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Substance use in Portuguese and Spanish Adolescents: Highlights from Differences and Similarities and Moderate Effects

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Abstract

Many behaviors with lasting health impact are initiated in adolescence. Substance use is one such behavior. To analyse the factors involved in adolescent substance use among Portuguese and Spanish boys and girls, an explanatory model was developed using structural equations modelling. The model proposes that the impact of social contexts (family, friends, classmates and teachers) on substance use (tobacco, alcohol and illicit drugs) is mediated by perceptions of well-being (psychological symptoms, well-being and school satisfaction). Data on 1589 Portuguese (mean age = 13.27, *SD* = .59) and 4191 Spanish adolescents (mean age = 13.21; *SD* = .47) who took part in the HBSC/WHO survey were analysed. The models fits the data of each country (*CFI* > .90; *RMSEA* < .03) and the majority of the relationships proposed in the model had revealed as expected for both samples. The relations with a major effect, for both countries, were: the negative effect of family on psychological symptoms and the positive effect of family on subjective well-being; the negative effect of classmates on psychological symptoms; the positive effect of teachers on school satisfaction; the effect of psychological symptoms (negative) and school satisfaction (positive) on well-being; the negative effect of school satisfaction on tobacco and alcohol use; and the positive effect of tobacco on alcohol use, and alcohol use on cannabis. For each of the dependent factors studied (tobacco, alcohol and illicit drugs), the levels of explained variance varied between 9% (for tobacco use) and 46% (for alcohol use). Some non-invariant paths were obtained in country comparisons, controlling for gender. In multivariate analyses the paths from tobacco use to cannabis and from alcohol to cannabis were significant, but much stronger for Spanish girls than Portuguese girls.

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Keywords

adolescents; tobacco; alcohol; cannabis; social contexts

Among the many factors associated with adolescent substance use, social context, including family, peers, and teachers, is prominent. In general, positive social relationships within family, peer group, and school, are protective against threats to adolescent well-being (Huver, Engels, Van Breukelen, & de Vries, 2007; Mason, 2010; Simons-Morton, 2007). Good relationships are thought to facilitate well-being (Argyle, 1997; Matos, Simões, Batista-Foguet, & Cottraux, 2010) and discourage substance use (Griffin, Botvin, Scheier, Epstein, & Doyle, 2002), while poor relationships increase the risk for adjustment problems and substance use (Dorfman, Trokel, Lincoln, & Mehta, 2010; Simantov, Schoen, & Klein, 2000).

The family has a fundamental role in child and adolescent development (Rueger, Malecki, & Demaray, 2010; Steinberg, 2001; Toumbourou, 2001), namely in substance use (Skeer et al., 2011). Notably, emotional support, supervision, and communication between parents and adolescents are key elements for adolescent adjustment (Greeff & le Roux, 1999; Hunt et al., 2011).

Peer-group affiliation is particularly important and influential during adolescence (Sprinthall & Collins, 1999). Norms with respect to substance use and other behaviors are greatly influenced by peer group and close friends (Simons-Morton & Chen, 2009; Spijkerman, Van den Eijnden, Overbeek, & Engels, 2007).

Positive relationships with teachers and the classmates are important to social well-being and adjustment to school (Davidson, Gest, & Welsh, 2010; Samdal & Dür, 2000; Simões, 2007; Torsheim & Wold, 2001). Several studies show that the support and acceptance of classmates is positively related to well-being (Wenz-Gross, Siperstein, Untch, & Widaman, 1997) and negatively related to psychological symptoms (Torsheim & Wold, 2001). Moreover, good attachment with teachers who provide support, advice, and affection is important for well-being and school adjustment (Benard, 1995; Werner & Smith, 2001) and school connectedness discourages deviant behavior (Bonny, Britto, Klostermann, Hornung, & Slap, 2000) and fosters well-being (Matos et al., 2006). Good communication with parents, support from teachers and a good parents-school communication is also important for pupils' school adjustment and to low psychological symptoms (Matos, Dadds, & Barret, 2006). Sex and age are important contributions to the development of adolescent substance use (Grogan, Conner, Fry, Gough, & Higgins, 2009; Matos et al., 2006). In general, substance use prevalence is higher among boys than girls and higher among older than younger adolescents (Currie et al., 2008; Hibell et al., 2009) although there is evidence that the gender gap may be declining (Simons-Morton et al., 2009). Notably, girls may be more reactive to interpersonal conflicts with parents or peers compared with boys and this conflict is associated with increased risk for depressive symptoms (Rudolph & Hammen, 1999) and substance use (Kelly et al., 2011). Also, girls have more conflicts in peer relations, are more vulnerable to peers rejection (Oldenburg & Kems, 1997)(Coleman, 1985; Oldenburg & Kerns, 1997), and may be more susceptible to peer influence compared with boys (Carli,

1989; Mercken, Snijders, Steglich, Vertainen, & de Vries, 2010). The importance of peer relationships appears to vary during adolescence, and there is some evidence that peer effects are most important for positive behavior among younger adolescents and negative behavior among older adolescents (Coleman, 1985; Schaffer, 1994)(Schaffer, 1994; Settertobulte, 2000).

