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ORIGINAL

SELF-CONCEPT, PHYSICAL ACTIVITY AND HARMFUL SUBSTANCES: A STRUCTURAL EQUATION MODEL

AUTOCONCEPTO, ACTIVIDAD FÍSICA Y SUSTANCIAS NOCIVAS: UN MODELO DE ECUACIONES ESTRUCTURALES

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ABSTRACT

The present study defines and contrasts an explanatory model of alcohol and tobacco consumption, and physical activity engagement according to the five dimensions of self-concept in a sample of 2.134 adolescents from the province of Granada (Spain). The instruments used were the Self-concept Questionnaire Form-5, the Test for the Identification of Disorders in the Use of Alcohol-AUDIT, the Test for the Nicotine-FTND Unit and an ad-hoc questionnaire designed to estimate physical activity engagement. The structural equation model developed in the present study demonstrated acceptable fit indices ($\chi^2 = 79.476$, $gl = 8$, $p = 0,000$, $CFI = 0,968$, $NFI = 0,964$, $IFI = 0,968$, $RMSEA = 0,065$). The results show a positive relationship between alcohol consumption and tobacco consumption, with negative relationships between alcohol consumption and family, emotional and academic self-concept.

KEYWORDS: self-concept; tobacco; alcohol; physical activity; teenagers.

RESUMEN

La presente investigación pretende definir y contrastar un modelo explicativo del consumo de alcohol y tabaco, y la práctica de actividad física en función de las cinco dimensiones del autoconcepto en una muestra de 2.134 adolescentes de la provincia de Granada (España). Los instrumentos empleados fueron el Cuestionario de Autoconcepto Forma-5, Test para la Identificación de Trastornos en el Uso de Alcohol-AUDIT, Test para la Dependencia a la Nicotina-FTND y un cuestionario ad-hoc para controlar la práctica de actividad física. En esta investigación se planteó un modelo de ecuaciones estructurales que se ajustó de forma adecuada ($\chi^2 = 79,476$; $gl = 8$; $p = 0,000$; $CFI = 0,968$; $NFI = 0,964$; $IFI = 0,968$; $RMSEA = 0,065$). Los resultados obtenidos muestran una relación positiva entre el consumo de alcohol y el consumo de tabaco, y relaciones negativas entre el autoconcepto familiar, emocional y académico con el consumo de alcohol.

PALABRAS CLAVE: autoconcepto; tabaco; alcohol; actividad física; adolescentes.

INTRODUCTION

Adolescence defines a period of transition between childhood and adulthood. During this period individuals experience a multitude of physical, cognitive and social changes, such as the development of sexuality and the acquisition of adult roles and responsibilities (Booker and Dunsmore, 2017). The adolescent life stage is typically accompanied by a radical change in the individual's lifestyle and in their social relations, often culminating in the young person moving out of the family home, entering the world of work or initiating higher education (Jolliffe, Farrington, Piquero, MacLeod and van de Weijer, 2017). In addition, the accompanying social changes result in a distancing from youth and a movement towards adulthood, as the individual attains an age legally associated with adulthood and displays behavioural modifications associated with the fulfilment of a new role in a new social position (Bewick, Koutsopoulou, Miles, Slaa and Barkham, 2010; Ray, Frick, Thornton, Wall Myers, Steinberg and Cauffman, 2017). During the transition towards the new adult role, adolescents typically display a combination of adult and infantile behaviours, as they have not yet fully formed and internalised their new adult identity, a process which is completed at the end of adolescence (Haapanen and Tervo, 2012; Klemanski, Curtiss, McLaughlin and Nolen-Hoeksema, 2017). In post-industrial society, adolescents driven by emotional instability often display unstable traits, with the peer group exerting a significant influence on behavioural responses. However, during this stage, the adolescent still lacks the mechanisms necessary to control stressors experienced during adulthood (Bewick et al., 2010; Rutland and Killen, 2017).

