undergraduates, majoring in various branches of medical sciences. The majority of the students were female, single, and living on campus.

Prior to conducting the CFA, the suitability of data was assessed, using the univariate and multivariate characteristics of each item. The evaluation of individual items is called item analysis [28]. Criteria for inclusion of an item include consideration of item variance of each item and moderate correlations with other items (≥ 0.30) [28]. The correlations between the factors, except that between Factors 1(external regulation) and 5 (amotivation), were statistically significant (Table 2). Data were collected on the 19 items, all of which satisfied the inclusion criteria and were included in the CFA.

Several alternative models were tested against the proposed five-factor original model. The overall fit indices for the four competing models improved (Table 3) when comparing the one-factor model (Model 1), the uncorrelated factors model (Model 2), the correlated five-factor model (Model 3), and the modified correlated five-factor model (Model 4). As expected, the correlated five-factor model (Model 3) was a better fit than the uncorrelated five-factor model (Model 2); however, the overall fit indices did not reach the criteria for a good fit. To improve the five-factor model (Model 4), researches applied the model modification indices and expected changes supplied by the LISREL software.

A corrected Satorra-Bentler Chi-Square was used to allow for non-normality and robust standard errors for parameter estimates and robust goodness-of-fit indices. The results of this analysis confirmed that Model 4 was the best fit to the data (Chi-Square = 426.94, DF = 143, GFI = 0.91, NFI = 0.95, NNFI = 0.97, CFI = 0.97, RMSEA = 0.06, SRMR = 0.05). Therefore, the data showed a good fit of the final CFA model (Model 4). The final CFA model (Model 4), including factor loadings, Cronbach's Alpha coefficients, and ICCs are presented in Table 4. Standardized factor loading of the 19 items indicated that all factors, with loading values ranging from 0.48 to 0.88, were statistically significant ($P < 0.05$).

Reliability was determined by examining both the internal consistency and test-retest stability. The 5 factors of the BREQ-2 showed adequate internal consistency ($\alpha \geq 0.7$) (Table 4) [27]. Results of correlational analysis, as shown in Table 4, indicated substantial test-retest reliability for the BREQ-2 factors, namely, intrinsic regulation ($r = 0.92$), identified regulation ($r = 0.90$), introjected regulation ($r = 0.86$), external regulation ($r = 0.87$), and amotivation ($r = 0.81$).

**Table 1:** Characteristics of the participants

| Variable | Mean (SD) |
|---|---|
| Age (yr) | 19.47 (2.3) |
| BMI (kg/m$^2$) | 22 (3.56) |
| Sex (%) | |
| Female | 66.5 |
| Male | 33.5 |
| Marital status (%) | |
| Single | 96.2 |
| Married | 3.8 |
| Current living situation (%) | |
| Live with roommates in dormitory | 51.7 |
| Live with parent(s) | 45.2 |
| Live with friends in renting house | 3.1 |

**Table 2:** Correlation for the BREQ-2 components

| Components | ER | INJR | IDR | IR | AMO |
|---|---|---|---|---|---|
| External regulation (ER) | 1 | | | | |
| Introjected regulation (INTJR) | 0.35** | 1 | | | |
| Identified regulation (IDR) | 0.31** | 0.67** | 1 | | |
| Intrinsic regulation (IR) | 0.12* | 0.43** | 0.72** | 1 | |
| Amotivation (AMO) | 0.03 | - 0.24** | -0.48** | -0.54** | 1 |
| Mean | 0.67 | 1.22 | 2.14 | 2.57 | 0.61 |
| Standard deviation | 0.67 | 1.12 | 1.03 | 1.2 | 1.0 |

** $P < 0.01$
* $P < 0.05$

**Table.3:** Fit index of Confirmatory factor analysis of the BREQ-2

| Models | Chi-square | DF | GFI | NNFI | NFI | CFI | RMSEA | SRMR |
|---|---|---|---|---|---|---|---|---|
| One factor (Model1) | 2153. 84 | 152 | 0. 65 | 0.82 | 0.83 | 0. 84 | 0. 18 | 0. 13 |
| Uncorrelated 5-factor (Model 2) | 1221. 66 | 152 | 0.76 | 0.86 | 0.86 | 0. 88 | 0. 13 | 0. 26 |
| Correlated 5-factor (Model 3) | 425. 98 | 142 | 0. 90 | 0.96 | 0.95 | 0. 97 | 0. 06 | 0. 05 |
| Modified correlated 5-factor (Model 4) | 426. 58 | 143 | 0. 91 | 0.97 | 0.95 | 0. 97 | 0. 06 | 0. 05 |

DF = degrees of free; GFI = goodness of fit; NNFI = non-normed fit index; NFI = normed fit index; CFI = comparative fit index; RMSEA = root mean square error of approximation; SRMR = standardized root mean residual.

