Moreno, J. A., Cervelló, E. M., y Martínez, A. (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. *The Journal of Sport Medicine and Physical Fitness, 47*(3), 366-378.

Measuring Self-determination Motivation in a Physical Fitness Setting; Validation of the Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2) in a Spanish Sample

Juan Antonio Moreno Murcia

University of Murcia

Eduardo Cervelló Gimeno

Miguel Hernández University of Elche

Antonio Martínez Camacho

Physical Education and Sport Research Unit

Date: 27-01-2006

Correspondence:

Juan Antonio Moreno Murcia

Facultad de Educación

Universidad de Murcia

Campus Universitario de Espinardo

30100 Espinardo, Murcia, Spain

E-mail: morenomu@um.es

Fax: 968 36 41 46

Tel: 968 36 70 60

Abstract

Purpose: The purpose of this study is the validation in the Spanish context of the BREQ-2 (Behavioural Regulation in Exercise Questionnaire-2) scale, developed by Markland and Tobin[1], from the point of view of the Self-determination Theory and to compare the effect of gender, age and exercise duration and mode.

Method: For the validation of the instrument two studies were carried out (N = 250 and N = 311) with a total sample formed of 561 adults in the metropolitan area of the city of Murcia, Spain, who do non-competitive sport and physical activities. They were given the adaptation of the questionnaire BREQ-2 by Markland and Tobin[1] to fill in.

Results: After an exploratory factor analysis and a confirmatory factor analysis, an adaptation of the scale was obtained with 18 items and 5 factors with acceptable reliability coefficients and a total variance explained of 68.8%. The two highest assessed forms of behavioural regulation were intrinsic and identified, with the women showing more intrinsic regulation. Those that exercised for less time were the ones that showed higher levels of amotivation and the older people showed a greater tendency to identified regulation.

Conclusions: The BREQ-2 scale has all the required conditions as far as reliability and validity criteria are concerned to be used in the Spanish context in different areas of physical activity.

Keywords: motivation, self-determination, sport, physical exercise, measurement.

Introduction

The Self-determination Theory is a macro-theory of human motivation that has a connection with the development and functioning of the personality within social contexts. The theory analyses the extent to which human behaviour is volitional or self-determined, in other words, the degree to which people perform their actions at the highest level of reflection and are engaged in the actions with a sense of choice[2]. One of the theories in the Self-determination Theory is the Organismic Integration Theory by Deci and Ryan[2], which details the different forms of extrinsic motivation and the contextual factors that either promote or prevent their internalisation and integration in behavioural regulation. These authors establish a taxonomy where motivation is structured in the form of a continuum that covers the different degrees of self-determination of behaviour, from the non-self-determined, to the self-determined, establishing three types of motivation (amotivation, extrinsic motivation and intrinsic motivation) and a series of behavioural regulation stages (amotivation, external regulation, introjected regulation, identified regulation and intrinsic regulation). Every one of the motivation types is determined by a series of regulatory processes, which can be values, rewards, self-control, interests, fun, satisfaction, etc.

Motivation towards exercise behaviour has been measured with different instruments and we can highlight several among them. The Sport Motivation Scale (SMS) by Pelletier et al.[4] measures the three types of intrinsic motivation (to know, to accomplish and to experience stimulation), the three forms of regulation for extrinsic motivation (identified, introjected and external) and amotivation. It has been used in different studies on the motivational aspects in competitive sport[5, 6, 7, 4], in its different versions and the psychometric measurements obtained in the respective studies have been good.

In order to measure self-determined motivation in physical exercise, the Behavioural Regulation in Exercise Questionnaire (BREQ)[8] was created, which was later revised and completed by Markland and Tobin[1], validating it as BREQ-2. The original questionnaire was developed to measure external, introjected, identified and intrinsic regulation. The study by Markland and Tobin adds another factor to these four: amotivation. The BREQ has been used by Ingledew, Markland & Shepard[9], Landry & Solmon[10], Markland & Tobin[1], Mullan & Markland[11], and BREQ-2 has been used by Wang[12] and Wilson & Rodgers[13], obtaining good psychometric measurements.