The consumption of tobacco and alcohol is common amongst the adolescent population. Engagement in such behaviours represents a step away from childhood towards adulthood and can even reaffirm the adult condition within the adolescent (Mezquita, Stewart, Kuntsche and Grant, 2016; Gaete and Araya, 2017). However, consumption of these substances can also result in patterns of regular use and dependence which increase the risk of suffering from chronic conditions and related health problems in the future (Kobiella et al., 2014). In recent years the consumption of legal drugs such as alcohol and tobacco by adolescents has reduced, though levels still remain high, above all in the case of alcohol. This is largely a result of recent health policies introduced to reduce the consumption of tobacco, which are now starting to take effect in society (Hernández, Orozco and Ríos, 2017). Adolescence is typically the life stage during which consumption of the aforementioned substances is initiated. This can be due to many factors, amongst them the absence of parental control, peer pressure and contextual changes, alongside the cognitive changes that they produce, have been identified as the most influential (Carver, Elliott, Kennedy and Hanley, 2017). In current society, alcohol acts as a form of socialisation as its ingestion modifies feelings and emotions, alters processes of thought and critical judgement and provokes a phase of excitement that predisposes individuals to relate themselves with others (Mezquita et al., 2016; Pegg, O'Donnell, Lala and Barber, 2017). To a large extent tobacco has lost its social attraction. However, it does produce a strong addiction due to its high content of nicotine and other substances capable of altering the emotional state of the consumer and generating a dependence towards further consumption (Kobiella et al., 2014).

Consumption of alcohol and tobacco is socially accepted due to the fact that both are relatively soft drugs and are legally permitted. However, consumption is associated with certain risks and negative effects with regards to health, some of which carry gravely severe consequences. With regards to alcohol, according to the OMS (2015), consumption results in more than three million deaths per year worldwide, whilst also being a risk factor for suffering various illnesses and cardiovascular disorders such as cirrhosis and hepatic cancer, amongst others (Maurage, Joassin, Speth, Modave, Philippot and Campanella, 2012; Connor, 2017; Elliott, Forster, McDonough, Bowd and Crabb, 2017). According to the OMS (2015), tobacco consumption is responsible for more than six million deaths per year worldwide, twice as many as alcohol. Further, alcohol consumption is directly related with suffering diseases such as pulmonary emphysema, chronic obstructive pulmonary disease, various cardiopathologies and lung cancer (Haldorsen, Martinsen, Kjærheim and Grimrud, 2017; Vrana, Kern and Anderson, 2017). In light of this previous research it is evident that the consumption of both alcohol and tobacco should be controlled during the period of adolescence in order to repress the initiation of consumption and prevent addiction. To this end, avoidance or controlled consumption should be promoted by health organisations at a local, regional, national and even international level (Kuipers, Brandhof, Monshouwer, Stronks and Kunst, 2017).

As an alternative to engaging in damaging behaviours during adolescence, the development of social policies promoting engagement in healthy behaviours

such as physical activity have been proposed. Physical activity is a behaviour with huge potential value due to the vast array of health benefits it has demonstrated, such as reduced risk of suffering cardiovascular diseases, and improvements at the cognitive, physiological and social level (Lewis, Napolitano, Buman, Williams and Nigg, 2017). Despite this, engagement in physical activity has been shown to reduce throughout adolescence (Bonet, Parrado and Capdevila, 2017). This may be due to a number of cultural factors together with a reduction in the availability of free time and leisure time. Thus, a fundamental task of the state must be to encourage engagement in physical activity and encourage acquisition of this behaviour within the population as a habit from an early age (Schlechter, Rosenkranz, Milliken and Dzewaltowski, 2017).