**Table 4:** Factor loading, Cronbach's Alpha, and intraclass correlation coefficient for the modified 5 factor correlated model (Model 4)

| Items | FL | CA | ICC |
|---|---|---|---|
| External regulation | | 0.71 | 0.87 |
| 1. I exercise because other people say I should | 0. 68 | | |
| 6. I take part in exercise because my friends/family say I should | 0. 78 | | |
| 11. I exercise because others will not be pleased with me if I don't | 0. 48 | | |
| 16. I feel under pressure from my friends/family to exercise | 0. 60 | | |
| *Introjected regulation* | | 0.74 | 0.86 |
| 2. I feel guilty when I don't exercise | 0.66 | | |
| 7. I feel ashamed when I miss an exercise session | 0.68 | | |
| 13. I feel like a failure when I haven't exercised in a while | 0.76 | | |
| *Identified regulation* | | 0.77 | 0.90 |
| 3. I value the benefits of exercise | 0.72 | | |
| 8. It's important to me to exercise regularly | 0.73 | | |
| 14. I think it is important to make the effort to exercise regularly | 0.72 | | |
| 17. I get restless if I don't exercise regularly | 0.56 | | |
| *Intrinsic regulation* | | 0.88 | 0.92 |
| 4. I exercise because it's fun | 0.74 | | |
| 10. I enjoy my exercise sessions | 0.80 | | |
| 15. I find exercise a pleasurable activity | 0.83 | | |
| 18. I get pleasure and satisfaction from participating in exercise | 0.88 | | |
| *Amotivation* | | 0.85 | 0.81 |
| 5. I don't see why I should have to exercise | 0.70 | | |
| 9. I can't see why I should bother exercising | 0.74 | | |
| 12. I don't see the point in exercising | 0.80 | | |
| 19. I think exercising is a waste of time | 0.83 | | |

FL = Factor loading; CA = Cronbach alpha, ICC = Intraclass correlation

## Discussion

The purpose of the study was to examine the validity and reliability of the BREQ-2 in a sample of Iranian college students. Confirmatory factor analysis (CFA) was used to determine whether the original model proposed by Markland and colleagues was a good fit to the data in the study's sample. While the initial fit indices did not provide full support for this model, a modified five-factor correlated model resulted in better-fit indices. After multiple iterations, acceptable model fit was achieved with the 19 items representing the five factors. The internal consistency and test-retest reliability of the Iranian version of the BREQ-2 were acceptable in the study's sample. The results of test–retest analysis suggested that the five subscales of the BREQ-2 were stable over a 2-week period.

The uni-dimensionality of items is a major issue in assessing the psychometric properties of an instrument. The Cronbach's alpha coefficients for the BREQ-2 total scale (0.85) and each of the five subscales (0.82 – 0.85) indicated good internal consistency for the instrument. The reliability coefficients from our study were similar to those found by Murcia et al. [32], who assessed the psychometric properties of their Spanish version of the BREQ-2. However, unlike the present study and the original instrument created by Markland and colleagues [21], Murcia et al. did not include item 17; their instrument was grouped into 5 factors and explained 68.8% of the variance.

The BREQ-2 is used to assess constructs from the SDT and can be used to explore the reasons underlying peoples' decisions to engage or not engage in physical activity [8]. The SDT can be used to provide greater insight into the mechanisms by which individual, social, and environment factors may impact participation in physical activities [9]. Therefore, it is important for the BREQ-2 to be tested in international populations since there are differences in language, culture, and lifestyle. This study provides evidence to support the content and construct validity as well as the internal consistency and test-retest reliability of the BREQ-2 in a sample of Iranian college students. The coefficients obtained in the factor analysis are similar to those of Markland et al and Murcia et al. [21, 33]. The small changes made to the BREQ-2 strengthened the reliability and validity of the instrument among Iranian college students. Different studies carried out with the BREQ scale indicate this to be important [21-22, 24, 32, 37].