Different studies have been carried out in the area of physical activity and sport relating gender with the different types of motivation. As a result, with regards to people who do weight training in gyms, Arbinaga and García[14] found higher scores in introjected regulation in females and higher scores in external regulation in males. Fortier et al.[15] and Chantal et al.[6] also found that sportswomen are more intrinsically motivated than males. In connection with exercise duration, Landry & Solmon[10], in a study carried out in the area of exercising in free time, determined intrinsic and identified regulation as the predominant forms of behavioural regulation of exercising. Along the same lines, Maltby & Day[16] found that those who exercise less had more possibilities of abandoning the exercise in the first phases of acquiring exercise behaviour.

Therefore, the objective of the study is to validate the Behavioural Regulation in Exercise Questionnaire-2 (BREQ-2) in the Spanish context in the area of physical activity and health and to discover the effects of gender, age, exercise mode and duration in that behaviour.

Materials and Methods

Subjects

The research is presented by means of two studies with different samples. Study 1 is formed by 250 subjects (M = 30.36 years old, SD = 10.98), where 54.4% (136) are male and 45.6% (114) are female. Study 2 is formed by 311 exercisers (M = 33 years old, SD = 9.30), of which 127 (40.8%) are male and 184 (59.2%) are female. The total sample (study 1 + study 2) is formed by 561 subjects (263 men and 298 women) with an average age of 31.82 (SD = 10.16), who do different kinds of physical activities (jogging, recreational water sports, aerobics, weight training, etc.).

Instrument

Behavioural Regulation Exercise Questionnaire-2 (BREQ-2). This is the last modification (Markland & Tobin, 2004) of the BREQ (Behavioural Regulation in Exercise Questionnaire), developed by Mullan, Markland & Ingledew (1997). The original questionnaire was developed to measure external, introjected, identified and intrinsic regulation. As far as the BREQ-2 scale is concerned, it has 19 items, compared with 15 in the original scale, which measure the stages of the self-determination continuum. It uses a Likert-type scale of 5 points, where 0 = not true for me and 4 = very true for me. The study by Markland and Tobin adds another factor to these four: the amotivation factor.

Socio-demographic and Physical Activity Variables. In addition, a series of socio-demographic variables were included in the questionnaire: sex, age (16-24, 25-34 and 35-73), exercise duration (0-45 minutes, 46-60 minutes and over 60 minutes) and exercise mode (alone, with friends and within a guided programme). How long the person had been exercising (in years) was also recorded.

Procedure

The English version of the BREQ-2 was translated into Spanish by two experts

in sport psychology, who normally use both the English and Spanish languages. Prior to carrying out this research, a pilot study with 15 students was designed to control possible semantic instrument concerns. In a second phase, the Spanish version of the BREQ-2 was translated from Spanish into English by an independent bilingual translator, who then acknowledged that the last version conforms to the original one.

Having made the changes, it was given to the sample in study 1 anonymously and voluntarily, after authorisation by those in charge of the premises (gyms, swimming pools, etc.) where the exercise takes place. The exercisers were told how to fill in the questionnaire, emphasising the importance of not leaving any item unanswered. The approximate time necessary to complete the instrument was 10 minutes. Those questionnaires that were incomplete or badly answered were rejected.

Statistical Analysis

The sample was divided into two groups in order to carry out the studies. Study 1 (N = 250) served for the exploratory factor analysis (EFA) and study 2 (N = 311) for the confirmatory factor analysis (CFA). The reliability of the instrument was analyzed using the Cronbach's Alpha coefficient. The correlation analysis and a MANOVA were carried out with the total sample, where the dependent variables were the five self-determined motivation factors and the independent variables gender, age, exercise duration and mode.

Results

Psychometric Properties of the BREQ-2

Exploratory factor analysis. An exploratory factor analysis of principal components with varimax rotation was carried out with data from study 1. After a first analysis, item 17 ("Because I get restless if I don't exercise regularly") did not reach

the minimum saturation established for every item of .40. The above-mentioned item was eliminated and a new analysis was performed, where item 8 ("Because it is important to me to exercise regularly") was present in factors 1 and 2, but finally it was included in factor 2 (identified regulation) as it had more saturation (.61) in it. Item 18 ("Because I get pleasure from participating in exercise") was also present in two factors, 1 and 2, and it was included in factor 1 (intrinsic regulation) with a saturation of .72, which was higher than the .40 that it had in the second factor. After that, 18 items were obtained grouped into 5 factors called (Table I): intrinsic regulation, identified regulation, introjected regulation, external regulation and amotivation, with eigenvalues above 1.00 (2.97, 2.91, 2.31, 2.17 and 2.01, respectively) with a total variance explained of 68.85% (16.52%, 16.21%, 12.84%, 12.09% and 11.17%, respectively).

