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RESEARCH ARTICLE

Validation of Motivational Factors for Sports Activities in University Students through SEMPLS

Validación de factores motivacionales para actividades deportivas en alumnos universitarios mediante SEMPLS

Inés Santi-Huaranca* [1] Universidad de San Martín de Porres, Lima, Perú.
ORCID: https://orcid.org/0000-0002-4656-5731

Víctor García-Huambachano [2] Universidad de San Martín de Porres, Lima, Perú.
ORCID: https://orcid.org/0000-0001-9788-7127

Nicolás Sáenz-Tejada [3] Universidad de San Martín de Porres, Lima, Perú.
ORCID: https://orcid.org/0000-0002-7809-7784

[1]Master' Degree in Administration and Public Management. Research Professor. [2]PhD in Education, Head of the Culture and Sport Department of the School of Administrative Sciences and Human Resources. [3]Statistician and Professor.

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***Correspondence**

Email: isantih@usmp.pe

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Summary

The objective of this research work is to evaluate the scale of motivational factors (appearance, competence, enjoyment, fitness and social) for sport activities using SEMPLS multivariate methods in order to verify the importance of the reliability and validity of the measurement model, based on a construct.

The sample usedconsisted of 401 university students from administrative sciences programs and related programs of a Peruvian university. The results found report an average variance extracted of 69.5% for each of the variables and values below the point 0.90 (moderate) for the second order discriminant validity for the HTMT criterion (Heterotrait -Monotrait).

Keywords: Motivational factors, physical activities, structural equations

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Resumen

La presente investigación tiene como objetivo evaluar la escala de factores motivacionales (apariencia, competencia, disfrute, fitness y social) hacia las actividades deportivas utilizando las técnicas de métodos multivariados SEMPLS con la finalidad de comprobar la importancia de la fiabilidad y validez del modelo de medida, basado en un constructo. La muestra utilizada de 401 alumnos universitarios de las carreras de ciencias administrativas y carreras afines de una universidad peruana. Los resultados encontrados reportan una varianza extraída media de 69.5% para cada una de las variables; la validez discriminante de segundo orden para el criterio HTMT (Heterotrait –Monotrait) con valores debajo del punto 0.90 (moderado).

Palabras clave: Factores motivacionales, Actividades físicas, Ecuaciones estructurales

Introduction

The motivational theory is studied from different approaches or perspectives. One of them is the self-determination theory, which manifests itself in the autonomy of a person to choose and direct his actions (Deci & Ryan, 1985, 1991; Moreno & Martínez, 2006; Ryan & Deci, 2000). Motivation is determinant of human behavior (Iso-Ahola & St.Clair, 2000). People can be influenced to engage in a certain activity either voluntarily or prompted by social conditioning, to maintain appearances, among other factors, other than for truly essential reasons (Hellín, Moreno, & Rodríguez, 2006).

The studies about motivational theory recognize its multidimensionality. Intrinsic motivation is concerned with activities related to adherence that provides enjoyment and competence. Extrinsic motivation seeks rewards, external aspects to behavior and finally, amotivation (Deci & Ryan, 1985; Weinberg, Tenenbaum, McKenzie, Jackson, Ashel, Grove & Fogarty, 2000). Motivation plays an important role in psychological health, academic performance, decision to stay or drop out of university studies, among others (Del Valle, Matos, Díaz, Pérez & Vergara, 2018).

The decision to start sport activities has been object of many studies about motivation for this activity. According to Tabernero (1998) and Pavón et al. (2008), the most important reasons have been to be physically fit, improve their level, improve their skills, have fun, do exercises and be in shape. Enjoyment is also a factor that persistently increases (Wankel, 1993). Intrinsic motivation is the reason young people consider for sport (Villamarin, Mauri & Sanz, 1998). The studies differentiate the motivation factors for the participation in sport activities according to gender, as that presented by Koivula (1999) in which men lean towards competition; Martínez (2003), Hellín et al. (2004) point out the concern about the body image and the aesthetics mainly in women. Another reason to participate in sport activities is health and lifestyle (Savage, 1998).