The strengths of this study include the large sample size and the robust statistical analyses employed. However, the study faced certain limitations. First, the participants were college students from an Iranian university and therefore results may not be generalized to Iranians of other ages and demographics. Future research should replicate the study with Iranian adolescents and adults from a variety of ages. Second, the BREQ-2 is focused on exercise behavior and does not address all types of physical activity behavior. Exercise is one type of physical activity designed specifically to improve health. We suggest that future studies should examine the relationship between the various aspects of physical activity motivation and objectively measured physical activity. Additional research is needed to develop scales that include the different forms of intrinsic motivation as proposed by Vallerand [38]. That is, intrinsic motivation to know, intrinsic motivation to accomplish, and intrinsic motivation to experience stimulation.

## Conclusion

To advance our understanding of exercise behavior change, theoretically dri-

ven interventions need to be evaluated, using appropriate strategies and suitable instruments [39]. As the design and validation of data gathering tools is time consuming and costly, researchers should use existing measures whenever possible and adapt to specific subgroups, if necessary. This is the first study to examine the validity and reliability of the BREQ-2 among Iranian subjects. The Iranian version of BREQ-2 is a good measure of the different types of motivation from the perspective of the postulates of the SDT and could be used in future studies examining motivation to exercise.

***Competing interests***

The authors declare that they have no competing interests.

## Authors' contributions

RF, SN, AH, EH and DL contributed equally to the design and conduct of the survey, analysis of the results, drafting and critical revision of the manuscript. RF, SN, AH, EH and DL read and approved the final version of the manuscript.

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## References

[1] Warburton DE, Nicol CW, Bredin SS (2006). Health benefits of physical activity: the evidence. *Can Med Assoc J* 174: 801–9.

[2] Blair SN, Brodney S(1999). Effects of physical inactivity and obesity on mortality and morbidity: current evidence and research issues. *Med Sci Sport Exer* 31: 646–662.

[3] WHO(2009). physical inactivity : a global publice health problem. Available from: www.who.int/entity/dietphysical activity fact sheet-inactivity/en.

[4] Sheikholeslam R, Mohamad A, Mohammad K, Vaseghi S (2004). Non-communicable disease risk factors in Iran. *Asia Pac J Clinical Nutrition* 13 Suppl 2:S100.

[5] Sallis JF(2000). Age-related decline in physical activity: A synthesis of human and animal studies. *Med Sci Sport Exer* 32(9): 1598-100.

[6] Haase A, Steptoe A, Sallis JF, Wardle J(2004). Leisure-time physical activity in university students from 23 countries: associations with health beliefs, risk awareness, and national economic development. *Prev Med* 39(1):182-90.

[7] Kelishadi R, Sadri G, Tavasoli AA, Kahbazi M, Roohafza, HR, Sadeghi M, Khosravi A, Sabet B, Amani A. Ansari R, Alikhassy H (2005). Cumulative prevalence of risk factors for atherosclerotic cardiovascular diseases in Iranian adolescents: IHHP-HHPC. *J Pediatr* 81(6): 447-53.

[8] Biddle SJ, Nigg CR (2000). Theories of exercise behaviour. *Int J Sport Psychol* 31: 290–304.

[9] Ryan RM, Deci EL(2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am Psychol* 55(1): 68-78.

[10] Ryan RM(1995). Psychological needs and the facilitation of integrative processes. *J Pers* 63(3): 397-427.

[11] Deci EL, Ryan RM(1985). *Intrinsic motivation and self determination in human behavior*. Plenum Press.New York.

[12] Deci EL, Ryan RM (2000). The ''what'' and ''why'' of goal pursuits: Human needs and the self-determination of behaviour. *Psychol Inq* 11: 227–68.

[13] Wilson PM, Rodgers WM, Blanchard CM, Gessell J (2003).The relationship between psychological needs, selfdetermined motivation, exercise attitudes, and physical fitness. *J Appl Soc Psychol* 33: 2373–92.

[14] Deci EL, Ryan RM(1985).The general causality orientations scale: self-determination in personality. *J Res Pers* 19: 109-34.

[15] Pelletier LG, Fortier MS, Vallrand RJ, Tuson KM, Briere NM, Blaise MR (1995). Toward a new measure of intrinsic motivation, extrininsic motivation, and amotivation in sports: The Sport Motivation scale(SMS). *J Sport Exerc Psychol* 17: 35-53.

[16] Ntoumanis N(2001). Empirical links between achievement goal theory and self-determination theory in sport. *J Sport Sci* 19(6): 397-409.