During adolescence the inter-relation of a multitude of cognitive and social factors strongly influences personal development, reinforcing the acquisition of patterns that will be maintained into adulthood. This includes behaviours with positive health effects such as physical activity, and those with damaging effects such as consumption of harmful substances. For this reason it is essential to analyse the cognitive factors that influence engagement in certain behaviours during adolescence. The present study therefore aimed to investigate the self-concept of adolescents. This variable was employed to provide an overall representation of how individuals perceive themselves (Hattie, 2014) and is composed of factors relating to the social, emotional, physical, family and academic environment (García and Musitu, 1999; Shavelson, Hubner and Stanton, 1976).

A large number of studies have examined self-concept in relation to a wide array of variables and during different life stages, with adolescence being one of the most commonly studied (Zurita, Castro, Álvaro, Rodríguez and Pérez, 2016). Moreno, Moreno and Cervelló, (2009) identified that adolescent non-smokers reported a more positive body image. On the other hand, Dudovit, Li and Chung (2013) demonstrated that self-concept predicted behaviours related with the abusive consumption of alcohol in adolescents. This highlighted the obvious need for interventions to encourage development of a healthy self-concept during childhood and adolescence, in order to avoid problems associated with a negative self-concept. In summary, it is clearly imperative to continue developing investigations targeting the relationships between the cognitive, social and contextual factors that are prominent during adulthood and that influence decisions to engage in healthy or harmful behaviours (Jackson, Von Eye, Fitzgerald, Zhao and Witt, 2010; Rhodes, Devlin, Steinberg and Giovannetti, 2017).

The theoretical assumptions derived from the literature review conducted and discussed above will be examined in the present research through the following hypothetical model (Figure 1) which includes the following factors; Factor 1: Academic self-concept (AS), Factor 2: Social self-concept (SS), Factor 3: Family self-concept (FS), Factor 4: Physical self-concept (PS), Factor 5: Emotional self-concept (ES), Factor 6: Engagement in physical activity (PA), Factor 7: Alcohol consumption (ALCOHOL) and Factor 8: Tobacco consumption (TOBACCO).

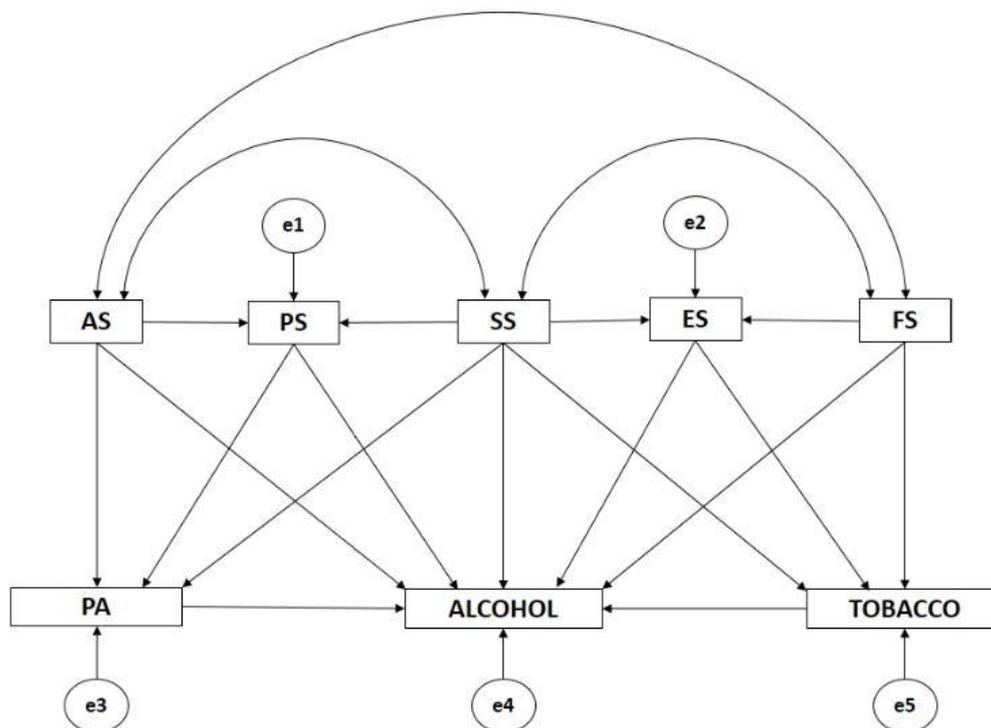


Figure 1. Hypothetical model of the consumption of harmful substances, engagement in physical activity and self-concept.