Factor 1 (intrinsic regulation), formed by 4 items, refers to the type of behavioural regulation in which it is chosen freely. The reward is the behaviour itself and it is something pleasant. It includes items such as "Because I think exercise is fun" or "Because I enjoy the exercise sessions". The Cronbach's alpha reliability coefficient of this factor was .89.

Factor 2 (identified regulation) is formed by 3 items and it refers to the subject thinking that the behaviour is valuable, but it is done as it is considered to be beneficial for the subject. It includes items such as "Because I value the benefits of exercise" or "Because it is important to me to exercise regularly". The Cronbach's alpha reliability coefficient of this factor was .81.

Factor 3 (introjected regulation) refers to the way the subject performs the behaviour so as not to feel guilty or uneasy about not having exercised. It is formed by 3 items, such as "Because I feel guilty when I don't exercise" and "Because I feel

ashamed when I miss a session". The Cronbach's alpha reliability coefficient of this factor was .82.

Factor 4 (external regulation), formed by 4 items, refers to the subject performing the behaviour as a means of obtaining an external reward or due to influence by external subjects or factors. The behaviour is performed controlled by external contingencies. It has items, such as "Because others say I should", "Because my friends/family/partner say I should" or "To please other people". The Cronbach's alpha reliability coefficient of this factor was .86.

Factor 5 (amotivation) is formed by four items. It covers the subject's non-intentional behaviour. There is no clear reason for exercising. It includes items, such as "I don't see why I should have to exercise" or "I can't see why I should bother exercising". The Cronbach's alpha reliability coefficient of this factor was .85

Internal consistency analysis. The internal consistency of the instrument was obtained by calculating Cronbach's alpha coefficient. Factor 1 (intrinsic regulation), formed by 4 items, refers to the type of behavioural regulation in which it is freely chosen, the reward is the behaviour itself and it is something pleasant. It includes items, such as "Because I think exercise is fun" or "Because I enjoy the exercise sessions". The Cronbach's alpha reliability coefficient of this factor was .89.

Confirmatory factor analysis. A confirmatory factor analysis was performed with the second part of the sample, formed by 311 subjects (Table II). Confirmatory factor analysis using AMOS 4.0 was used to test the hypothesized model. Maximum likelihood method was employed in the present study and the covariance matrix was calculated. This method assumes multivariate normality. Due to the fact that the data violated the multivariate normality, bootstrapping [17, 18] techniques to improve non-normality of data were used. This approach calculates the parameter estimates from

an empirical sampling distribution, rather than the theoretical distribution of statistics tests as chi-square and normality test[19].

As indicated by Hoyle and Panter[20], there is little agreement among researchers about the best index overall fit used in confirmatory factor analysis. Consequently, to achieve a comprehensive evaluation of model fit, a range of different indices was 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[21]. To control this possible sensitivity, the chi square/degrees of freedom index was also employed. Four incremental fit indices were used to analyse model fit. Incremental fit indices are based on comparisons between the hypothesized model and a null model and are not influenced by sample size[22]. The goodness-of-fit- index (GFI) is based on a ratio of the sum of the squared discrepancies between the observed and population variance. The adjusted goodness-of-fit index (AGFI) adjusts the GFI for degrees of freedom in the hypothesized model. The Tucker-Lewis Index (TLI) indicates the amount of improvement in fit over a baseline model, adjusted to the number of degrees of freedom in the model. Finally, the last incremental index used in this research was the comparative fit index (CFI), which measures improvement in fit of the hypothesized model compared with a completely independent model. Kline[23] indicates that values of incremental indices of less than the hypothesized model could be substantially improved. The standardised root mean square residual (SRMR) assesses the degree to which the a priori structure reproduces the data, and for well-specified models, the SRMR value should be close to .08. The mean discrepancy between the observed covariances and those implied by the model per degree of freedom was evaluated using the root mean square error of approximation

(RMSEA), and the confidence interval associated with the RMSEA, as an index of stability in other samples. A value of .05 or lower indicates a good fit, and values less than .08 are interpreted as a reasonable fit[24].

Results showed that the chi-square/degrees of freedom index was 2.14. The CFI (Comparative Fit Index) shows a value of .92; the TLI (Tucker-Lewis Index) gives a value of .90, which is a good explanation of the covariance matrix, as its values are above .90. Similarly, the RMSEA (Root Mean Square Error of Approximation) and the SRMR show values respectively of .06 and .05, slightly above .05. Therefore, the data showed a good fit of the theoretical model to empirical data.