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It is necessary to infer the motivations of people through behavior or by using several instruments such as personal reports and/or questionnaires. Many studies have validated the scales referred to motivational factors to conduct sport activities. One of them was performed by Frederick and Ryan (1993). They employed a sample of 376 employees from a hospitable university to whom a 23 item questionnaire was applied in order to measure motivation for engaging in physical activities considering enjoyment, competence factors and the factor related to body.The technique used was the exploratory factor analysis with promax rotation and correlation of independent factors.

Ryan et al. (1997) applied a sample of 155 students and workers from a university sport center, in which a 30 items scale was used. These items were grouped in five factors: enjoyment (7 items), appearance (6 items), social (5 items), fitness/health (5 items) and competence (7 items). Enjoyment and competence have been used to reflect an intrinsic motivational orientation, and the other three (social, fitness/health and competence) reflect the external levels of motivation to the person. The polychotomous items are measured in a 7-point Likert scale. A factor analysis with varimax rotation was applied. The Cornbrash's alpha for each one of them is .92, .88, .83, .78 and .91 respectively. The five factors account for 66% of the total variance. Other authors like Frederick and Schuster-Schmidt (2003); Xu ad Biddle (2000) have used and validated this scale in different contexts and they obtained a good reliability and validity values in all of them.

Moreno et al. (2005) validated for the Spanish context the scale of Ryan et.al. (1997). A sample of 464 people who practice non-competitive physical activities of a Spanish city was used. The sample responds to the statement "Performed physical activity…" through the items making up the scale. The polychotomous items are measured in a 7-point Likert scale where 1 corresponds to "nothing true for me" and 7 "fully true for me." An exploratory factor analysis of main components with direct oblimin rotation was carried out using self-values higher than 1 and a total variance explained of 69.36%.

Then, an internal consistency analysis was performed to determine the reliability coefficient of Cronbach's alpha. Enjoyment (.84), appearance (.87), social (.81), fitness (.80) and competence (.85). A correlation analysis between all the variables, being positive and significant among all factors. Enjoyment variable had higher correlation with competence and fitness.

The aforementioned studies show evidences of the application of Likert scales where the statistical techniques of factor analysis and correlation were found to be acceptable to measure their reliability and validity. This study is an extension of previous studies that try to evaluate the scale of motivational factors for sport activities of Ryan et.al. (1997), using the SEMPLS multivariate methods in order to verify the measurement model that has the analysis of reliability and validity, considering mainly the construct of the non-observable variables, latent variables.

Method

A descriptive-correlational design was used. The population is composed of university students from the administrative sciences program and related programs of a private university in Lima. Table 1 shows the characteristics of the students in relation to the sport activities they practice. The sample consisted of 401 university students (177 men and 224 women) with ages ranging from 16 to 48: 74.0% are female students and 73.2% are male students, who have attended at the university for less than 3 years. In addition, 49.5% of women and 48.3% of men are in the first two years of studies and more than 50% study in the management and international business schools. Moreover, 60.5% of women and 90.4% of men perform a type of sport and more than 84.3% of women and 93.2% of men perform it voluntarily.

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Table 1.

Sport characteristics of the students surveyed (n=401).

	Women (224)	Men (177)
Age		
Average (in years)	20.0 (DE 3.03)	20.6 (DE 12.55)
Range	16-48	17-30
Years of study in the university		
Less than 3 years	74.0%	73.2%
Between 4 and 5 years	23.7%	21.4%
More than 6 years	2.3%	5.4%
What year are you in?		
First year	27.0%	23.4%
Second year	22.5%	24.9%
Third year	18.9%	18.8%
Fourth year	14.4%	13.2%
Fifth year	7.2%	9.7%
Which school do you study in?		
Administration	28.1%	36.7%
International Business	29.4%	34.5%
Accounting	17.2%	11.3%
Marketing	10.0%	7.3%
Other	15.4%	10.1%
Do you practice any sport?		
Yes	60.5%	90.4%
No	39.5%	9.6%
The workshops you are engaged in are		
Voluntary	84.3%	93.2%
Mandatory	15.7%	6.8%
Hours a week you do sport activities		
Until 3 hours	48.0%	47.3%
Between 4 and 6 hours	42.7%	30.0%
Between 7 and 9 hours	8.4%	13.4%
More than 10 hours	0.7%	9.3%
Do you practice sport in other institutions?		
Yes	28.6%	49.4%
No	71.4%	50.6%

Note: D.E=Standard deviation. Source: Structured survey applied to 401 university students.

