The impact of social influence on adolescent intention to smoke: Combining types and referents of influence

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Objectives. Theory and research suggest that the intention to smoke is the main determinant of smoking initiation and emphasizes the role of cognitive and social factors on the prediction of the intention to smoke. However, extended models such as the I-Change and results from published studies reveal inconsistencies regarding the impact of social influence on the intention to smoke. Possible explanations for this may be the definition and measurement of the constructs that have been used.

Design and methods. The current study was designed with two main goals: (i) to test a measurement model for social influence, combining different types of social influence (subjective norms, perceived behaviour, and direct pressure) with various referents of influence (parents, siblings, peers, and teachers); (ii) to investigate the impact of social influence on adolescent intention to smoke, controlling for smoking behaviour. LISREL was used to test these models. The sample includes 3,064 Portuguese adolescents, with a mean age of 13.5 years, at the beginning of the seventh school grade.

Results. The hypothesized measurement model of social influence was supported by results and explained 29% of the variance of the intention to smoke. A more extended model, including attitude and self-efficacy, explained 55% of the variance of the intention to smoke. Perceived behaviour of peers, parental norms, and perceived behaviour of parents were the social influence factors with impact on adolescent intention to smoke.

Conclusions. Results suggest that different referents exert their influence through distinct types of social influence and recommend further work on the definition and measurement of social influence.

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Smoking is the single most important preventable cause of morbidity and mortality in developed countries (World Health Organisation, 1997, 1999). Worldwide, deaths attributable to tobacco are near 5 million (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). In Portugal, between 1950 and 2000, about 2,00,000 deaths are attributed to smoking, and nowadays more than 8,000 deaths per year are caused by tobacco, half of them in middle age (Peto, Watt, & Boreham, 2006). During the last 10 years, Portuguese overall smoking prevalence has been decreasing (from 29 to 24%, European Commission, 2003, 2007), as has the prevalence of tobacco ‘ever smokers’ and ‘daily smokers’ among Portuguese adolescents (8.5-5.0%, Matos et al., 2006). In spite of these positive trends, smoking figures in Portugal are still high and the consequences of smoking remain severe, underlining the need for more research to improve knowledge and control of this very harmful behaviour.

An important objective for controlling tobacco use and damage is to promote effective smoking prevention programmes. This implies to reach youth early in their adolescence since more than 90% of smokers had their first puff during adolescence and the peak of initiation is between 11 and 15 years (e.g. Azevedo, Machado, & Barros, 1999; Santos & Barros, 2004; US Department of Health and Human Services, 1994). These findings are supported by the results of recent studies claiming that adolescents felt the first symptoms of dependence after just a few cigarettes and before smoking regularly (Colby, Tiffany, Shiffman, & Niaura, 2000; DiFranza et al., 2000, 2002). Consequently, prevention activities should reach adolescents before smoking initiation.

Several studies suggest that youngsters start to take up smoking because of direct pressure exerted by others (e.g. Evans et al., 1976, 1978; US Department of Health and Human Services, 1994). Although, other sources of influence are recognized (e.g. parents and mass media), Evans’ work resulted in a major emphasis on the direct role of peer pressure as the main determinant of smoking onset, combined with the adolescents’ inability to refuse cigarettes (Evans et al., 1978, 1988). At the same time, Bandura (1977, 1986) proposed that social influence could also have an indirect effect on youth when exposed to the behaviour of others (mere exposure) and/or by observing the positive outcomes of behaviour acquired by others (vicarious learning). Furthermore, several studies outlines the importance of parental behaviour (e.g. Bricker, Peterson, Leroux et al., 2006; Bricker, Peterson, Sarason, Andersen, & Rajan, 2007; Engels, Knibbe, De Vries, Drop, & Van Breukelen, 1999; O’Loughlin, Paradis, Renaud, & Gomez, 1998), and sibling behaviour as determinants for adolescent smoking initiation (Bricker et al., 2006; Rajan et al., 2003; Slomkowski, Rende, Novak, Lloyd-Richardson, & Niaura, 2005), and some research suggests that teachers could also play a role in this process (Barnett et al., 2007; Bente, Torsheim, Currie, & Roberts, 2004; Bewley, Johnson, & Banks, 1979; Wold, Torsheim, Currie, & Roberts, 2004).