Measurements, Deviations and Correlations

As far as the means (Table III) are concerned, intrinsic regulation has the highest value (4.73), followed by identified regulation (3.73), while the factor with a lower rating is amotivation (1.87). As far as correlations are concerned, there is a positive and significant correlation among all the variables. The amotivation variable has a greater correlation with external regulation and introjected regulation. Introjected regulation has more correlation with identified regulation, whilst intrinsic regulation correlated to a greater extent with identified regulation and less with amotivation and external regulation.

Main Effects and Interaction Effects of Gender, Age, Exercise Duration and Mode on Self-determined Motivation

A MANOVA was performed with the entire sample (Table IV and V), where with regards to gender significant differences were found (Wilks' Lambda = .97, $F = 2.89$, $p < .01$). These differences occur in the factor "identified regulation" ($F = 7.52$, $p < .001$) and the factor "intrinsic regulation" ($F = 12.32$, $p < .01$), always for the women.

There were no significant differences in the factors “amotivation” ($F = .30$, $p > .05$), “external regulation” ($F = .10$, $p > .05$) and “introjected regulation” ($F = .51$ $p > .05$).

When relating age with self-determined motivation, significant differences can be seen (Wilks’ Lambda = .94, $F = 3.35$, $p < .001$) in the factors “introjected regulation” ($F = 3.47$, $p < .01$), “identified regulation” ($F = 15.47$, $p < .001$), and “intrinsic regulation” ($F = 8.70$, $p < .001$). The post-hoc test (Tukey’s HSD) indicates that the differences in the factors “intrinsic regulation” and “identified regulation” occur between the 16-24 age group ($M= 4.43$ and $M = 3.45$) and the 25-34 ($M = 4.85$ and $M = 3.78$) and the 35-73 age groups ($M = 4.83$ and $M = 3.90$). The oldest age groups are the ones that obtain the highest score. With regards to the factor “introjected regulation”, significant differences are established between the 16-24 age group ($M = 2.21$) and the 35-73 age group ($M = 2.47$), in favour of the latter. The factors “amotivation” ($F = .52$, $p > .05$) and “external regulation” ($F = .93$, $p > .05$) do not show any differences.

With reference to the connection with exercise duration, there are also significant differences (Wilks’ Lambda = .92, $F = 3.78$, $p < .001$). These differences occur in the factors “amotivation” ($F = 9.91$, $p < .001$), “external regulation” ($F = 9.34$, $p < .001$) and “identified regulation” ($F = 3.89$, $p < .01$). The post-hoc test implemented shows that, for the factor “amotivation”, significant differences are established between the group that exercises between 0 and 45 minutes ($M = 2.07$) and the group that exercises for more than 60 minutes ($M = 1.46$) and the least motivated are the ones that exercise the least. For the factor “external regulation”, significant differences are established between the group that exercises the least (0-45 minutes, $M = 2.14$) and the group that exercises the longest (+ 60 minutes, $M = 1.46$) and the most externally regulated are those that exercise the least. In the factor

"identified regulation", differences are established between the groups of 0-45 minutes (M = 3.85) and 46-60 minutes (M = 3.76) and the group of 46-60 minutes and the group that exercises the most (+60 minutes, M = 3.46). The greatest differences occur in favour of those that exercise the least. There are no differences in the rest of the factors: "introjected regulation" ($F = 1.00$, $p > .05$) and "intrinsic regulation" ($F = 1.27$, $p > .05$).

In the "exercise mode" variable there are significant differences (Wilks' Lambda = .92, $F = 4.2$, $p < .001$). These occur in the factors "introjected regulation" ($F = 6.83$, $p < .001$), "identified regulation" ($F = 9.92$, $p < .001$) and "intrinsic regulation" ($F = 15.87$, $p < .001$). There are no significant differences in the factors "amotivation" ($F = .88$, $p > .05$) and "external regulation" ($F = 1.33$, $p > .05$). In the post-hoc test for the factor "introjected regulation", significant differences occur between those that exercise with friends (M = 2.06) and those that do guided exercise (M = 2.50) in favour of the latter. For the factor "identified regulation", differences are established between those that exercise alone (M = 3.64) and those that do guided exercise (M = 3.88) in favour of the latter. There are also differences between those that exercise alone and those that exercise with friends (M = 3.43), and the mean is lower for the latter. For the factor "intrinsic regulation", differences can be seen between those that exercise alone (M = 4.40) and those that do guided exercise (M = 4.99) in favour of the latter. There are also significant differences between those that exercise with friends (M = 4.31) and those that exercise within a guided setting (M = 4.99), as well as between the latter and those that exercise alone (M = 4.40) and those that exercise with friends (M = 4.31). The mean is higher for those that exercise in a guided setting.