Ultimately, interactions between environmental and individual factors influence adolescent substance use (Igra & Irwin, 1996). The literature suggests that positive relations with family, peers, classmates and teachers may provide protective effects against substance use through their positive influence on well-being and school satisfaction. While attitudes are greatly influenced by social relationships they may also moderate the effect of relationships on substance (Beauvais & Oetting, 1999).

Considerations about social contexts and relationships among adolescent boys and girls were the bases for the development of a substance use explicative model. In an attempt to provide a “global picture”, rather than considering the various relationships separately, the model presented in this article was designed to establish connections between the social relationship variables and substance use and their mediation by individual intervening variables. The major contribution of this model is the integration of social and individual variables in one model, the description of their interconnections and how these variables impact on different types of substance use (namely tobacco, alcohol and illicit drugs use), as well as how these types of substances influence each other. Other studies (Simões, 2007) had already address these issues, but there is still a gap in research on how these factors act in younger adolescent's, as well as how the social, cultural and political factors associated to country ethos can be an influence in this scenario. According to this model, adolescents' social contexts and relationships impact on individual perceptions of well-being and school satisfaction, considered to be intervening factors, which, in turn, influence the outcome of interest, adolescent substance use.

Several factors, like gender and age moderate these relationships (Simões, 2007). Other aspects, namely the country, through the historical, cultural, social and economic aspects can also influence these associations. Portugal and Spain are two southern countries of Europe that share part of their history. There are therefore lots of similarities but some differences also occur such as several social and economic indicators, between both countries, that can be checked in the annual joined publication of the Portuguese and Spanish National Institutes of Statistics “The Iberian Peninsula in numbers” (INE, 2006, 2009). Within Portuguese and Spanish adolescents there are also similarities and differences namely in health related behaviors (Currie et al., 2008). The Health Behavior in School-aged Children (HBSC) show that for, 13 years old adolescents, there are no differences in weekly tobacco use between the Portuguese and Spanish, but there are differences in alcohol and cannabis use. Spanish girls reports more weekly alcohol use (7%) comparatively to the Portuguese girls (3%). There are no differences between boys in this indicator, but for drunkenness the Portuguese boys report higher involvement (8%) comparatively to the Spanish boys (5%). Life time cannabis use, at least once, is highest among Spanish adolescents (5% for boys, 4% for girls) comparatively to Portuguese adolescents (3% for boys, 1% for girls) (Matos et al., 2006; Moreno et al., 2008). There are other similarities and differences on HBSC health

indicators. For instance, 25% of the Portuguese and Spanish 13 year's old girls refer they like school a lot, while only 17% of the Spanish boys and 13% of the Portuguese boys refer it. For school performance, the perception of having a good or very good school performance is highest among Spanish comparatively to Portuguese adolescents (Currie et al., 2008). This fact is confirmed by the international PISA study (Baldi et al., 2007) that shows higher scores for Spanish students in science literacy comparatively to Portuguese students. Nevertheless, the perception of having classmates that are kind and helpful is highest among Portuguese adolescents (Currie et al., 2008). Other interesting example is health and life satisfaction perceptions that are higher in Spanish adolescents, and the health complaints, more than once a week, that are lower in Portuguese adolescents.

To assess the unique relationships of social context variables in Portuguese and Spanish adolescents, controlling these relationships by gender, analytic models were tested in four different groups of respondents: Portuguese boys, Spanish boys, Portuguese girls and Spanish girls of 13 years old. This age range was chosen because, according to recent studies, a significant number of adolescents initiate substance use at this age, namely into tobacco and alcohol use, as well as into drunkenness episodes (Currie et al., 2008; Hibell et al., 2009). Since the early use of tobacco and alcohol is a predictor of later tobacco, alcohol and illicit drugs use (Riala, Hakko, Isohanni, Jarvelin, & Rasanen, 2004; Vega, Chen, & Williams, 2007), it is important to know the factors associated to substance use at early ages to prevent the escalate and the negative consequences associated to it.

Specifically, we expected the following relationships: a) Family, friends (more precisely, an easy communication with parents and friends), classmates and teachers (positive relations) have a positive effect on subjective well-being and school satisfaction, and a negative effect on psychological symptoms; b) Psychological symptoms have a negative effect on subjective well-being and school satisfaction, and a positive effect on substance use (tobacco, alcohol and cannabis); c) School satisfaction has a positive effect on well-being and a negative effect on substance use; d) Subjective well-being has a negative effect on substance use; e) Tobacco use has a positive effect on alcohol and cannabis use; f) Alcohol use has a positive effect on cannabis use.

Methods

Participants

In this study data of 13-years-old Portuguese and Spanish adolescents were analysed, providing a sample of 1589 Portuguese students and 4191 Spanish students. Respondents were 12 to 14 years old (Portuguese sample mean age = 13.27, $SD = .59$; Spanish sample mean age = 13.21; $SD = .47$). Of these, 50.5% were boys and 49.5% were girls in the Portuguese sample, and 49.9% were boys and 50.1% were girls in the Spanish sample.