Note. A. AS: Academic self-concept; PS: Physical self-concept; SS: Social self-concept; ES: Emotional self-concept; FS: Family self-concept; PA: Physical activity; ALCOHOL: Alcohol consumption; TOBACCO: Tobacco consumption.

The model developed in the present study is based on that which has been proposed by Chacón, Castro, Caracuel, Padial, Collado and Zurita (2016). It was developed to examine the relationships between all dimensions of self-concept and alcohol consumption. The decision to examine these variables was informed by results from a large number of studies, which have identified alcohol consumption as a behaviour highly susceptible to the influence of psychosocial factors during adolescence (Murray, Farrington and Sekol, 2012; Mezquita et al., 2016). The model also seeks to examine the association between academic, physical and social self-concept, and engagement in physical activity. Emotional and family self-concept are not predicted to exhibit important relationships due to the typical distancing of individuals away from their family home during adolescence (Bewick et al., 2010). In development of the model, the present study seeks to establish the relevant relationships, whilst also guarantying a synthesised and parsimonious model by ensuring that adjustment indices are not negatively affected (Marsh, 2007).

Academic self-concept, social self-concept and family self-concept were introduced into the model as exogenous variables, while physical self-concept, emotional self-concept, alcohol consumption, tobacco consumption and engagement in physical activity were introduced as endogenous variables. The bidirectional arrows shown in the model (covariance) show relationships between the exogenous variables, while the unidirectional arrows illustrate the effects (direct and indirect) between the included endogenous variables.

Prediction error terms associated with the endogenous variables are also presented, as these are under the influence of other variables and thus carry a degree of error. Estimation of parameters was conducted according to the method of maximum likelihood estimation (ML) as this has been shown to be coherent, unbiased and invariant to types of scale.

With this in mind the present study aims to address the following objectives: a) to analyse and identify the relevant relationships between the different dimensions of self-concept, the variables associated with the consumption of harmful substances (alcohol and tobacco) and engagement in physical activity; b) to define and contrast an explanatory model of consumption of harmful substances and physical activity engagement as a function of self-concept and its dimensions in Spanish adolescents; c) to examine the effect of self-concept on the consumption of alcohol and tobacco and engagement in physical activity, from the explanatory model described in objective b).

METHOD

Participants

A descriptive and exploratory cross-sectional study was conducted with a sample of 2.134 Spanish adolescents. Of these 1.062 were male (49,8%) and 1.072 were female (50,2%), with a self-reported age of between 15 and 18 years old ($M=15,93$ years; $DT= 0,853$) and participants being recruited from centres of obligatory secondary education (OSE) in the province of Granada. From a total of 18.930 students registered on academic courses 2.014/2.015 (data provided by the Ministry of Education), a representative sample of 2.134 students in obligatory secondary education was obtained (sampling error of 0,02; $IC = 95,5\%$) using the random stratified sampling techniques described by Santos, Muñoz, Juez and Cortiñas (2003). Both centres of education and individual students agreed to participate voluntarily and provided informed consent.