The effects of interaction between age and exercise duration were also calculated (2 x 2 MANOVA). The MANOVA showed significant interaction differences (Wilks' Lambda = .93, F = 1.66, p < .01). These differences appear in "introjected regulation" (F = 2.67, p < .01). Interaction effects can also be seen by means of the MANOVA between the variables "exercise days" and "exercise mode" (Wilks' Lambda = .95, F = 2.0, p < .01) in the factor "amotivation" (F = 4.78, p < .01).

Discussion

The purpose of the study is to validate the behavioural regulation in physical exercise scale (BREQ-2) by Markland and Tobin[1] in the Spanish context and to discover the effect of gender, age, exercise mode and duration on the different levels of human behavioural regulation established in a continuum, which goes from amotivation to intrinsic motivation.

In order to meet the first objective set, we carried out an exploratory factor analysis of principal components in order to examine the factor structure of the measurement instrument used and to therefore determine the reasons why individuals do non-competitive physical exercise. After the analysis was performed, we discovered that by eliminating an item from the original version, we increased the internal consistency. Item 17 was therefore excluded from the original instrument ("Because I get restless if I don't exercise regularly"), resulting in 18 final analysis items grouped in five factors (amotivation, external regulation, introjected regulation, identified regulation and intrinsic regulation) with eigenvalues above 1.00 and explaining a total variance of 68.85%. The confirmatory factor analysis strengthened the reliability and validity of the instrument. Our version adapted to the Spanish context has been called the "Behavioural Regulation in Exercise Scale".

Unlike our analysis, the original instrument created by Markland and Tobin[1] is formed by 19 items (one item more than ours) grouped into the same five factors. The coefficients obtained in the factor analysis, similar to those of Markland and Tobin[1], strengthen the reliability and validity of the instrument in the Spanish context to measure the different stages of the motivation continuum postulated by Deci and Ryan[2]. The studies carried out with the BREQ scale (Ingledew, Markland & Shepard[10]; Mullan & Markland[12]; Mullan, Markland & Ingledew[8]; Wilson, Rodgers & Fraser[25]; Markland & Tobin[1]) indicate this. As in the study by Chatzisarantis, Hagger, Biddle, Smith & Wang [26], the existence of the behavioural regulation continuum is also considered to be sound. Therefore, these studies support and strengthen the theoretical framework that is a basis for carrying out this study, reinforcing the idea of the Self-determination Theory[2] as a logical and coherent explanation statistically established on human motivation regulation.

Nevertheless, we discovered that there are very few studies in the physical activity and health area that provide data on the methods of behavioural regulation in subjects that do these activities. However, the studies carried out in the PE and competition sport area can enable us to extract some relations on the most usual methods of behavioural regulation in subjects that do exercise within these areas. The studies carried out indicate that those activities focused on the goal, or dependent on external rewards, pressurised situations or negative feedback show higher levels of amotivation or have a higher tendency towards external regulation. Task oriented exercise produces a greater tendency towards self-determined behaviour and its methods of regulation[27,28,29,30]. In competition sport, studies also indicate that competitive activity generates more tendencies towards amotivation and external regulation[6,15].

We agree with other authors[10] in that the predominant types of behavioural regulation are identified and intrinsic, with introjected having less specific influence. Although Wang[12], in a study carried out with adolescents, indicates that identified and intrinsic regulation do not have any differences when they are connected with the students' levels of physical activity.

With regards to the gender, we agree with other studies carried out in the sport area[15, 6], in which girls are more intrinsically motivated. We also agree with data obtained by Arbinaga and García[14], where women score more highly in introjected regulation and men in external regulation.