[17] Mallett C, Kawabata M, Newcombe P (2007). Progressing measurement in sport motivation with the SMS-6: A response to Pelletier, Vallerand, and Sarrazin. *Psychol Sport Exerc* 8: 622–31.

[18] Pelletier LG, Vallrand RJ, Sarrazin P (2007) .The revised six-factor Sport Motivation Scale (Mallett, Kawabata, Newcombe, Otero-Forero, & Jackson,: Something old, something new, and something borrowed. *Psychol Sport Exerc* 8: 615–621.

[19] Li F(1999). The Exercise Motivation Scale: Its multifaceted structure and construct validity. *J Appl Sport Psychol* 11: 97–115.

[20] Lonsdale C, Hodge K, Rose EA(2008). The behavioral regulation in sport questionnaire (BRSQ): instrument development and initial validity evidence. *J Sport Exerc Psychol* 30(3): 323-55.

[21] Markland D, Tobin V(2004). A modification of the Behavioral Regulation in Exercise Questionnaire to include an assessment of amotivation. *J Sport Exerc Psychol* 26: 191_196.

[22] Mullan E, Markland D, Ingledew DK (1997). A graded conceptualisation of self-determination in the regulation of exercise: Development of a measure using confirmatory factor analytic procedures. *Pers Individ Dif* 23: 745-52.

[23] Mullan E, Markland D(1997). Variations in self-determination across the stages of change for exercise in adults. Motiv Emot 21: 349-62.

[24] Wilson PM, Rodgers WM, Fraser SN(2002).Examining the psychometric properties of the behavioral regulation in exercise questionnaire. *Meas Phys Educ Exerc Sci* 6 :1–21.

[25] Wilson PM, Rodgers WM (2004).The relationship between perceived autonomy support, exercise regulations and behavioral intentions in women. *Psychol Sport Exerc* 5: 229-242.

[26] Banville D, Desrosiers P, Genet-Volet Y(2000). Translating questionnaires and inventories using a cross-cultural translation technique. *J Teaching Physical Educ* 19: 374–87.

[27] Nunnally JC, Bernstein IR(1994). *Psychometric theory*. 3rd ed. McGraw Hill. New York.

[28] Dixon JK(2005). Exploratory Factor analysis. in: *Statistical Methods for Health Care Research*. Ed, BH Munro.Lippincott, New York, pp. 321-49.

[29] Stevens JJ (1996). *Applied multivariate statistics for the social sciences*. 3rd ed. Erlbaum. Hillsdale NJ.

[30] Schumacker RE, Lomax RG (2004). *A beginner,s guide to structural equation modeling*. 2nd ed. Lawrence Erlbaum Associates. London.

[31] Hoyle RH, Pantere AT(1995). Writing about structural equation models.in: *Structuralequationmodeling:concepts,issues,and application*. Ed, R.H. Hoyle, Sage, London,pp.158-75.

[32] Murcia JA, Gimeno EC, Camacho AM(2007). Measuring self-determination motivation in a physical fitness setting: validation of the Behavioral Regulation in Exercise Questionnaire-2 (BREQ-2) in a Spanish sample. *J Sports Med Phys Fitness* 47(3): 366-74.

[33] Aroian KJ, Norris AE(2005). Confirmatory Factor analysis, in: *StatisticalMethods for Health Care Research* Ed, B.H. Munro, Lippincott: New York,pp.351-75.

[34] Browne MW, Cudeck R (1993). Alternative ways of assessing model fit. in:*Testing structural equation*

*models*. Ed, KA Bollen , JS Long, Sage, Newbury Park,CA, pp.136-162.

[35] Tabachnick BG, Fidell LS(2007). *Using multivariate statistics*. 5th ed. Allyn and Bacon, Boston.

[36] Byrne BM(1998). *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming*. NJ: Lawrence Erlbaum Associates. Mahwah.

[37] Daley AJ, Duda JL (2006). Self-determination, stage of readiness to change for exercise, and frequency of physical activity in young people. Eur J Sport Sci 6(4): 231-43.

[38] Vallerand RJ(1997). Toward a hierarchial model of intrinsic and extrinsic motivation.In :*Advances in experimental social psychology*. Ed, MP Zanna. Academic Press, New York,PP. 271-360.

[39] Lubans DR, Foster C, Biddle SJH(2008). A review of mediators of behavior in interventions to promote physical activity among children and adolescents. *Prev Med* 47: 463-70.