Instrument

The instrument is based on the questionnaire of Ryan et al. (1997), translated by Moreno et al. (2005) that consider 30 items of the factors appearance (6 items), enjoyment (7 items), social (5 items), fitness (5 items) and competence (7 items). (See Table 2); with the 6-point Likert scale having small modifications in the interpretation of the polytomic Likert scale of Moreno et al. (2005), in which 1 corresponds to "*fully disagree*" and 6 "*fully agree.*"

Table 2.

Scale of motivational factors for sport activities.

Enjoyment
P13 Because it is funny
P14 Because I like to do this activity
P15 Because it makes me happy
P16 Because I think that it is interesting P17 Because I enjoy doing this activity
P18 Because I find this activity stimulating
P19 Because I like to feel excited to participate
Appearance
P20 Because I want to keep the my weight to have a good image
P21 Because I want to tone my muscles to have a good image
P22 Because I want to improve my appearance
P23 Because I want to become attractive to others P24 Because I want to improve my body image
P25 Because I will feel less physically attractive if I do not practice exercises
Social
P26 Because I like to be with my friends
P27 Because I like to be with others who also are interested in this activity
P28 Because I want to meet new people
P29 Because I like to spend time with others doing this activity
P30 because I like to feel integrated with others
Fitness
P31 Because I want to be in good physical shape
P32 Because want to have more energy
P33 Because I want to improve my cardiovascular fitness
P34 Because I want to maintain my physical strengthen to live healthy
P35 Because I want to maintain my physical health and wellbeing
Competence
P36 Because I want to be engaged in physically challenging activities
P37 Because I want to develop new skills
P38 Because I want to improve my skills
P39 Because I like challenges
P40 Because I want to maintain my current level of skill
P41 Because I like physically challenging activities
P42 Because I want to be good to develop my activity

Prepared by the authors, based on Moreno et al. (2005).

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Validity and Reliability Analysis

Validity and reliability were carried out through structural equations with partial least squares (SEM-PLS), which is a second generation technique in the area of multivariate methods. This technique was used since the scale used in this study is multidimensional, so the statistical package SmarthPLS (Ringle, Wende & Becker, 2016), a software developed to test structural models, was used.

Structural equations to model a latent construct consider two models: measurement and structural. Reliability and validity of the scales are determined in the measurement model. Reliability was analyzed through two indicators: Cronbach's alpha and composite reliability, generally the interpretation of the values is the same. The values .7, .8, .9 are considered acceptable, good and excellent, respectively. These two indicators indicate if the scales shows internal consistency. (Hair, Hult, Ringle & Sarstedt, 2017)

As for validity, the convergent and discriminant validity was examined. For the former, the factorial loads must be higher than .708 (authors suggest not to be so rigid in the preliminary stages of the analysis) and the average variance extracted was calculates, in which an acceptable threshold is equal to or higher than 0.5, which means that the latent construct obtained a variance explained of 50%. According to Fornell Larcker criterion, the square root of the AVE of the dimensions should be higher that the correlations with other dimensions in the model, thereby confirming the independence of the latent variables. (Hair et al. 2017)

In addition, the criterion of Heterotrait Monotrait Ratio (HTMT) was used (Henseler et al, 2015) to validate the constructs of each one of the factors, since these scales are evaluated as models of hierarchical components, that is, by levels. According to this indicator, the coefficients must be under the conservative point (.90). Moreover, to calculate the reliability intervals, the Bootstrapping resampling technique (sample= 5000 times, using the option without changing the sign) was used, and they should not include value 1. At

the same time, a discriminant validity between the second order construct and dimensions making it up may not be established. However, this result is to be expected, since the measurement model of the construct repeats the indicators of the first order dimensions. (Hair, Hult, Sarstedt, Ringle, & Gudergan, 2017)

Furthermore, the main focus is the second order construct and its measurement model is built from the relationship of the second order construct with its dimensions. In fact, to calculate the average variance extracted and the composite reliability, path coefficients are considered.