In this study, we have observed that those subjects who spend less time exercising are the most amotivated and in addition, they are the ones that usually exercise within a guided setting. We therefore agree with the study by Maltby and Day[16], who also determine the importance of exercise duration in exercise behaviour maintenance and in the development of self-determined motivation methods. The fact that there is more amotivation in those subjects that do guided exercise again leads us to consolidate the Self-determination Theory, since some of the aspects that encourage the tendency towards non-self-determined behaviour are external agents, imposed deadlines, etc.[3]

On the other hand, we have observed that exercisers in older age groups have a higher tendency to identified regulation of the behaviour. We can infer from this that these subjects could be participating in activities either as a result of medical advice or of the knowledge they may have of the benefits that exercise could provide them, despite the fact that they do not consider the activity to be very pleasant, while those subjects that are younger seem to have a higher tendency towards intrinsic regulation, as well as the women. Those that exercise within a guided programme

have a higher tendency towards external regulation of the exercise behaviour, which may indicate that they are possibly exercising under external pressures from family, friends, doctor or other agents.

After studying the reliability and validity of the BREQ-2 scale, we can determine that it is a reliable instrument to determine the regulation levels of the amotivation-intrinsic motivation continuum, according to the model by Deci and Ryan[2, 3, 31]. Other research can be aimed at measuring or developing measurement instruments that include the different forms of intrinsic motivation proposed by Vallerand[33]: intrinsic motivation to know, intrinsic motivation to accomplish and intrinsic motivation to experience stimulation. It can also apply to the different types of amotivation, as well as confirm or refute the results obtained in this research in other contexts. In conclusion, BREQ-2 in its validation in the Spanish context can be a good measurement instrument of the different types of motivation, from the perspective of the postulates of the Self-determination Theory.

References

1. Markland, D. & Tobin, V. A modification to Behavioural Regulation in Exercise Questionnaire to include an assessment of amotivation. J Sport and Exerc Psychol 2004; 26; 191-196.
2. Deci, E. L. & Ryan, R. M. The general causality orientations scale: Self-determination in personality. Journal of Research in Personality 1985; 19; 109-134.
3. Ryan, R. M. & Deci, E. L. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development and well-being. American Psychologist 2000; 55; 68-78.

4. Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Brière, N. M. & Blais, M. R. Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sport Motivation Scale (SMS). J Sport Exerc Psychol 1995; 17; 35-53.
5. Brière, N., Vallerand, R., Blais, N. & Pelletier, L. Développement et validation d'une mesure de motivation intrinsèque, extrinsèque et d'amotivation en contexte sportif : l'Échelle de motivation dans les sports (ÉMS). Int J Sport Psychol 1995 ; 26; 465-489.
6. Chantal, Y., Guay, F., Dobreva-Martinova, T. & Vallerand, R. J. Motivation and elite performance: An exploratory investigation with Bulgarian athletes. International Journal of Sport Psychology 1996; 27; 173-182.
7. Ntoumanis N. Empirical links between achievement goal theory and self-determination theory in sport. J Sports Sci 2001; 19(6):397-409.
8. Mullan, E., Markland, D. & Ingledew, D. K. A graded conceptualization of self-determination in the regulation of exercise behavior: Development of a measure using confirmatory factor analysis. Personality and Individual Differences 1997; 23; 745-752.
9. Ingledew, D.K., Markland, D. & Sheppard, K.E. (2004). Personality and self-determination of exercise behaviour. Personality and Individual Differences 2004; 36; 1921-1932.
10. Landry, J.B. & Solmon, M.A. (2004). African American women's self-determination across the Stages of Change for Exercise. Journal of Sport and Exercise Psychology 2004*;* 26; 457-469.
11. Mullan, E. & Markland, D. Variations in self-determination across the stages of change for exercise in adults. Motivation and Emotion 1997; 21; 349-362.