The theory of planned behaviour (TPB; Ajzen, 1988, 1991; Ajzen & Madden, 1986), an extension of the theory of reasoned action (TRA; Fishbein & Ajzen, 1975), is the most applied model in studies on health-related behaviours (e.g. Armitage & Conner, 2001; Rivis & Sheeran, 2003). This theory explicitly acknowledges social influence, via subjective norm, as a proximal predictor of intention, and behaviour, as well as attitude towards the behaviour and perceived behavioural control (Ajzen, 1988, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). However, the theoretically predicted role of social influence as a main determinant of intention, and behaviour is not clearly confirmed by published research on health-related behaviours (e.g. Armitage & Conner, 2001). This inconsistency between theory propositions and research results
suggests the need of an extension of the social influence component of the TPB. Direct pressure, the concept proposed by Evans to explain smoking onset (Evans, 1976) and modelling, a central concept in the social learning theory (Bandura, 1977, 1986), were not included in TPB. Namely, the unique contribution of direct pressure, and modelling (perceived behaviour of important others or descriptive norms) was demonstrated in an elaboration of the TRA, the ASE-Model (De Vries, Backbier, Kok, & Dijkstra, 1995), and its successor the Integrated Model of Behaviour Change or the I-Change model (De Vries, Mudde et al., 2003; Holm, Kremers, & De Vries, 2003; Vitoria, Kremer, Mudde, Pais Clemente, & De Vries, 2006). More examples found in literature of efforts to expand the social influence component of TPB were moral norms (Godin, Conner, & Sheeran, 2005), social support (Rhodes, Jones, & Courneya, 2002), self-identity (Hagger & Chatzisarantis, 2006), and prototype perceptions (Gibbons, Gerrard, & Lane, 2003). Among these approaches two main streams emerge: one more focused on normative processes (e.g. Subjective norms and descriptive norms) and other more focused on direct interpersonal processes (e.g. Direct pressure and social support).

All the above-referred theories agree on one point: a significant part of human behaviour can be predicted from the intention to perform it and, furthermore, intention mediates influence on behaviour from other proximal variables (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Results of many studies have supported this claim (e.g. Armitage & Conner, 2001). A recent meta-analysis concluded that a medium-to-large change in intention leads to a small-to-medium change in behaviour (Webb & Sheeran, 2006). This result indicates that the impact of intention on behaviour is not as big as previous meta-analyses based on correlational studies have concluded but, on the other hand, confirms that intention continues to be the main predictor of behaviour. Intention to smoke was also empirically confirmed in many studies as the main predictor of adolescent smoking behaviour (e.g. Andrews, Tildesley, Hops, Duncan, & Severson, 2003; Choi, Gilpin, Farkas, & Pierce, 2001; Vitoria et al., 2006; Wakefield et al., 2004). Considering these results and the need to address youth with smoking prevention activities during early adolescence, preferentially before the first experiences with tobacco, the intention to smoke should play a central role in any work aimed to prevent smoking initiation and to improve the results of smoking prevention programmes.

As referred before, the expected role of social influence as a main determinant of smoking onset has not been confirmed by published research. Moreover, the role of important referents has been also inconsistent. Peer influence was considered the best predictor of adolescent smoking initiation in many studies (e.g. Conrad, Flay, & Hill, 1992; Kobus, 2003; Tyas & Pederson, 1998), but the results of recent research suggest that family members, mainly parents but also siblings, may have an important influence on adolescent smoking behaviour, particularly in early adolescence (e.g. Bricker, Peterson, Andersen et al., 2006, Bricker, Peterson, Leroux et al., 2006; De Vries, Engels, Kremer, Wetzels, & Mudde, 2003; McMillan, Higgins, & Conner, 2005; Nebot, Tomás, Ariza, Valmayor, & Mudde, 2002; Nebot et al., 2004; Rajan et al., 2003). These conflicting research results may be caused by inconsistencies in the conceptualization of social influence, the operationalization, and measurement of social influence concepts, the statistical approaches adopted in the investigation and differences in the age of the study sample (e.g. Avnevoli & Merikangas, 2003; De Vries, Candel, Engels, & Mercien, 2006; De Vries, Engels et al., 2003; Hagger & Chatzisarantis, 2005; Kobus, 2003; McMillan et al., 2005).
The purpose of the current study was to further analyse the role and impact of social influence on adolescent intention to smoke testing a more comprehensive operationalization of social influence. Previous studies have investigated either the relative contribution of different types of social influence (e.g. De Vries et al., 1995; McMillan et al., 2005) or the relative contribution of different referents (e.g. Bricker, Peterson, Leroux et al., 2006, Bricker et al., 2007; Kobus, 2003). However, one can simultaneously conceive the existence of differences in the impact on youngsters' intention to smoke from norms of parents or norms of peers or perceived behaviour of best friend or direct pressure of siblings. Thus, the main contribution of the current study is to acknowledge both the existence of different types and referents of social influence and to combine them in a new measurement model. The proposed social influence measurement model, with three scales (three types of social influence), each with four factors (the four groups of important others as sources of influence) was tested and used to investigate the impact of social influence on adolescent intention to smoke, firstly on its own, and secondly together with the other proximal variables of the I-Change model: attitudes and self-efficacy (see Figure 1, forgetting for now the figures).