Results

Table 3 shows descriptive statistics of motivation for sport activities. It is observed that the items show averages that vary for enjoyment (M=5.11) and appearance (M= 4.48). We can observe that enjoyment and competence show a higher average (M= 5.07), which corresponds to intrinsic motivation. Data show asymmetry and kurtosis within the range -1 to +1, which indicates that they meet the normality assumption.

Table 3.

Descriptive statistics of data of the sample of university students.

Item	M	SD	Asymmetry	Kurtosis
Enjoyment	5.11	.79	.94	.70
Appearance	4.49	1.04	.93	.70
Social	4.79	.84	.92	.69
Fitness	4.99	.84	.94	.76
Competence	5.07	.79	.95	.72

Source: Structured survey applied to 401 university students.

Figure 1 shows the analysis of constructs of all the factorial loads of the first order dimensions, which represent the motivation factors for sport. All of them show significance above .708, except for item P25 “because I will feel less physically attractive if I do not practice exercises.” (.685)

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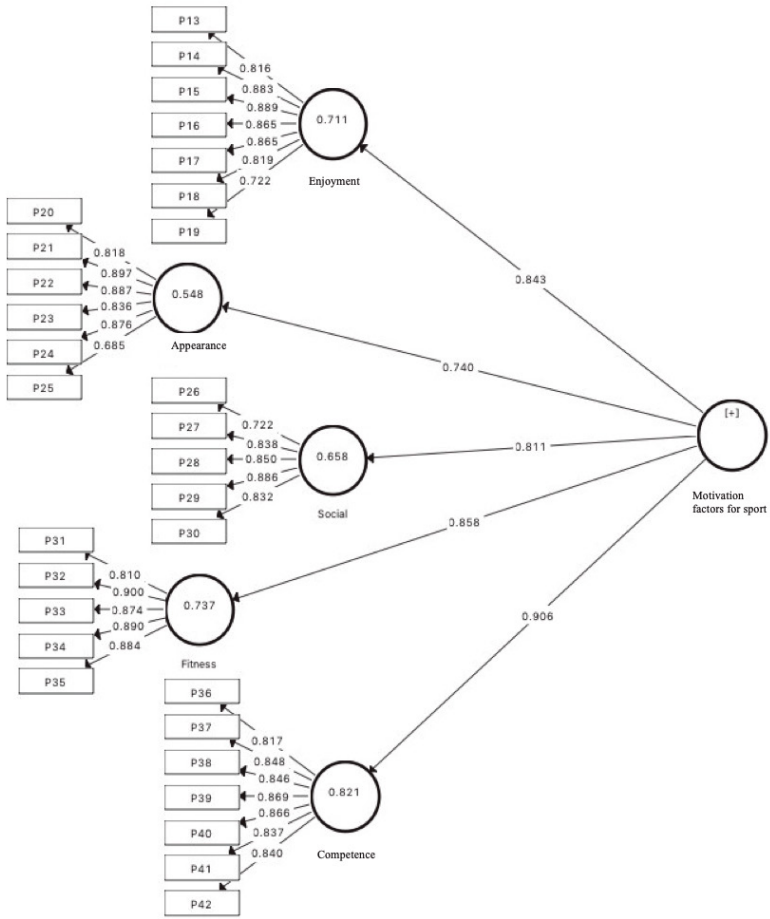

Figure 1. Second order factorial structure of the scales of motivational factors for sport activities using SEM-PLS (see Table 1 meaning of items).

Composite reliability values vary between .915 and .946 (see Table 4). There is internal consistency in such scale. The average variance extracted (AVE) of each dimension of motivational factors for participating in sport activities and for the same construct is satisfactory and varies between .685 and .760.

Table 4.

Validity and reliability of motivational factors for sport activities.