12. Wang, S.H. The effects of goal setting on female middle school students' physical activity levels and motivation toward exercise. Dissertation Theses. Florida State University 2004. College of Education.
13. Wilson, P.M & Rodgers, W.M. The relationship between perceived autonomy support, exercise regulations and behavioral intentions in women. *Psychol Sport Exerc* 2004; 5; 229-242.
14. Arbinaga, F. & García, J. M. Motivación para el entrenamiento con pesas en gimnasios: un estudio piloto. Rev Int de Med y Ciencias de la Actividad Física y del Deporte, 2003; 9. In http://cdeporte.rediris.es/revista/revista9/artmotivacion.html
15. Fortier, M. S., Vallerand, R. J., Brière, N. M. & Provencher, P. J. Competitive and recreational sport structures and gender: A test of their relationship with sport motivation. International Journal of Sport Psychology, 2005; 26; 24-39.
16. Maltby, J. & Day L. The relationship between exercise motives and psychological well-being. J Psychol 2001; 135(6):651-60.
17. Efron, B. The jackknife, the bootstrap and other resampling plans. Philadelphia: SIAM; 1982
18. Byrne, B. M. (2001). Structural Equation Modelling with AMOS: Basic Concepts Application, and Programming. Mahwah, NJ: Lawrence Erlbaum Associate; 2001.
19. Mooney, C.Z. & Duval, R.D. Bootstrapping: A Nonparametric Approach to Statistical Inference. Sage Publications, Incorporated; 1993.
20. Hoyle, R.H. & Panter, A.T. Writing about structural equation models. In R.H. Hoyle (Ed.), *Structural Equation Modelling: Concepts, Issues, and Applications*, (pp. 158-175). London: Sage; 1995.

21. Jöreskog, K.G. & Sörbom, D. LISREL 7: A guide to the program and applications (2nd Ed.). Chicago: SPSS; 1989.
22. Marsh, H.W., Balla, J.R. & Hau, K.T. An evaluation of incremental fit indices: a clarification of mathematical and empirical properties. In G.A. Marcoulides & R.E. Schumaker (Eds.), Advanced Structural Equation Modelling Mahwah, NJ: Lawrence Erlbaum Associates; 1996. p. 315-353.
23. Kline, P. Handbook of Psychological Testing. London: Routledge; 1998.
24. Browne, M.W. & Cudeck, R. Alternative ways of assessing model fit. In K.A. Bollen & J.S. Long (Eds.) Testing Structural Equation Models. Newbury Park, C.A: Sage; 1993 .p. 136-162.
25. Wilson, P.M., Rodgers, W.M. & Fraser, S.N. Examining the psychometric properties of the Behavioral Regulation in Exercise Questionnaire. Measur Phys Educ Exerc Sci 2002; 6; 1-21.
26. Chatzisarantis, N. L. D., Hagger, M. S., Biddle, S. J. H., Smith, B. & Wang, J. C. K. (2003). A meta-analysis of perceived locus of causality in exercise, sport, and physical education contexts. J Sport Exerc Psychol 2003; 25; 284-306.
27. Biddle, S., Soos, I. & Chatzisarantis, N. Predicting physical activity intention using goal perspectives and self-determination theory approaches. European Psychologist 1999 4; 83-89.
28. Georgiadis, M. M., Biddle, S. J. H. & Chatzisarantis, N. L. D. The mediating role of self-determination in the relationship between goal orientations and physical self-worth in Greek exercisers. European Journal of Sport Science 2001; 1(5); 1-9.
29. Liukkonen, J., Jaakkola, T., Biddle, S. & Leskinen, E. Motivational antecedents of physical activity in Finnish youth. Manuscript submitted to publication, 2003.

30. Wang, C. K. J., Chatzisarantis, N. L. D., Spray, C. M. & Biddle, S. J. H. Achievement goal profiles in school physical education: Differences in self-determination, sport ability beliefs, and physical activity. British Journal of Educational Psychology 2002; 72; 433-445.
31. Deci, E. L. & Ryan, R. M. (Eds.) Handbook of self-determination research. Rochester, NY: University of Rochester Press; 2002.
32. Vallerand, R. J. (1997). Toward a hierarchical model of intrinsic and extrinsic motivation. In M. P. Zanna (Ed.), Advances in experimental social psychology. New York: Academic Press; 1997 .pp. 271-360.

Table I. Exploratory Factor Analysis of the BREQ-2.

Factors	1	2	3	4	5
Intrinsic Regulation					
4. Because I think exercise is fun	.840				
10. Because I enjoy my exercise sessions	.781				
15. Because I find exercise a pleasurable activity	.835				
18. Because I get pleasure and satisfaction from participating in exercise	.725	.400			
Identified Regulation					
3. Because I value the benefits of exercise		.727			
8. Because it's important to me to exercise regularly	.414	.616			
14. Because I think it is important to make the effort to exercise regularly		.757			
Introjected Regulation					
2. Because I feel guilty when I don't exercise			.846		
7. Because I feel ashamed when I miss an exercise session			.841		
13. Because I feel like a failure when I haven't exercised in a while			.846		
External Regulation					
1. Because other people say I should				.673	
6. Because my friends/family/partner say I should				.826	
11. To please other people				.733	
16. Because I feel under pressure from my friends/family to exercise				.545	
Amotivation					
5. I don't see why I should have to exercise					.791
9. I can't see why I should bother exercising					.813
12. I don't see the point in exercising					.644
19. I think exercising is a waste of time					.669
Eigenvalue	2.97	2.91	2.31	2.17	2.01
Factor variance	16.52	16.21	12.84	12.09	11.17
Total variance	16.52	32.74	45.58	57.67	68.85
Reliability	.89	.81	.82	.86	.85

Table II. Confirmatory Factor Analysis of the BREQ-2.