We have chosen intention to smoke as the dependent variable for several reasons already exposed in this introduction: (i) because research indicates that prevention activities must start preferentially before the first experience with tobacco (Colby et al., 2000; DiFranza et al., 2000, 2002); (ii) because of the low age of participants in the study, and (iii) because intention is appointed by the theory as the best predictor of behaviour (e.g. Ajzen, 1988, 1991; Fishbein & Ajzen, 1975) and this theoretical claim has been confirmed by research results (Andrews et al., 2003; Choi et al., 2001, Conrad et al., 1992; McMillan et al., 2005; Vitoria et al., 2006; Wakefield et al., 2004).

To operationalize social influence, we have adopted the three concepts (types) of social influence proposed by De Vries et al. (1995); (i) Subjective norms, which is the most used definition of social influence in research on smoking behaviour since it is one of the core proximal variables in TPB (Ajzen, 1988, 1991; Ajzen & Madden, 1986); (ii) the perceived smoking behaviour of important others, inspired by Bandura's concept of indirect, or vicarious learning (Bandura, 1977, 1986), and (iii) the direct pressure to smoke from important others, suggested by (Evans et al., 1976). Regarding approaches with the purpose of expanding the social influence component of TPB, among these three variables, one represents the normative stream (subjective norms), other represents the direct interpersonal stream (pressure), and the third (perceived behaviour) is in-between these two main streams of efforts to extend the social influence component in TPB-based models. The three types of social influence were combined with referents or important others for adolescents, namely (i) parents (father, mother); (ii) siblings [brother(s), sister(s)]; (iii) peers (best friend, friends, people in the same year), and (iv) teachers (see also De Vries et al., 1995; Holm et al., 2003; Vitoria et al., 2006).

Method

Participants
The sample comprises 3,064 seventh grade students with a mean age of 13.5 years old (SD = 1.1) 50.9% were girls, and 13% were repeating the seventh grade. Regarding nationality, 82% were Portuguese and most of the remainders were from the Portuguese former colonies in Africa.
Considering smoking behaviour, 71.3% reported never having smoked (‘never smokers’), 24% smoked occasionally (‘occasional smokers’), and 4.7% smoked weekly or more frequently (‘regular smokers’). Regarding intention to smoke, 85% did not intend to smoke in the coming year and 72% did not intend to smoke in the future.

The percentage of smokers among important others were 23.8% of mothers, 43.5% of fathers, 10.5% of brothers, 6.8% of sisters, and 8.9% of best friends (information reported by adolescents).

**Procedure**

The data collection took place in 1998 and was conducted as part of the European Smoking prevention Framework Approach (ESFA; De Vries, Mudde et al., 2003). In the first phase of this research, 64 public schools, with seventh grade students, from five municipalities near Lisbon, were invited to participate in the project. Twenty-five schools confirmed participation by sending a letter of participation and by appointing an official school contact teacher. The distribution, in terms of urban/rural location and socio-economic level, did not differ when comparing schools that accepted with those who refused to participate in this study. Schools that refused participation indicated being too busy. Questionnaires were filled in during classes, under teacher supervision. Measurement conditions were optimized by assuring respondents the strict confidentiality of their responses. A pilot of an initial version of the questionnaire, made with Portuguese adolescents, led to the final version of the questionnaire.

Out of the 3,134 questionnaires received, 3,064 (97.8%) were completed satisfactorily (questions on smoking behaviour were answered) and were included in the analysis.

**Measures**

All variables were assessed using a questionnaire developed and validated (De Vries & Kok, 1986; De Vries, Dijkstra, & Kuhlman, 1988, 1995; Markham et al., 2004; Vitoria et al., 2006), based on the theoretical models I-Change (De Vries, Mudde et al., 2003) and ASE (De Vries & Mudde, 1998; De Vries et al., 1988; De Vries, Backbier, & Kok, 1994, 1995). The questionnaire assesses smoking behaviour, intention to smoke, social influence, attitude, and self-efficacy.

Intention to smoke was measured by two questions on adolescents’ intention to smoke in the future and within the following year. Answering categories ranged from ‘Definitely not’ (1) to ‘Definitely yes’ (7). The sample polychoric correlation between the 2 items (intention to smoke in the future and in the next year) is .79.

Social influence was measured using three different scales assessing subjective norms, perceived behaviour, and direct pressure to smoke from parents, siblings, peers, and teachers.

The subjective norms scale assesses adolescents’ perceptions of whether important referents think they should smoke or not and comprises eight items [father, mother, brother(s), sister(s), best friend, friends, people in the same year, and teachers] measured on a seven-point Likert-type scale. For example, ‘My best friend thinks that . . . ’ ‘I don’t know’ or ‘I don’t have’ (1), ‘I definitely should not smoke’ (2) to ‘I definitely should smoke’ (7).

The perceived behaviour scale assesses adolescents’ perception on the smoking behaviour of important others and included five items [father, mother, brother(s),
sister(s), and best friend] measured on a three-point scale [e.g. 'Does your father smoke?'; 'No' (1), 'I don't know' or 'I don't have' (2), 'Yes' (3)] and three items (friends, people in the same year, and teachers) measured on a six-point scale [e.g. 'How many of your friends smoke?'; 'I don't know' (1), 'Almost nobody' (2) to 'Almost all of them' (6)].