To obtain a representative sample of Portuguese students 11, 13 and 15 years old (according to the international HBSC protocol), 136 schools were randomly selected from the 1194 Portuguese state schools (stratified by the five continental regions, Madeira and the Azores not included) for the Portuguese sample. For the Spanish sample, 311 schools were selected with a random multi-stage sampling, stratified by conglomerates, bearing in mind - in

addition to the age of the adolescents, in the case of Spain covered until age 17-18- the geographical area (region of the country, using 19 strata corresponding to the 18 autonomous communities and autonomous cities, Ceuta and Melilla), habitat (rural and urban) and type of education center (public or private) from the 17953 Spanish schools. The basic sampling unit was the class. Therefore, for the Portuguese sample 296 classes were selected from the 6th (96 classes), 8th (102 classes) and 10th grades (98 classes), with a total of 7400 students (corresponding to 1.6% of all Portuguese students in the 2005/2006 school year in the selected grades). For the Spanish sample 714 classes were selected from the 11-12 years (180 classes), 13-14 years (186 classes) 15-16 years (184 classes) and 17-18 years (164 classes), with a total of 22000 students (corresponding to 1% of all Spanish students in the 2005/2006 school year in the selected grades).

The school response rate was 92% (87% for classes and students) for the Portuguese sample and 88% (82% for classes and students) for the Spanish sample. The final Portuguese sample included 4877 subjects and the final Spanish sample included 21811 subjects from 11 to 17 years old. For this study only 13 years old subjects were selected for the analysis (1589 Portuguese students and 4191 Spanish students).

The research project was submitted and approved by several national organizations (Ministry of Education, National Data Protection Commission and Ethics Commission in Portugal, and Ministry of Health, Social Affairs and Equal -Department of Public Health- and Ethics Commission of the University of Seville in Spain).

Measures

Data were analysed from surveys conducted in Portugal and Spain as part of the Health Behavior in School Children Study (HBSC) (Currie, Smith, Boyce, & Smith, 2001; Matos et al., 2006; Moreno et al., 2008). The survey instrument used in the HBSC study is a standard questionnaire developed by the international research network. The questionnaire consists of a set of mandatory questions that each participant country or region must use to facilitate the collection of a common data set. It is based on a strong conceptual framework and includes a coherent set of indicators of the social and individual determinants of health, as well as of health and behavioral outcomes (Currie et al., 2004). The main HBSC survey included questions on demographics (age, gender, and socio-demographics), school-related variables, tobacco and alcohol use, physical activity and leisure, nutrition, safety, psychosocial health aspects, general health symptoms, social relations and social support. For the present study 23 variables that operationalize the 10 underlying factors (family, friends, classmates, teachers, psychological symptoms, subjective well-being, school satisfaction, tobacco, alcohol and illicit drugs consumption) were selected. The family factor has two indicators: *father/ mother communication* (1 = don't have or see this person; 2 = very difficult; 3 = difficult; 4 = easy; 5 = very easy). The friends' factor has two indicators: *same gender friends/ opposite gender friends' communication* (1 = don't have or see this person; 2 = very difficult; 3 = difficult; 4 = easy; 5 = very easy). The classmates' factor has three indicators: *enjoy being together, are kind and helpful, accept me as I am* (1 = strongly disagree; 2 = disagree; 3 = neither agree nor disagree; 4 = agree; 5 = strongly agree). The teachers factor has three indicators: *treat us fairly, help when I need, are interested in me as person* (1 =

strongly disagree; 2 = disagree; 3 = neither agree or disagree; 4 = agree; 5 = strongly agree). The psychological symptoms factor has three indicators: feeling low, irritability or bad temper, feeling nervous (1 = rarely or never; 2 = about every month; 3 = about every week; 4 = more than once a week; 5 = about every day). The subjective well-being factor has two indicators: *health* (1 = poor; 2 = fair; 3 = good; 4 = excellent); and *life satisfaction* (0 = worst possible life; 10 = best possible life). The school satisfaction factor has two indicators: *feel about school* (1 = don't like it at all; 2 = don't like very much; 3 = I like a bit; 4 = I like a lot) and *academic achievement* (1 = very good; 2 = good; 3 = average; 4 = below average). The tobacco use factor has one indicator: *tobacco use frequency* (1 = I do not smoke; 2 = less than once a week; 3 = at least once a week; 4 = every day). The alcohol use factor has three indicators: *beer and spirits consumption* (1 = never; 2 = rarely; 3 = every month; 4 = every week; 5 = every day) and *been drunk* (1 = never; 2 = once; 3 = 2-3 times; 4 = 4-10 times; 5 = more than 10 times). The cannabis use factor has two indicators: *cannabis life time and cannabis last 12 months* (1 = never; 2 = 1-2 times; 3 = 3-5 times; 4 = 6-9 times; 5 = 10-19 times; 6 = 20-39 times; 7 = 40 times or more).