Variables and Instruments

The present study measured the included variables using the standardised instruments introduced below:

Self-concept Questionnaire Form-5 (AF-5). This instrument was adapted by García and Musitu (1999) and is based on the theoretical model developed by Shavelson et al. (1976). It is composed of 30 items which are scored on a 5-point Likert scale, where 1 is "Never" and 5 is "Always". The instrument groups self-concept according to five dimensions, these are: academic self-concept (items 1, 6, 11, 16, 21 and 26), social self-concept (items 2, 7, 12, 17, 22 and 27), emotional self-concept (items 3, 8, 13, 18, 23 and 28), family self-concept (items 4, 9, 14, 19, 24 and 29) and physical self-concept (items 5, 10, 15, 20, 25 and 30). García and Musitu (1999) established the instruments reliability (determined through Cronbach's alpha coefficient): $\alpha = 0,810$. Similar values were identified in the present study ($\alpha = 0,833$).

Tobacco consumption scale, extracted from the “Fagerström Test for Nicotine Dependence (FTND)” questionnaire, which was developed by Heatherton, Kozlowski, Frecker and Fagerström (1991) and translated into Castellano by Villareal-González (2009). Using the instrument, respondents self-report the quantity of cigarettes smoked, their desire to smoke and their dependence on nicotine. It is composed of 6 items, four of which are dichotomous (0=No and 1=Yes), while the two remaining items are scored on a three-point Likert scale. The reliability index for this instrument in the present study was $\alpha = 0,956$, which is similar to that reported previously by Villareal-González (2009) in their seminal work ($\alpha = 0,970$).

Alcohol consumption scale, extracted from the “Alcohol Use Disorders Identification Test (AUDIT)” instrument. This item was developed by Saunders et al. (1993) and translated into Castellano by Rubio (1998). It composes of 10 items, with the first eight being scored on a five-point Likert scale, where 0 is “Never” and 5 “Daily”. The final two questions are scored on a three-point Likert scale (0, 2 and 4). Responses to this item are summed giving a possible total score of between 0 and 40 points. A study conducted by Rubio (1998) obtained an internal reliability score of $\alpha = 0,800$, while the present study obtained a score of $\alpha = 0,832$.

Ad-hoc questionnaire to estimate engagement in physical activity, respondents were asked to report whether or not they engaged in physical activity. Responses were dichotomous with 0 being “No” and 1 being “Yes”.

Procedure

Firstly, information packs were sent from the department of Physical Education and Sport of the University of Granada to potential participants soliciting interest in collaboration with the study. Information packs detailed the nature and objectives of the proposed study, and enclosed informed consent forms for participants and their legal guardians. Data was collected after attaining informed consent. A total of 2.211 students who were enrolled in obligatory secondary education (OSE) took part in the present study. Questionnaires were excluded for 77 participants due to incorrect completion, leaving a final sample of 2.134 participants. Instruments were administered during a normal lesson at the participant’s centre of education with no problems being reported. Members of the research team were present in order to ensure correct administration of the instruments. All students participated voluntarily with anonymity being maintained at all times. Principles laid out in the Declaration of Helsinki regarding research ethics were adhered to and ethical approval was received from the committee of research ethics and the University of Granada.

Data analysis

IBM SPSS® statistical software package version 24 for Windows was used to conduct basic descriptive analysis of the data (means and frequencies). The program, IBM AMOS® 23 was used to analyse the relevant relationships and

effects between the measured constructs through a structural model. To achieve this, path analysis was conducted with the following observable variables: academic self-concept (AS), physical self-concept (PS), social self-concept (SS), emotional self-concept (ES), family self-concept (FS), engagement in physical activity (PA), alcohol consumption (Alcohol) and tobacco consumption (Tobacco). Model fit was examined in order to verify compatibility of the model with the empirical data. Consistency of the model was assessed according to goodness of fit criteria (Marsh, 2007, p.785). Chi-squared analysis was conducted with non-significant p-values indicating good model fit. Comparative fit indices (CFI) were deemed to be acceptable when values were greater than 0,90, and excellent when values were greater than 0,95. To support good model fit, the value for the normalised adjusted fit index (NFI) should be greater than 0,90. Incremental fit indices (IFI) are deemed to be acceptable when values are greater than 0,90, and excellent when values are greater than 0,95. Finally, the root mean square error approximation (RMSEA) value is deemed to be excellent when it is lower than 0,05, and acceptable when it is lower than 0,08.