The direct pressure scale measures the adolescents' perception of being directly pressured to smoke by important others evaluated by eight items [father, mother, brother(s), sister(s), best friend, friends, people in the same year, and teachers]. All the items were answered using a 6-point scale [e.g. 'Have you ever felt pressure from your mother to smoke?', 'I don't know' or 'I don't have' (1), 'Never' (2) to 'Very often' (6)].

Attitude measures the adolescents' beliefs on the disadvantages of smoking and includes three items [('If I smoke, or were to smoke, I consider my behaviour ...' 'Wrong', 'Very stupid', and 'Very bad for my health')], measured on a seven-point scale: 'Very wrong' / 'Very stupid' / 'Very bad for health' (1) to 'Very right' / 'intelligent' / 'good for my health' (7). Answers 'I don't know' were coded in the middle of the scale (4). The sample polychoric correlation between the three items are: .71 ('wrong' - 'stupid'), .65 ('stupid' - 'bad for health'), and .68 ('wrong' - 'bad for health').

Self-efficacy measures the adolescents' perception of their ability to refrain from smoking using three items: 'When with others who smoke', 'When feel upset', and 'When on the way home from school'. These items were answered using a seven-point scale: 'I am sure I won't smoke' (1) to 'I am sure I will smoke' (7). Answers 'I don't know' were coded in the middle of the scale (4). The sample polychoric correlations between the three items are: .81 ('with others who smoke' - 'when feel upset'), .80 ('with others who smoke' - 'when on the way home from school'), and .86 ('when feel upset' - 'when on the way home from school').

Analysis
Besides obtaining descriptive statistics and polychoric correlations, data analysis included performing confirmatory factor analysis (CFA), as a first step, to confirm each of the three measurement models of social influence (subjective norms, perceived behaviour, and direct pressure to smoke), each with four factors (the referents: parents, siblings, peers, and teachers).

As a second step structural equation modelling (SEM) was used to calculate correlations between factors of each scale of social influence and intention to smoke and to estimate the impact of social influence on adolescents' intention to smoke. This goal was accomplished firstly by testing each of the three social models separately, secondly by testing all the three types of social influence at the same time, and thirdly by testing the social influence together with attitudes and self-efficacy, the other proximal variables of the I-Change model (see Figure 1, ignoring for now the figures). Past smoking behaviour was controlled by performing the last analysis using a sample without 'regular smokers'.

All items were treated as variables measured on an ordinal scale, and LISREL 8.80 (Jöreskog & Sörbom, 2006) was used to calculate polychoric correlations and to perform CFA and SEM. A robust maximum likelihood estimation procedure implemented in LISREL was used to estimate all models.

Model-data fit was assessed using the following measures of fit: the Satorra-Bentler scaled chi-square statistic, the expected cross-validation index (ECVI), the Akaike information criterion (AIC), the root mean square error of approximation (RMSEA), the
standardized root mean square residual (SRMR), the comparative fit index (CFI), and non-normed fit index (NNFI).

Results

Testing social influence measurement models

The first goal of the current study was to test the structure of the three social influence scales (three types of social influence), each with four factors, distinguishing the four groups of important referents (parents, siblings, peers, and teachers), as theoretically hypothesized (see Figure 1, forgetting for now the figures). To accomplish this goal, for each social influence scale, three different measurement models were tested using CFA: a first-order factor analysis model with four factors was compared to a first-order single-factor model and to a second-order factor analysis model, as suggested by several authors (e.g. Byrne, 1998; Kline, 1998).

Subjective norms CFA. Results of the four factors model revealed factor loadings that were statistically significant and adequate (all greater than .66, on a standardized solution - see Table 1). The four factors scale measurement model was confirmed by acceptable fit indices, and revealed to perform better than the single factor model (see Table 2). LISREL estimated correlations between the four factors ranged between .42 and .66 (Table 3). These correlations between factors of subjective norms were high enough to suggest the use of a second-order model. However, the AIC value obtained for the estimated second-order FA model (142.62) was higher than that obtained for the estimated first-order FA model (120.61), thus suggesting a poorer model-data fit (Table 2). Consequently, the first-order factor analysis model with four factors seems to be the most appropriate. The obtained factors composite reliability coefficients were above the commonly used threshold value for acceptable reliability (Hair, Anderson, Tatham, & Black, 1998): .82 (parents), .75 (siblings), and .78 (peers; teachers was measured with only one item). The average variance extracted for each factor was also acceptable (Hair et al., 1998): .70 (parents), .59 (siblings), and .54 (peers).