Procedure

The HBSC survey is a collaborative WHO study (Currie et al., 2001) that involves 41 countries in Europe and North America. The first cross-national survey was conducted in 1983/84, the second in 1985/86 and since then data collection has been carried out every four years using a common research protocol (Currie et al., 2008). The data used in this study are from the Portuguese and Spanish HBSC 2006 study (Matos et al., 2006; Moreno et al., 2008). Data were collected through anonymous self-completion questionnaires administered at schools. According to the international protocol, the countries use one of the two administration procedures: administration by the teacher or administration by researchers (Currie et al., 2004). In Portugal, the questionnaires were administered in the classroom under the supervision of the teacher. The teacher received a letter, to be read at loud for the students, with the aim of the study and the administration procedures. In Spain, the questionnaires were administered in the classroom by a team trained by the researchers to collect the data. The aim of the study and the administration procedures were introduced to the students by the members of the team. The questionnaires took about 60 minutes to be filled [detailed information about the survey procedures can be found in Roberts, Tynjälä, Currie, and King (2004), or in the national report of each country: Portugal – Matos et al. (2006); Spain - Moreno et al.(2008).

Data Analyses

Structural Equations Modelling, EQS *Structural Equation Modelling Software* (Bentler, 1995), was used to analyse the proposed model. Variables were transformed to continuous variables through *optimal scaling*¹. However, since our transformed variables violate the multivariate normality assumption robust estimation was used for all analysis.

¹*Optimal scaling* is a procedure that attaches optimal quantifications to the arbitrary original ordinal values, while it analyses the relationships among the observable variables to produce the factor scores (Batista-Foguet, Fortiana, Currie, & Villalbí, 2004). Since the indicators in our study are ordinal, it is appropriate to submit them to optimal scaling before using linear relationship analysis techniques such as Structural Equations Modelling (Batista-Foguet, et al., 2004; Simões, Batista-Foguet, Matos, & Calmeiro, 2008).

The analysis first tested the measurement models and then the structural relationships between the factors. So, three confirmatory factorial analysis (CFA) were conducted prior to testing the three proposed measurement models, each of which included the following: the “exogenous latent factors model” that tested the measurement quality of independent latent variables (family, friends, classmates and teachers); the “intervening latent factors model” that tested the measurement quality of mediator variables (psychological symptoms, subjective well-being and school satisfaction); and the “final endogenous latent factors model” that tested the measurement quality of dependent consumption variables (tobacco, alcohol and cannabis use).

Making comparisons between countries based on the usage of questionnaires requires a step frequently omitted: prior to computing and interpreting any result of a cross-cultural comparison, it is crucial to assess the degree to which the measured constructs (operationalized through the items) have the same meaning for the respondents of the different groups to be compared which is known by different terms such as factorial invariance, factorial equivalence, measurement equivalence, and *construct comparability* (Little, 1997; Meredith, 1993). The level of equivalence that could be established will determine which inferences can be made, and especially whether we are entitled to conduct the intended group comparison (Sánchez-García & Batista-Foguet, 2008). Failure to conduct such an analysis means that observed differences in the distribution of the underlying dimensions among groups may be attributable to different meanings attached to those factors. Factorial invariance must therefore be checked in any analysis with multiple groups. However, it is particularly vital in cross-cultural research (as in our case) for evaluating whether or not data of different countries can be taken as equivalent, given that there are reasons to believe that certain evaluations or perceptions are structured differently - not just because the various groups receive translated versions of questionnaires (Batista-Foguet, Boyatzis, Guillen, & Serlavos, 2008).

After testing the measurement models and their factorial invariance for the Portuguese and Spanish samples, we conducted a multi-group analysis between the groups defined by country and gender (Portuguese boys vs. Spanish boys; Portuguese girls vs. Spanish girls). These multi-group comparisons enabled tests of the effect of exogenous categorical variables such as country, controlling for gender, in structural equations models (Batista-Foguet, Coenders, & Ferragud, 2001).

Results

Between Countries Comparison

The equivalence of measures can be established through sequential steps in nested multi-group mean and covariance structure models that can determine the extent to which constructs can be compared across groups. The first requirements known as *configural and metric invariance* assure that the composition of factors is constant, that the weight of each item in the factor construction can be considered to be equal as well as the measurement units (See Batista-Foguet et al, 2008, for a more detailed nonmathematical explanation).

The analysis of each measurement model for the Portuguese and Spanish samples showed good fit indices ($CFI > .97$; $RMSEA < .05$) with all factors loadings above .45. The results of invariance analysis, between the Portuguese and Spanish samples, showed that the CFI difference between the unconstrained and constrained models, for independent and intervening measurement models, allows the assumption of invariance between the two samples ($CFI = .01$) for these measurement models (Cheung & Rensvold, 2000). For the final dependent factors model just *partial factorial invariance* has been fulfilled which is sufficient to anchor a common meaning to the factors between groups (Billiet, Cambré, & Welkenhuysen-Gybels, 2002). After this step, the global model was tested (structural model). The fit indices held in the analysis for the global model were good [for the Portuguese sample: Satorra-Bentler $\chi^2(200) = 333.89$, $p < .001$; $CFI = .92$; $RMSEA = .024$ (.019/.028); for the Spanish sample: Satorra-Bentler $\chi^2(200) = 340.73$, $p < .001$; $CFI = .97$; $RMSEA = .020$ (.017/.024)]. The results of invariance analysis showed that the global model is invariant ($DCFI \leq .01$) between the two samples. The factor loadings of the indicators of each factor and the explained variance are present in Table 1. The standardized solution for each sample, with beta coefficients, is shown in Figure 1.