RESULTS

The values obtained in the evaluation of model fit indicate good model fit for all indices. The chi-squared value produced a significant p-value ($\chi^2 = 79,476$; $gl = 8$; $p = 0,000$), however, although this is an important value to consider, it is important to keep in mind that it has no upper limit. As a result, it is not possible to make a standardised interpretation of this value. Further, chi-squared values are sensitive to sample size. In order to address these weaknesses, other standardised fit indices were also employed which are less sensitive to sample size. The indice of comparative fit (CFI) produced a value of 0,968, which suggests excellent model fit. The indice of normalised fit (NFI) and the indice of incremental fit (IFI) produced values of 0,964 and 0,968 respectively, both of which also suggest excellent fit. Finally, root mean square error adjustment (RMSEA) analysis produced an acceptable value of 0,065.

Figure 2 presents the estimated values for the included parameters. In order to be considered significant, estimates must have an adequate magnitude and effects should significantly differ from zero. Further, improper estimations such as negative variances, should not be obtained.

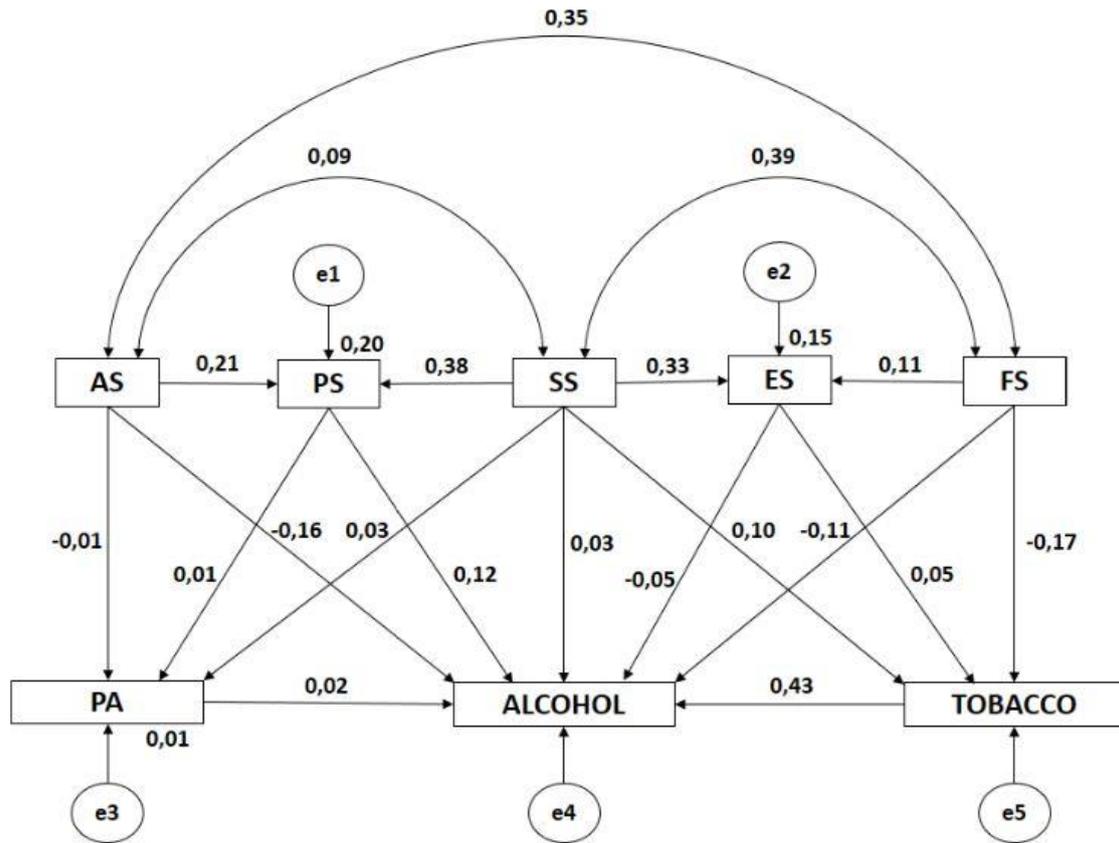


Figure 2. Structural equation model.