Perceived behaviour CFA. All factor loadings were statistically significant and adequate (> .40) supporting the four factors structure (Table 1). Moreover, the overall goodness-of-fit indices lend substantial support for this four factors structure over the single-factor structure (see Table 2). LISREL estimated correlations between the four factors range between −.01 and .27 (Table 3). In this case, correlations among the four factors were low, suggesting a poor fit of a second-order model. The fit indices confirm that the four factors model is the most appropriate measurement model (Table 2). The factors composite reliability coefficients (.64 for parents, .65 for siblings, and .65 for peers), and the average variance extracted for each factor (.48 for parents, .46 for siblings, and .40 for peers) were somewhat below the recommended limit. Despite these values, regarding that our research question is to investigate the specificity of types and sources of social influence, we have decided to accept the four factors model. Even though the obtained coefficients are not far from the proposed standard limits, which the literature does not impose as absolute (e.g. Hair et al., 1998), the interpretation of our results should be done with some caution.

Direct pressure to smoke CFA. The scale with four referents was confirmed in a CFA with factor loadings that were statistically significant and relatively high (> .55), resulting in a reasonable model-data fit (Table 1). This measurement model also revealed
Table 1. Standardized factor loadings for the four factors of subjective norms, perceived behaviour, and direct pressure to smoke

<table>
<thead>
<tr>
<th>Item</th>
<th>Subjective norms</th>
<th>Perceived behaviour</th>
<th>Direct pressure to smoke</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Parents</td>
<td>Siblings</td>
<td>Peers</td>
</tr>
<tr>
<td>Mother</td>
<td>.84</td>
<td></td>
<td>.78</td>
</tr>
<tr>
<td>Father</td>
<td>.83</td>
<td></td>
<td>.59</td>
</tr>
<tr>
<td>Brother(s)</td>
<td>.81</td>
<td></td>
<td>.77</td>
</tr>
<tr>
<td>Sister(s)</td>
<td>.73</td>
<td></td>
<td>.58</td>
</tr>
<tr>
<td>Best friend</td>
<td></td>
<td>.74</td>
<td>.40</td>
</tr>
<tr>
<td>Friends</td>
<td></td>
<td>.80</td>
<td>.83</td>
</tr>
<tr>
<td>People in the year</td>
<td>.66</td>
<td></td>
<td>.59</td>
</tr>
<tr>
<td>Teachers</td>
<td></td>
<td></td>
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Table 2. Goodness-of-fit indices of the three alternative measurement models for each of the three types of social influence

<table>
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<tr>
<th>Model</th>
<th>$\chi^2$</th>
<th>df</th>
<th>$\chi^2$/df</th>
<th>p-value</th>
<th>ECVI</th>
<th>AIC</th>
<th>RMSEA</th>
<th>SRMR</th>
<th>CFI</th>
<th>NNFI</th>
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<tr>
<td><strong>Subjective norms</strong></td>
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<td></td>
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<tr>
<td>Single factor</td>
<td>409.41</td>
<td>20</td>
<td>20.47</td>
<td>&lt; .001</td>
<td>.14</td>
<td>441.41</td>
<td>.08</td>
<td>.08</td>
<td>.98</td>
<td>.97</td>
</tr>
<tr>
<td>Four factors</td>
<td>78.61</td>
<td>15</td>
<td>5.24</td>
<td>&lt; .001</td>
<td>.04</td>
<td>120.61</td>
<td>.04</td>
<td>.03</td>
<td>1.00</td>
<td>.99</td>
</tr>
<tr>
<td>Second order</td>
<td>104.62</td>
<td>17</td>
<td>6.15</td>
<td>&lt; .001</td>
<td>.05</td>
<td>142.62</td>
<td>.04</td>
<td>.03</td>
<td>.99</td>
<td>.99</td>
</tr>
<tr>
<td><strong>Perceived behaviour</strong></td>
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<tr>
<td>Single factor</td>
<td>747.02</td>
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<td>&lt; .001</td>
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<td>779.02</td>
<td>.11</td>
<td>.12</td>
<td>.79</td>
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<tr>
<td>Four factors</td>
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<td>15</td>
<td>6.34</td>
<td>&lt; .001</td>
<td>.05</td>
<td>137.97</td>
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<td>7.47</td>
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<td>.05</td>
<td>164.97</td>
<td>.05</td>
<td>.06</td>
<td>.97</td>
<td>.95</td>
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<tr>
<td><strong>Direct pressure to smoke</strong></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Single factor</td>
<td>120.06</td>
<td>20</td>
<td>6.00</td>
<td>&lt; .001</td>
<td>.05</td>
<td>152.06</td>
<td>.04</td>
<td>.15</td>
<td>.99</td>
<td>.99</td>
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<tr>
<td>Four factors</td>
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<td>15</td>
<td>1.21</td>
<td>.237</td>
<td>.02</td>
<td>60.11</td>
<td>.01</td>
<td>.05</td>
<td>1.00</td>
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<tr>
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<td>1.30</td>
<td>.183</td>
<td>.02</td>
<td>60.04</td>
<td>.01</td>
<td>.06</td>
<td>1.00</td>
<td>1.00</td>
</tr>
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Table 3. Estimated correlations between the three social influence scales, attitude and self-efficacy, and intention to smoke