As it is possible to see, social contexts (exogenous factors) present a significant impact on the intervening factors. In the Portuguese sample, family communication ($\beta = -.25$), friends ($\beta = .10$) and classmates ($\beta = -.25$) had a significant effect on psychological symptoms. The effect of teachers ($\beta = -.08$) on psychological symptoms wasn't significant. Family ($\beta = .35$), psychological symptoms ($\beta = -.35$), and school satisfaction ($\beta = .53$) present the greatest effect on subjective well-being. The effect of friends ($\beta = .03$), teachers ($\beta = .00$), and in this case, also classmates ($\beta = .09$) wasn't significant on subjective well-being. For school satisfaction, teachers present the greatest significant effect on school satisfaction in the Portuguese sample ($\beta = .28$) followed by the family ($\beta = .13$). For the Spanish sample, family ($\beta = -.23$) and classmates ($\beta = -.22$) had a significant effect on psychological symptoms. The effect of teachers ($\beta = -.06$) and friends ($\beta = .02$) on psychological symptoms wasn't significant. Family ($\beta = .22$), classmates ($\beta = .28$), teachers ($\beta = .09$), psychological symptoms ($\beta = -.26$), and school satisfaction ($\beta = .27$) present a significant effect on subjective well-being. Again, the effect of friends ($\beta = .03$) wasn't significant on subjective well-being. For school satisfaction, teachers present the greatest significant effect on school satisfaction in the Spanish sample ($\beta = .55$) followed by psychological symptoms ($\beta = -.24$), classmates ($\beta = -.08$) and family ($\beta = .07$). The effect of friends on school satisfaction wasn't significant.

The intervening factors had a significant direct effect on substance use. For the Portuguese sample, subjective well-being had a significant effect on alcohol use ($\beta = .48$) and on cannabis use ($\beta = .20$). The effect of subjective well-being on tobacco use wasn't significant. Psychological symptoms had a similar effect on substance use, that means, a significant effect on alcohol use ($\beta = .26$) and on cannabis use ($\beta = .19$), however its effect on tobacco use wasn't significant. Finally school satisfaction present also a significant direct effect on substance use, but only on tobacco use ($\beta = -.36$) and alcohol use ($\beta = -.45$). For the Spanish sample, subjective well-being had a small significant effect on alcohol use ($\beta = .08$). The effects of subjective well-being on tobacco use ($\beta = -.03$) and on cannabis use ($\beta = .03$)

were not significant. Psychological symptoms had a similar effect on substance use, that means, a significant small effect on alcohol use ($\beta = .08$), yet its effect on tobacco use ($\beta = .07$) and on cannabis use ($\beta = -.02$) wasn't significant. Finally, school satisfaction presents also a significant direct effect on substance use, but, as it happens with the Portuguese sample, only on tobacco use ($\beta = -.25$) and alcohol use ($\beta = -.36$).

For the endogenous factors, in the Portuguese sample, alcohol use presents the greatest effect on cannabis use ($\beta = .54$). The effect of tobacco on cannabis use wasn't significant ($\beta = .05$). Tobacco use had one of the greatest effects on alcohol use ($\beta = .40$). In the Spanish sample, tobacco use presents the greatest effect on cannabis use ($\beta = .38$) followed by alcohol use ($\beta = .23$). For alcohol use, the factor with great effect was tobacco use ($\beta = .49$).

The explained variance of the relationships shown in Figure 1 for the intervening factors, in the Portuguese sample, ranged from 13% to 78%. Family, friends, classmates, and teachers' factors explained 17% of the variance in psychological symptoms, 78% of the variance in subjective well-being and 13% of the variance in school satisfaction. For the endogenous factors, the explained variance was 9% for tobacco, and 32% for alcohol and cannabis use. For the Spanish sample, the variance explained for the intervening factors ranged from 15% to 58%. Family, friends, classmates, and teachers' factors explained 15% of the variance in psychological symptoms, 58% of the variance in subjective well-being and 42% of the variance in school satisfaction. For the endogenous factors, the explained variance was 9% for tobacco, 46% for alcohol and 31% for cannabis use.

The moderate effect of country and gender

As it was done in the previous section, factorial invariance was tested in different groups: Portuguese boys, Spanish boys, Portuguese girls and Spanish girls. The analyses do not reject configurational and metric invariance in the exogenous and intervening measurement models between Portuguese boys and Spanish boys groups, as well as between Portuguese girls and Spanish girls (see Table 2). Nevertheless, in the endogenous measurement model invariance was found only in the Portuguese boys and Spanish boys comparison. Even so, as was justified by Byrne, Shavelson, and Muthén (1989, cit. in Billiet et al., 2002) the comparisons between the structural part of the model were undertaken for the all groups.

The Table 3 presents the factor loadings for the four groups in each factor. In general, all factor loadings are above .40. The factor loading of "health" indicator (subjective well-being factor) was the lowest in all groups.