Note. A. AS: Academic self-concept; PS: Physical self-concept; SS: Social self-concept; ES: Emotional self-concept; FS: Family self-concept; PA: Physical activity; ALCOHOL: Alcohol consumption; TABACO: Tobacco consumption.

As shown in Table 1, outcomes were significantly significant at an alpha level of 0,001 for all apart from seven of the examined relationships between variables. The largest regression weights correspond to the association between tobacco consumption and alcohol consumption, followed by associations between social and physical self-concept, social and emotional self-concept, and academic and physical self-concept. All of these relationships were positive and direct. In contrast, negative relationships were identified between family self-concept and tobacco consumption, and between academic self-concept and alcohol consumption. Both family and emotional self-concept were also negatively related with alcohol consumption. According to the developed model, engagement with physical activity was not associated with any of the other measured variables in the adolescent sample examined in the present study. With regards to the relationships that were not statistically significant, the critical ratio (CR) produced was lower than 2. Since coefficients higher than 2 indicate a significant deviation from zero it was interpreted that no significant association was present for these variables (Byrne, 2013). It is therefore evident that the scales employed to measure these variables lacked convergent validity.

Table 1. Regression weights and standardised regression weights

Associations between variables			R.W.				S.R.W.
			Estimations	S.E.	C.R.	P	Estimations
PS	<---	AS	0,218	0,021	10,589	***	0,206
PS	←-	SS	0,422	0,022	19,289	***	0,376
ES	<---	SS	0,361	0,024	15,321	***	0,331
AE	<---	FS	0,110	0,021	5,310	***	0,115
PA	<---	AS	-0,009	0,014	-0,662	0,508	-0,015
PA	<---	PS	0,007	0,015	0,482	0,630	0,012
Tobacco	<---	FS	-0,612	0,082	-7,422	***	-0,173
Tobacco	<---	ES	0,169	0,085	1,985	0,047	0,046
Tobacco	<---	SS	0,390	0,098	3,984	***	0,097
PA	<---	SS	0,022	0,016	1,399	0,162	0,033
Alcohol	<---	SS	0,240	0,176	1,367	0,172	0,031
Alcohol	<---	PA	0,240	0,213	1,130	0,258	0,021
Alcohol	<---	Tobacco	0,825	0,036	22,695	***	0,430
Alcohol	<---	PS	0,818	0,143	5,735	***	0,120
Alcohol	<---	ES	-0,377	0,143	-2,631	0,009	-0,053
Alcohol	<---	AS	-1,149	0,148	-7,779	***	-0,159
Alcohol	<---	FS	-0,714	0,149	-4,800	***	-0,105

¹R.W., Regression weights; S.R.W., Standardised regression weights; S.E., Standard error; C.R., Critical Ratio.

²PA: Physical activity; AS: Academic self-concept; SS: Social self-concept; FS: Family self-concept; PS: Physical self-concept; ES: Emotional self-concept.

³ *** Statistically significant associations between variables at $p < 0,005$.

DISCUSSION

The present study examined a model of self-concept composed of five dimensions –academic, physical, social, emotional and family- (Fuentes, García, Gracia and Lila, 2011) in a sample of adolescents. The variables of physical activity engagement, alcohol consumption and tobacco consumption were also examined within the model. The resulting structural equation model demonstrated adequate fit to the empirical data and was grounded in findings reported by previously conducted studies within similar contexts (Bustos, Oliver and Galiana, 2015; Dudovitz, Li and Chung, 2013; Jackson et al., 2010; McKay, Sumnall, Cole and Percy, 2012; Zurita et al., 2016).