<table>
<thead>
<tr>
<th>Item</th>
<th>Intention</th>
<th>SN-Parents</th>
<th>SN-Siblings</th>
<th>SN-Teachers</th>
<th>SN-Parents</th>
<th>SN-Siblings</th>
<th>SN-Teachers</th>
<th>PB-Parents</th>
<th>PB-Siblings</th>
<th>PB-Parents</th>
<th>PB-Siblings</th>
<th>PB-Teachers</th>
<th>PB-Parents</th>
<th>PB-Siblings</th>
<th>PB-Teachers</th>
<th>DP-Parents</th>
<th>DP-Siblings</th>
<th>DP-Parents</th>
<th>DP-Siblings</th>
<th>DP-Teachers</th>
<th>DP-Teachers</th>
<th>Attitude</th>
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<tbody>
<tr>
<td>SN-Parents</td>
<td>.22</td>
<td></td>
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<td>.19</td>
</tr>
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Note. SN, subjective norms; PB, perceived behaviour; DP, direct pressure.
to have a more adequate fit than the single-factor structure (see Table 2). LISREL estimated correlations values among the four factors ranged from .48 to .63 (Table 3). These values were high, suggesting a second order FA model. Although, the fit indices of this model were similar to those obtained by the four factors model, in line with previous decisions about subjective norms and perceived behaviour, and considering the purpose of the current study, we decided to adopt the four factors scale measurement model. The three factors composite reliability coefficients were .67 (parents), .56 (siblings), and .79 (peers), and the average variance extracted for each factor were .92 (parents), .39 (siblings), and .55 (peers). The coefficient for siblings is below the proposed standard limit but, for the reasons presented before, we have decided to continue with the four factors model. As stated before, this set of values impose some caution in the interpretation of our results.

In summary, the goodness-of-fit results and the measurement model assessments provided enough support for the confirmation of the proposed model with three social influence scales (the three types of social influence) each with four factors (the referents).

**Testing the impact of social influence on adolescents' intention to smoke**

The second goal of this study was to investigate the role of social influence in predicting intention to smoke using the measurement models already tested. Table 3 shows the estimated correlations between intention to smoke and the remaining factors of the model as well as the intercorrelations among the factors.

Analysing correlations between the intention to smoke and the factors of the social influence model, higher scores were found for perceived behaviour of peers ($r = .48$), peers' direct pressure to smoke ($r = .30$), and parental norms ($r = .22$). The intercorrelations among factors of different scales were diverse, ranging from $r = .73$ (between siblings norms and siblings direct pressure) to $r = -.56$ (between siblings direct pressure and perceived behaviour of siblings).

To investigate the impact of social influence on adolescents' intention to smoke the models of subjective norms, perceived behaviour, and direct pressure were first tested separately.

The subjective norms model revealed adequate goodness-of-fit indices: $\chi^2(26) = 98.56$, $p < .001$; AIC = 156.56; RMSEA = .03; SRMR = .02; CFI = 1.00; NNFI = .99. Subjective norms explained 5% of the variance of adolescents' intention to smoke. In this model parents were the only factor with a significant impact on adolescents' intention to smoke, with a standardized effect of .15 ($p < .05$), suggesting that parental expression of anti-smoking expectations contributed to a lower intention to smoke.

The perceived behaviour model showed also adequate goodness-of-fit indices: $\chi^2(26) = 245.99$, $p < .001$; AIC = 303.99; RMSEA = .05; SRMR = .06; CFI = .97; NNFI = .95. Perceived behaviour explained 24% of the variance of the intention to smoke. Referents with significant impact were peers (standardized effect of .48, $p < .05$) and parents (standardized effect of .07, $p < .05$), suggesting that adolescents perceiving more frequent smoking behaviour of their peers, and of their parents, had a higher intention to smoke.

The direct pressure to smoke model also demonstrated adequate goodness-of-fit indices: $\chi^2(26) = 29.12$, $p = .31$; AIC = 87.12; RMSEA = .01; SRMR = .04; CFI = 1.00; NNFI = 1.00. Results revealed that direct pressure to smoke explained 15% of the variance of the intention to smoke. Significant impacts with intention were found from peers (standardized effect of .46, $p < .05$) and from teachers (standardized effect of
However, the impact from teachers was in the opposite direction. This last effect was unexpected considering the absence of correlation between teachers' direct pressure to smoke and intention to smoke (see Table 3). This effect is likely to be caused by the high intercorrelations between this factor and some others included in the model, thus, causing a suppressor effect (Tabachnick & Fidell, 1996). Hence, we will consider pressure from peers as the unique factor with a significant impact on intention to smoke, suggesting that adolescents feeling higher pressure from peers towards smoking present a higher intention to smoke.