Interactions effects

Two analyses were run to test the structural part of the model between Portuguese (Pt) and Spanish (Sp) adolescents (controlling for gender): one between Portuguese and Spanish boys and the other between Portuguese and Spanish girls. Group comparisons indicated that the model is not invariant ($DCFI > .01$) in the two comparisons (see Table 4 for fit indices of unconstrained and constrained models for each of the comparisons). In the comparison between Portuguese boys and Spanish boys the CFI difference between constrained and unconstrained model was slightly larger than .01 ($DCFI < .011$), and in the comparison between Portuguese girls and Spanish girls the CFI difference was .027. In this case the

relevant parameters (paths between factors) that were non-invariant in the two comparisons are shown in Table 5.

For the comparison between Portuguese and Spanish boys, shown in Table 5, two paths were non-invariant, namely the path between family and well-being and the path between teachers and school. The positive effect of family on well-being was greater for the Portuguese boys ($B = .14$ for Portuguese boys, $B = .09$ for the Spanish boys) and the effect of teachers on school was greater for the Spanish boys ($B = .41$ for Spanish boys vs. $B = .14$ for Portuguese boys). This strategy allow us to find out some interaction of our independent variables with country and gender, for instance, the positive effect of family on well-being is significant but it is higher in Portugal than in Spain for boys.

For the comparison between Portuguese and Spanish girls four paths were non-invariant, specifically the paths between: teachers and school; psychological symptoms and well-being; tobacco and cannabis; and alcohol and cannabis. The effect of teachers on school was significant for both samples, but it was greater for the Spanish girls ($B = .55$ for Spanish girls, $B = .34$ for Portuguese girls) as it was for the Spanish boys. The significant negative effect of psychological symptoms on well-being was greater for the Portuguese girls ($B = -.24$ for Portuguese girls, $B = -.13$ for Spanish girls). The positive effect of tobacco on cannabis was significant only for Spanish girls ($B = .02$ for Portuguese girls, $B = .18$ for the Spanish girls), as well as the effect of alcohol on cannabis ($B = .04$ for Portuguese girls, $B = .51$ for the Spanish girls). Again, this allows us to find out some interaction of our independent variables with country.

Discussion

The results of this study show that the proposed model is adequate to explain the relations between social and psychological variables in study and substance use in adolescence and those variables like country and gender are important features in this field.

The majority of the relationships proposed in the model had revealed as expected for both samples. Family had a positive effect on subjective well-being and school satisfaction and a negative effect on psychological symptoms, and the same happens with classmates, except for his effect on subjective well-being and school satisfaction, that was only significant in the Spanish sample. Teachers had only a significant effect on school satisfaction, for both samples, and on subjective well-being in the Spanish sample. The effect of teachers on psychological symptoms wasn't significant as well as the impact of friends on subjective well-being and on school satisfaction in both samples. Friends had only a significant effect on psychological symptoms, in the Portuguese sample, and against the expectation, it was a positive effect. As expected, psychological symptoms had a negative effect on subjective well-being, in both samples, and on school satisfaction (only in the Spanish sample). On the other side, the positive effect of psychological symptoms on alcohol was verified for both samples and in the Portuguese sample for cannabis. The effect of psychological symptoms on tobacco wasn't significant for both samples. Against the expectations, subjective well-being had a positive effect on alcohol use, for both samples, and on cannabis use for the Portuguese sample. The effect of subjective well-being on tobacco wasn't significant for

both samples, as it had happen with psychological symptoms. School satisfaction has a positive effect on well-being for both samples, as it was expected, and a negative effect on substance use, but only for tobacco and alcohol. The effect of school satisfaction on cannabis wasn't significant in both samples. Tobacco use had a positive effect on alcohol and cannabis use, but its effect on cannabis use was only significant in Spanish sample. For alcohol use, as expected, a positive effect on cannabis use was verified in both samples.

The relationships between substance use and family, classmates, and teachers appeared to be work mainly through their association with intervening factors, suggesting the importance of social relationships (Dorfman et al., 2010; Huver et al., 2007; Mason, 2010; Pattussi, Moyses, Junges, & Sheiham, 2006). Consistent with other findings (Greeff & le Roux, 1999; Hunt et al., 2011), the relationships between family and classmates with substance use were mainly through their negative associations with psychological symptoms and positive associations with subjective well-being. Teacher's contribution to substance use was through association with school satisfaction, as found previously other researchers (Davidson et al., 2010; Samdal & Dür, 2000). The effect of friends on substance use appears to be only through psychological symptoms for the Portuguese sample. For the Spanish sample, friends had no significant effect on substance use through the intervening factors. This result can be due to the fact that this factor is related only to friends' communication. One important factor for substance use is the association with peers that use substances (Stanton et al., 2002; Swaim, Bates, & Chavez, 1998) and this aspect wasn't evaluated in this study.

Our finding that the variable psychological symptoms was positively associated with alcohol use, in both samples, and with cannabis in the Portuguese sample, is consistent with the notion that adolescents may sometimes use substances for relief from psychological symptoms (Matos, Gaspar, Vitória, & Clemente, 2003; Simantov et al., 2000; Simões, 2007; Whalen, Jamner, Henker, & Delfino, 2001). However, the significant positive association between well-being with these substances, especially in the Portuguese sample, suggests that these substances may be used also to have fun and not only to cope with negative symptoms (Braconnier & Marcelli, 2000; Simões, 2007). School satisfaction was negatively associated but only with tobacco and alcohol use, consistent with other research suggesting that school can be protective against substance use (Samdal, 1998; Simões, 2007).