CMIN	DF	X2/gl	GFI	AGFI	NFI	TLI	CFI	RMSEA	SRMR
268.362	125	2.147	.912	.880	.864	.903	.921	.061	.054

Table III. Mean, standard deviation, alpha coefficient and correlations of all the variables.

	M	SD	Alpha	1	2	3	4	5
1. Amotivation	1.87	.80	.85	-	.79**	.38**	.25**	.25**
2. External Regulation	1.92	.81	.86	-	-	.45**	.23**	.26**
3. Introjected Regulation	2.36	.94	.82	-	-	-	.41**	.30**
4. Identified Regulation	3.73	.61	.81	-	-	-	-	.69**
5. Intrinsic Regulation	4.73	.92	.89	-	-	-	-	-

* $p < .01$; **$p < .001$

Table IV. Univariate and multivariate analysis of the factors of the BREQ-2 according to gender, exercise days, exercise duration, age and exercise mode.

	Main effects				Interaction effects	
	Gender	Age	Exercise duration	Exercise mode	Age x exercise duration	Exercise days x exercise mode
	F	F	F	F	F	F
Amotivation	.30	.52	9.91**	.88	1.15	4.78*
External Regulation	.10	.93	9.34**	1.33	.56	.46
Introjected Regulation	.51	3.47*	1.00	6.83**	2.67*	1.97
Identified Regulation	7.52*	15.47	3.89*	9.92**	2.30	1.72
Intrinsic Regulation	12.32**	8.70**	1.27	15.87**	.19	1.22
Multivariate analysis						
Wilks' Lambda	.97	.93	.92	.92	.93	.95
Multivariate F	2.89*	3.35**	3.78**	4.2**	1.6*	2.0*

* $p < .01$; **$p < .001$

Table V. Mean and standard deviation by age groups, exercise duration, exercise mode and gender.

Age Groups	16-24 years (N = 153)		25-34 years (N = 217)		35-73 years (N =191)	
	M	SD	M	SD	M	SD
Amotivation	1.73	.78	1.89	.79	1.96	.81
External Regulation	1.79	.83	1.95	.82	1.99	.77
Introjected Regulation	2.21	.91	2.37	.94	2.47	.94
Identified Regulation	3.45	.65	3.78	.62	3.90	.50
Intrinsic Regulation	4.43	.96	4.85	.89	4.83	.89
Exercise Duration	0-45 minutes (N=210)		46-60 minutes (N=241)		+ 60 minutes (N=110)	
	M	SD	M	SD	M	SD
Amotivation	2.07	.79	1.88	.76	1.46	.74
External Regulation	2.14	.80	1.95	.78	1.46	.70
Introjected Regulation	2.51	.91	2.29	.94	2.25	.94
Identified Regulation	3.85	.60	3.76	.64	3.46	.49
Intrinsic Regulation	4.88	.94	4.74	.95	4.40	.75
Exercise Mode	Alone (N=114)		With friends (N=120)		Within a guided programme (N=327)	
	M	SD	M	SD	M	SD
Amotivation	1.76	.89	1.70	.81	1.97	.75
External Regulation	1.76	.86	1.79	.89	2.03	.75
Introjected Regulation	2.29	.89	2.06	.87	2.50	.95
Identified Regulation	3.64	.62	3.43	.68	3.88	.54
Intrinsic Regulation	4.40	.94	4.31	1.02	4.99	.79
Gender	Male (N = 263)				Female (N = 298)	
	M	SD			M	SD
Amotivation	1.84	.85			1.89	.75
External Regulation	1.89	.87			1.95	.76
Introjected Regulation	2.31	.92			2.41	.95
Identified Regulation	3.62	.62			3.83	.59
Intrinsic Regulation	4.52	.93			4.91	.89