	Cronbach's Alpha	*Composite reliability*	*Variance extracted (AVE)*
Enjoyment	.929	.943	.704
Appearance	.913	.933	.699
Social	.883	.915	.685
Fitness	.921	.941	.760
Competence	.934	.946	.716
Motivation factors for sport activities (second order)		.919	.695

Source: Structured survey applied to 401 university students.

For the evaluation of the discriminant validity between latent variables, the Fornell-Larker's criterion as well as the Heterotrait Monotrait (HTMT) criterion are used. The results are evaluated by levels between first order constructs, since the HTMT values must be below the conservative threshold value of .90 (see Table 5). In addition, the reliability intervals do not include the unit, with which this criterion is met.

For the second order, the discriminant validity cannot be established, since the results include first order indicators. Thus, the reliability intervals could not include the unit. The results shown are valid according to these criteria.

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Table 5.

Discriminant validity of motivational factors for sport activities using the Heterotrait Monotrait Ratio (HTMT) criterion.

	Appearance	Competence	Enjoyment	Fitness	Social	Motivation factors for sport
Fornell-Larker						
Appearance	(**.836)**					
Competence	.518	**(.846)**				
Enjoyment	.512	.705	**(.839)**			
Fitness	.586	.809	.593	**(.872)**		
Social	.565	.667	.638	.586	**(.827)**	
Motivational factors for sport activities	.740	.906	.843	.858	.811	**(.706)**
Heterotrait-Monotrait						
Motivational factors for sport activities	.795 [.740; .841]	.943 [.916; .963]	.890 [.848; .923]	.901 [.865; .929]	.885 [.832; .927]	

Note: Source: Structured survey applied to 401 university students.

Discussion

The dimensions used in this study corroborate the theoretical construct of the motivational factors for sport activities, in which the multidimensionality of motivation is shown through intrinsic and extrinsic reasons (Deci & Ryan, 1985; Weinberg, Tenenbaum, McKenzie, Jackson, Ashel, Grove & Fogarty, 2000). They are determined voluntarily or not by people. (Hellín, Moreno, & Rodríguez, 2006)

It is necessary to mention that the sample used in this study (n=401) has specific characteristics, and consists of university students (homogenous

sample). Consequently, the results are more consistent, compared to samples of studies of Ryan et al. (1997) and Moreno et al. (2005), where the former is a sample of students and workers, the latter is a sample of people who practice sport activities in a specific city, they can be understood as more heterogeneous. However, the results found are satisfactory, with a high internal consistency of the scales of motivational factors.

In research work, the motivational factors that best explain motivation are those intrinsic motivational factors (enjoyment and competence), as corroborated in the studies of Ryan et al. (1997) and Moreno et al. (2005), and according to Villamarin, Mauri & Sanz (1998), intrinsic motivation is what young people consider best.

The latent construct modeling, considering the 5 dimensions, reported an average variance extracted for each one of them higher than 50% and for the second order, an average variance extracted (AVE) of 69.5%, this proves that it is satisfactory, consistent with the findings of Moreno et al. (2005) for which an exploratory factor analysis and a total variance explained of 69.36% were used. This SEMPLS technique gives more accuracy in results.

Reliability of each one of the motivational factors of the study shows values ranging from .915 to .946 close to 1, satisfactory, exact and consistent results that provide a stable measurement, they are consistent with what was found by Ryan et al. (1997) and Moreno et al. (2005). The latter showed a Cronbach's alpha that ranges from .80 to .87. The technique used in this study takes into account the interrelationships of the constructs extracted.

The instrument that shows this research work contains 30 items proposed by Ryan et al. (1997), which using SEM-PLS, show factorial loads higher than 0.685, the scale structure being appropriate. In Moreno et al. (2005) based on the translation of Ryan, eliminated 2 items because they did not have high correlation and did not reach saturation of 0.40, resulting in a 28-item questionnaire according to the factor analysis of the scale, showing, therefore, restrictions in its analysis with respect to this study.

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This SEM-PLS approach applied to complex models explains better the relationships between several factors, giving more confidence in its results than the first generation or traditional techniques.

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