The findings that tobacco and alcohol use were highly associated between each other and with illicit drugs use has been shown in other studies (Ariza Cardenal & Nebot Adell, 2000; Kandel, 1998; Sells & Blum, 1996; Vega et al., 2007). Generally speaking, it seems that tobacco and alcohol use are important factors in cannabis use for Portuguese and Spanish adolescents, but possibly the expectations about their effects on mood seems to play also an important role in this behavior for Portuguese adolescents.

Subgroup analyses showed that the variables country and gender moderate the relationships among the variables in study. Notably, the association between teachers and school was the only one that was significantly different in both country comparisons (significant for boys and girls). The association between teachers and school satisfaction was found to be greater in Spanish adolescents comparatively to Portuguese adolescents. Probably, the figure of the tutor in the school, that is an important figure in the Spanish educative system, and with

whom the student spend several hours a week, included in the curriculum, contribute to the closeness between teacher and students and to the strong impact of teachers in school satisfaction in Spanish sample. The report “The Iberian Peninsula in numbers” show that Portugal expends more on education than Spain and the ratio teacher's students is higher in Spain. This findings corroborate previous results and worries from the Portuguese educational system (Matos et al., 2008) and indeed from 2006 on several governmental measures were took in order to increase pupils academic achievement, namely the development of a National agency for quality improvement in education (ANQ, 2010). On the other side, the association between family and subjective well-being was greater for Portuguese boys comparatively to Spanish boys. In the comparison between Portuguese and Spanish, beside the association between teachers and school, other paths were significantly different, namely the association between psychological symptoms and well-being that was greater in the Portuguese girls, as well as, the associations between tobacco and cannabis and alcohol and cannabis that were greater in Spanish girls comparatively to Portuguese girls. Again the reasons for these differences between countries are not straight, but some social and economic factors may contribute, namely the cost of substances, like tobacco and alcohol, that is higher in Portugal (where severe measures against tobacco were took in the last couple of years, INE, 2006), and the fact that Spanish girls refer more frequently (34%) to go out with friends four or more times a week comparatively to Portuguese girls (5%) (Currie et al., 2008). Also some social activities, like the “Botellón”, a Spanish phenomenon, that involve alcohol consumption by youth in public areas (Cortes Tomas, Espejo Tort, Martin del Rio, & Gomez Iniguez, 2010; Llorens, Barrio, Sanchez, & Suelves, 2011), may contribute to these differences. As Llorens et al. (2011) refer, socialization in leisure situations with friends who drink excessively was an important predictor of adolescent excessive drinking for Spanish adolescents. Other substances, like cannabis are also available in these youth concentrations. Years ago cannabis was more difficult to obtain and was associated with a higher perception of risk. However, nowadays it is more accessible and, moreover, it is used in a social interaction normative context. Nevertheless, it must be said that the high prevalence of cannabis use among Spanish adolescents focuses essentially on experimental use.

The findings should be interpreted within the limitations of the study, which include its cross-sectional design, the potential error or bias from self-report and the differences in samples sizes. Notwithstanding these limitations, this study used a large sample of adolescents and the sampling procedures helped to ensure a nationally representative sample.

Nevertheless, according to these results, several features seem important in prevention field that were already highlighted in previous work (Simões, 2007; Simões, Batista-Foguet, Matos, & Calmeiro, 2008), namely early intervention and the promotion of protective factors for substance use in main life contexts. It is known that previous behavior sets up one of the main determinants of future behavior, and that tobacco and alcohol consumption frames an important risk factor for consuming illicit drugs, as this study also point out. Today it is well known that protection, like risk, occurs in diverse contexts (Gilvarry, 2000; Lerner & Galambos, 1998). As this study shows, engaging key elements in main life contexts, namely parents, teachers and classmates is extremely important, due to their

significant role in well-being and school satisfaction. Future studies should invest in longitudinal designs to establish causal-effect relations between the variables in study. It seems also important to evaluate other aspects mentioned in literature as key elements in substance use in adolescence, namely parental support and supervision, and peers substance use attitudes and behaviors.

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Figure 1.

Substance use explanatory model: Comparison between Portuguese sample (*beta* coefficients at top) and Spanish sample (*beta* coefficients at bottom). *Note:* Only main effects are exhibited * $p < .05$

Table 1

Factor loadings (λ) and explained variance (R^2) of the indicators of the ten factors in the model for each country

Factor	Indicator	Pt Sample		Sp Sample	
		λ	R^2	λ	R^2
Family	Father communication	.774	.599	.764	.583
	Mother communication	.651	.423	.695	.482
Friends	Same gender friends communication	.588	.345	.845	.714
	Opposite gender friends communication	.869	.756	.774	.599
Classmates	Enjoy being together	.493	.243	.737	.543
	Are kind and helpful	.756	.572	.611	.374
	Accept me as I am	.630	.397	.586	.343
Teachers	Teacher treat students fairly	.582	.338	.661	.437
	Help when I need	.686	.470	.708	.501
	Are interested in me as person	.678	.459	.710	.504
Psychological symptoms	Feeling low	.712	.506	.721	.520
	Irritability or bad temper	.741	.549	.764	.583
	Nervous	.613	.376	.678	.460
Subjective well-being	Health	.422	.178	.474	.225
	Life satisfaction	.637	.406	.723	.522
School	Feel about school	.521	.272	.569	.324
	School achievement	.533	.285	.634	.401
Tobacco	Frequency	1.000	1.000	1.000	1.000
Alcohol	Beer consumption	.901	.812	.526	.277
	Spirits consumption	.763	.582	.763	.582
	Been drunk	.719	.518	.764	.584
Cannabis	Cannabis life time and	1.000	1.000	.956	.914
	Cannabis last 12 months	.867	.752	.970	.942