The second step to investigate the impact of social influence on adolescents' intention to smoke was to test the overall social influence model, combining the three types of social influence with the four groups of referents. This model resulted in an adequate model-data fit: \( \chi^2(225) = 678.41, p < .001; \) AIC = 930.41; RMSEA = .03; SRMR = .05; CFI = .99; NNFI = .99 and explained 29% of the variance of adolescents' intention to smoke. Significant estimates \( (p < .05) \) of intention to smoke were perceived behaviour of peers (standardized effect of .43), parental norms (standardized effect of .20), and perceived behaviour of parents (standardized effect of .08). However, peers' direct pressure to smoke was found to have a borderline influence (standardized effect of .15; \( p < .10 \)).

Finally, to verify if the effects observed with the proposed social influence model remain significant when tested in a larger model, we have included in the model attitudes, and self-efficacy. These three constructs (social influence, attitudes, and self-efficacy) are the proximal variables of intention to smoke in the I-Change model. Correlations between attitude, self-efficacy, and intention to smoke are higher than correlations between social influence scales and intention to smoke (ranging between .52 and .66; see Table 3). Correlations between attitude and social influence scales are low, and range between -.06 and .17, with the exception of direct pressure to smoke from peers which is higher (.37). Correlations between self-efficacy and social influence range between .02 and .28, with the exception of direct pressure to smoke from peers (.47). The estimates of the model in a completely standardized solution are presented in Figure 1. The model has an adequate model-data fit: \( \chi^2(363) = 912.79, p < .001; \) AIC = 1,242.79; RMSEA = .02; SRMR = .04; CFI = .99; NNFI = .99, and explained 55% of the variance of adolescents' intention to smoke.

Even when tested together with attitudes and self-efficacy, the impact of social influence on intention to smoke remained significant, and the factors with a significant impact on intention to smoke were confirmed: perceived behaviour of peers (standardized effect of .20, \( p < .05 \)), parental norms (standardized effect of .16, \( p < .05 \)), and perceived behaviour of parents (standardized effect of .07, \( p < .05 \)). This model also revealed that attitudes (standardized effect of .25, \( p < .05 \)) and self-efficacy (standardized effect of .40, \( p < .05 \)) had a significant impact on adolescents' intention to smoke which were larger than the impact showed by social influence.

An alternative model was also considered, including the three types of social influence as second-order factors, besides attitudes, and self-efficacy, as explanatory variables of intention to smoke. The following fit indices were obtained: \( \chi^2(423) = 1,466.26, p < .001; \) AIC = 1,676.26; RMSEA = .03; SRMR = .07; CFI = .99; NNFI = .98. Results confirmed those previously obtained with the proposed social influence model. A total of 53% of the variance on intention to smoke was explained. Perceived behaviour (standardized effect of .17, \( p < .05 \)) and subjective norms (standardized effect of .10, \( p < .05 \)) had a significant impact on intention to smoke, along with attitude (standardized effect of .28, \( p < .05 \)), and self-efficacy (standardized effect of .51, \( p < .05 \)).
Because past smoking behaviour showed to be an important determinant of intention to smoke and present smoking behaviour (e.g. Rivis, Sheeran, & Armitage, 2006), we have also decided to test the proposed model excluding from the sample the subset of 'regular smokers' (N = 143). Considering the sample without 'regular smokers' (N = 2,921), the model [χ²(367) = 831.25, p < .001; AIC = 1,153.25; RMSEA = .02; SRMR = .06; CFI = .99; NNFI = .99] explained 45% of the variance of adolescents' next year's intention to smoke.

Figure 1. Path diagram of the proposed model to investigate the impact of social influence on adolescents' intention to smoke with LISREL estimates in a standardized solution.
intention to smoke. In this model, regarding social influence, only parental norms (standardized effect of .15; \( p < .05 \)) showed to be significant. Perceived behaviour of peers (standardized effect of .09) and perceived behaviour of parents (standardized effect of .05) had a borderline influence \( (p < .10) \). Attitude (standardized effect of .25) and self-efficacy (standardized effect of .39) remained both significant \( (p < .05) \).

In summary, results show an impact of social influence on adolescents' intention to smoke although it is smaller than the impact showed by attitudes and self-efficacy. Results also provide some support to the hypothesis that different referents exerted their influence through distinct types of social influence. Among the various factors of social influence tested, parental norms seem to be the most stable in influencing intention. Perceived behaviour of peers and perceived behaviour of parents appear to have also an impact on intention to smoke. However, the impact of perceived behaviour weakened when past smoking behaviour was controlled for in the analysis.

Discussion
Results provide support to the hypothesized measurement model of social influence, which combines the three types of social influence (subjective norms, perceived behaviour, and direct pressure to smoke) with the four groups of important others (parents, siblings, peers, and teachers). This model explained 29% of adolescents' intention to smoke variance, figure that is similar to the result obtained in a previous study (De Vries et al., 1995). The extended version of the model, including social influence, attitudes, and self-efficacy, explained 55% of the variance of adolescents' intention to smoke, outcome which is also aligned with results obtained in previous studies (e.g. Armitage & Conner, 2001).