One of the main findings from the present research was the identification of inter-relationships between all dimensions of self-concept, apart from the emotional and family dimensions which did not display associations. This contradicts previous findings reported by Bustos et al. (2015) and Rodríguez-Fernández, Droguett and Revuelta (2012), who identified a direct association between the emotional and family dimensions. Caution is therefore required when interpreting these findings. A possible explanation for the lack of association between these two dimensions in the present study is that the present sample of adolescents may have given less importance to the role of family relations, as they were entering a lifestage characterised by greater social and emotional independence (Haapanen and Tervo, 2012; Berg, Kiviruusu, Karvonen, Rahkonen and Huurre, 2017).

Alcohol consumption was directly and positively related with tobacco consumption, with associations being large in size. This is an anticipated outcome given that both substances are often consumed together, particularly in social situations. A large number of studies have previously demonstrated that adolescent smokers consume a greater quantity of alcohol than adolescent non-smokers, due to the habit of consuming both drugs at the same time and the potentiating effect that each drug has on the effects of the other (Lindgren, Neighbors, Gasser, Ramirez and Cvencek, 2017; Matuszka, Bácskai, Czobor and Gerevich, 2017). Analysis of tobacco consumption in relation with the family dimension of self-concept produced a large negative association, suggesting that the family exerts a strong influence over the consumption of harmful substances during adolescence. Chartier, Thomas and Kendler (2017) suggest that alcohol and tobacco consumption may be related with avoidance behaviours or desires to escape from problematic family situations. This may at least partly explain the findings of the present study that adolescents with a poor family self-concept are also more likely to be smokers and to smoke more than those with better family self-concepts (Murray, Durazzo, Mon, Schmidt and Meyerhoff, 2015).

Analysis of the relationship between alcohol consumption and self-concept identified positive associations with the physical and social dimensions of self-concept, while negative relationships were identified with the academic dimension. The identified relationship between consumption of alcohol and social self-concept may be explained by findings that social motives prevail during adolescence, moving individuals towards alcohol consumption (Pegg et al., 2017). The consumption of harmful substances has also been associated with poorer academic performance and even abandonment of academic studies during the prepubescent and adolescent life stages (Kelly, Chan, Mason and Williams, 2015). Ingestion of legal or illegal drugs is associated with dysfunctional family situations, characterised by a lack of contact, support and discipline from within the family environment, leading the adolescent to seek support primarily from the peer group (Maurage et al., 2012).

Analysis of physical activity engagement in relation to all other variables did not produce any significant findings, despite a positive relationship between intention to be physically active and physical self-concept being reported by Moreno, Moreno and Cervelló (2013) and Revuelta, Esnaola and Goñi (2016).

It is important to highlight the main limitations of the present study, which must be interpreted in light of the fact this is descriptive and cross-sectional, which precludes causal conclusions from being made. It would also have been interesting and informative to have increased the number of variables examined in relation to engagement with physical activity during adolescence. Further variables relating to psychological outcomes such as self-esteem and anxiety, could also be included in future research to increase the applicability of the research.

The main conclusions of the present research are that a structural equation model was produced which demonstrated good fit to the empirical data and

adequate reliability. The present study provides a novel overview of the relationships that exist between psychological factors as described by self-concept and its dimensions, in relation with the consumption of harmful substances. Positive relationships were found between the social and physical dimensions of self-concept and the consumption of alcohol. Similarly, tobacco consumption was directly related with alcohol consumption, with self-concept proving to be an important risk factor with regards to the consumption of harmful substances in adolescents. In contrast, a negative association was found between academic self-concept and alcohol consumption. No relationships were identified between engagement in physical activity and the other measured variables.

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