Note: Pt (Portuguese); Sp (Spanish)

Table 2

Measurement models fit indexes for the four groups (two by two comparisons)

Measurement Model		CFI ¹	χ^2 (df) ²	RMSEA (90% C.I.) ¹
Pt Boys – Sp Boys				
Independent	Unconstrained	1.000	51.36 (58)	.000 (.000-.015)
	Constrained	.991	86.74* (64)	.019 (.006-.028)
Intervening	Unconstrained	.979	69.36*** (22)	.034 (.024-.044)
	Constrained	.978	68.72*** (26)	.038 (.028-.049)
Dependent	Unconstrained	.979	23.60 (17)	.019 (.000-.036)
	Constrained	.973	22.53 (14)	.024 (.000-.042)
Pt Girls – Sp Girls				
Independent	Unconstrained	.977	107.49*** (58)	.028 (.019-.035)
	Constrained	.970	127.85*** (64)	.030 (.022-.037)
Intervening	Unconstrained	.978	82.43*** (22)	.043 (.033-.053)
	Constrained	.978	85.92*** (26)	.039 (.030-.048)
Dependent	Unconstrained	.989	16.42 (14)	.012 (.000-.032)
	Constrained	.956	26.79 (17)	.022 (.000-.038)

** $p < .01$

Pt (Portuguese); Sp (Spanish)

¹ Robust² Scaled Chi-Square* $p < .05$ *** $p < .001$.

Table 3Factor loadings (λ) of the indicators of the ten factors in the model for each of the four groups

Factor	Indicator	Pt Boys λ	Sp Boys λ	Pt Girls λ	Sp Girls λ
Family	Father communication	.860	.805	.591	.608
	Mother communication	.620	.706	.799	.727
Friends	Same gender friends communication	.665	.724	.572	.609
	Opposite gender friends communication	.921	.601	.699	.984
Classmates	Enjoy being together	.459	.696	.550	.767
	Are kind and helpful	.776	.598	.886	.580
	Accept me as I am	.608	.535	.515	.542
Teachers	Teacher treat students fairly	.635	.645	.541	.629
	Help when I need	.727	.745	.635	.731
	Are interested in me as person	.677	.692	.634	.714
Psychological symptoms	Feeling low	.613	.705	.737	.689
	Irritability or bad temper	.747	.732	.673	.722
	Nervous	.670	.661	.544	.624
Subjective well-being	Health	.432	.465	.482	.473
	Life satisfaction	.546	.695	.673	.754
School	Feel about school	.412	.502	.522	.562
	School achievement	.496	.602	.537	.596
Tobacco	Frequency	1.000	1.000	1.000	1.000
Alcohol	Beer consumption	.925	.663	.920	.491
	Spirits consumption	.890	.700	.638	.737
	Been drunk	.759	.722	.616	.820
Cannabis	Cannabis life time and	1.000	.974	1.000	.987
	Cannabis last 12 months	.902	.950	.929	.987

Note: Pt (Portuguese); Sp (Spanish)

Table 4

Fit indexes for the structural model for the groups (two by two comparisons)

Comparison	Groups	CFI ¹	χ^2 (df) ²	RMSEA (90% C.I.) ¹
Country	Pt Boys-Sp Boys			
	Unconstrained	.950	602.15 *** (396)	.024 (.020-.028)
	Constrained	.939	659.58 *** (423)	.025 (.021-.028)
Country	Pt Girls-Sp Girls			
	Unconstrained	.957	584.61 *** (396)	.022 (.018-.025)
	Constrained	.930	728.53 *** (423)	.027 (.023-.030)

* $p < .05$ ** $p < .01$

Pt (Portuguese); Sp (Spanish)

¹ Robust² Scaled Chi-Square (Satorra-Bentler)***
 $p < .001$.

Table 5

Different paths (non-invariant) in country comparisons, controlling for gender

Comparison	Groups	Path	χ^2	<i>B</i>	
				Pt	Sp
Country	Pt Boys	Teachers – School	13.39***	.14*	.41*
	Sp Boys	Family – Well-being	4.60*	.14*	.09*
Country	Pt Girls	Tobacco – Cannabis	15.53***	.02	.18*
	Sp Girls	Teachers – School	10.28**	.34*	.55*
		Symptoms – Well-Being	5.65*	-.24*	-.13*
		Alcohol – Cannabis	13.70***	.04	.51*

B = Non-standardized

Pt (Portuguese); Sp (Spanish)

*
 $p < .05$ **
 $p < .01$ ***
 $p < .001$