Considering the three types of social influence, results of the current study suggest that perceived behaviour, and subjective norms are related with adolescents' intention to smoke. Direct pressure to smoke did not show a significant impact when the three types of social influence were tested simultaneously but, when tested alone, had an impact greater than subjective norms. If past behaviour was controlled for in the analysis, only subjective norms maintain the significant effect on intention to smoke. Perceived behaviour, which had the strongest effect among social influence scales when using the sample with all the participants, lost strength, and significance when participants with smoking experience were removed from the analysis. This observation suggests that perceived behaviour influence is effective only with adolescents which have already smoking experience.

Regarding the four groups of referents, results show an impact of peers, and parents on adolescents' intention to smoke. Siblings and teachers did not show a significant association with adolescents' intention to smoke. Peers had the strongest association with intention to smoke. However, when past behaviour was controlled for, peers influence became non-significant, and only parents maintained its influence.

An important result of the current study is the suggestion that different referents exerted their influence on adolescents' intention to smoke through distinct types of social influence. Peers' influence was exerted through perceived behaviour and parental influence was mainly exerted through subjective norms. Hence peers, and parental influences appear to be exerted or experienced by adolescents in different ways. Furthermore, these results suggest that intention to smoke of adolescents in different positions in the smoking initiation process was influenced by different types of social influence and referents. These conclusions should be considered with some caution.
regarding that some values of factors reliability did not reach the recommended standards. This warning suggests the need for more research in this field.

In brief, considering Portuguese youngsters in early adolescence, parental norms are the only social influence factor with a clear impact on adolescents’ intention to smoke. Results of the current study also reveal parents as a consistent and peers as an inconsistent source of influence on adolescents’ intention to smoke. These results contradict the common position that peers are the strongest source of influence on adolescents’ smoking initiation (e.g. Conrad et al., 1992; De Vries, Engels et al., 2003; Kobus, 2003; Tyas & Pederson, 1998) and support more recent research results indicating parents as an important source of influence on smoking initiation, particularly in early adolescence (e.g. Bricker, Peterson, Anderssen et al., 2006, Bricker, Peterson, Leroux et al., 2006; De Vries, Engels et al., 2003; McMillan et al., 2005). On the other hand, the current study has confirmed subjective norms as the type of social influence with a more consistent impact on adolescents’ intention to smoke, which is in line with the classic approach, that gives to subjective norms the role of representing the social influence component in TPB based models (Ajzen, 1988, 1991; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). Moreover, agreeing with the conclusion of a previous study by De Vries et al. (1995), the current results provide some support for the role of perceived behaviour in influencing intention to smoke of adolescents, especially of those who have already smoking experience.

These results sustain the position that social influence is a complex construct and entail the need for further work on the understanding of social influence role in explanation of intention and behaviour (e.g. Avenevoli & Merikangas, 2003; De Vries et al., 2006; De Vries, Engels et al., 2003; Hagger & Chatzisarantis, 2005; Kobus, 2003; McMillan et al., 2005). Further longitudinal and cross-sectional research, including adolescents with different ages, is needed to test the usefulness of this model in investigating the impact of social influence on the intention to smoke and on smoking initiation and the role of these factors as predictors of intention, and smoking. The outcome of future studies on the intention–behaviour gap (e.g. Armitage & Conner, 2001; Webb & Sheeran, 2006) is also important for research on smoking initiation giving to intention the nuclear role.

The present study has some limitations. The generalization of our results is limited since participants were Portuguese and comparisons between Portuguese adolescents and adolescents from other nationalities have showed noticeable differences (De Vries, Mudde et al., 2003). Another limitation is the indirect gathering of data on parents, siblings, friends, and teachers, based on adolescents’ own reports. However, studies in which independent reports from adolescents, and referents were obtained have showed that adolescents appear to be well aware of their parents’ and friends’ smoking behaviour and smoking positions (Engels, Finkenauer, Mecus, & Dekovic, 2001; Wilks, Callan, & Austin, 1989). Finally, the current study was based on a cross-sectional design, thus, precluding conclusions on the direction of relations between social influence and the intention to smoke. There is also some evidence that cross-sectional designs underestimate parental and overestimate peers’ influence on smoking intention and onset (e.g. De Vries, Engels et al., 2003; Engels, Knibbe, Drop, & De Haan, 1997).

Nevertheless, the current study has implications: results suggested that adolescents’ extended exposure to more smoking (or less anti-smoking) expectations expressed by parents and, somehow, adolescents’ exposure to peers, and parental smoking behaviour imply a higher intention to smoke. These findings have some relevant implications for smoking prevention. Parents’ expression of disagreement on their children present or
future smoking behaviour could contribute to adolescents' lower intention to smoke. Another useful preventive strategy could be raising the awareness of smokers, especially parents and adolescents, on the pernicious influence of their smoking behaviour on their offspring and colleagues. Helping smokers to quit, especially parents and youth, could have a positive impact on preventing smoking intention and initiation.

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