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Understanding the joint effects of family and other developmental contexts on the sense of coherence (SOC): A person-focused analysis using the Classification Tree.

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Abstract

Using a person-focused approach, the present study sought to identify meaningful constellations of contextual factors that led to predominantly high and low levels of sense of coherence (SOC). Specifically, the contributions of the quality of parent-child relationships, teacher and classmate support, models of behaviour in the peer group, and neighbourhood assets were examined in a representative sample of Spanish adolescents aged 13 to 18 that had taken part in the 2010 edition of the study *Health Behaviour in School-aged Children*. The quality of parent-child relationships emerged as the main predictor of SOC for the whole sample, but the remaining factors also made significant contributions, which underlines the importance of the simultaneous analysis of the main contexts in adolescents' lives. Additionally, the identified constellations usually included compensatory effects, so no factor should be considered to be completely determining. Interestingly, the role of support at school was different depending on contextual profiles.

Keywords: sense of coherence, salutogenesis, adolescence, developmental contexts, person-focused approach, Classification Tree Analysis.

Sense of coherence (SOC) is an important factor in the understanding of health. This construct, which is the core of the salutogenic model, is defined as ‘a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one’s internal and external environments in the course of living are structured, predictable and explicable (comprehensibility); (2) the resources are available to one to meet the demands posed by the stimuli (manageability); and (3) these demands are challenges, worthy of investment and engagement (meaningfulness)’ (Antonovsky, 1987).

The study of SOC has sparked a growing interest in recent decades, and research on SOC and its effects on health has significantly increased accordingly (Lindström & Eriksson, 2010). Thus, SOC has been shown to be a useful predictor of health and quality of life (Eriksson & Lindström, 2006, 2007) because it makes individuals more likely to successfully cope with life demands, even in situations of severe adversity (Braun-Lewensohn, Sagy & Roth, 2011). Specifically, individuals with a strong SOC will be more likely to perceive everyday life situations as non-stressful and to select appropriate coping strategies, and less likely to experience detrimental effects on health when exposed to stress (Antonovsky, 1987).

In adolescence, SOC has shown noteworthy associations with several health outcomes (e.g., García-Moya, Moreno & Rivera, in press; Moksnes, Espnes & Lillefjell, 2012), as well as with the adoption of healthy lifestyles including regular physical activity and dental hygiene, and a lower involvement in health-threatening behaviours, such as substance use (e.g., Mattila et al., 2011; Myrin & Lagerström, 2006). A strong SOC also seems to reduce adolescents’ likelihood to perceive school demands as stressful and to experience psychosomatic symptoms in response to school-related stress (e.g., Torsheim, Aaroe & Wold, 2001). The former suggests the potential of SOC to

contribute to a better understanding of adaptive functioning, coping and well-being in adolescence, a developmental stage characterised by numerous physical, psychological and social changes in which the study of health-related behaviours and well-being is considered of paramount importance. Indeed, adolescence is viewed as a time filled with challenges, which involves both health risks and opportunities (Leffert & Petersen, 1996; Lerner & Galambos, 1998) and current approaches in developmental science highlight the importance to understand the resources and assets which foster positive development in this period of life (Larson, 2000; Lerner, Phelps, Forman & Bowers, 2009; Morgan & Ziglio, 2007).

Regarding SOC development, it seems unlikely to find an established SOC during childhood due to the need for a certain cognitive complexity and a minimum life trajectory for the establishment of this disposition. Indeed, according to developmental psychology research (Smetana & Villalobos, 2009) and recent advances in developmental neuroscience (Blakemore & Choudhury, 2006), complex social cognitive abilities significantly develop during adolescence. However, there have been attempts to assess SOC in childhood (Margalit & Efrati, 1996), and some works have found a significant role of the parents' SOC in their children's well-being (e.g., Berntsson & Gustafsson, 2000; Ray, Suominen & Roos, 2009). In adolescence, SOC does seem to have reached enough entity and stability so that it can be assessed in the adolescents themselves (Honkinen, Suominen, Rautava, Hakanen & Valimo, 2006). Therefore, experiences from the main developmental contexts that have occurred since childhood and that generally expand and diversify during adolescence manifest in the adolescent SOC. Consequently, several authors have stated that adolescence is the most suitable period for the study of the contextual factors that shape SOC development (Evans, Marsh & Weigel, 2010; Marsh, Clinkinbeard, Thomas & Evans, 2007), a view

which is consistent with the characterisation of adolescence as an ideal period to study individual development in interpersonal and social context (e.g., Smetana, Campione-Barr & Metzger, 2006).

However, whilst literature on the relationships between SOC and health in adolescence has considerably increased, research on the factors that may contribute to SOC development still is comparatively scarce. The former is to some extent paradoxical when considering that one fundamental tenet in developmental psychology is that adolescent development cannot be understood without considering the everyday life experiences that occur within the main developmental contexts in adolescents' lives. Inasmuch extensive research has documented the impact of experiences within family, school, with peers and in the neighbourhood on adolescent well-being (for a review, see Lerner & Steinberg, 2009), developmental psychology literature seems to provide a firm background for the strategy of turning to those main developmental contexts for expanding research on SOC-promoting factors in adolescence.

Moving to salutogenic literature, both Antonovsky's original formulations (1987) and research conducted to date (Evans et al., 2010; García-Moya, Moreno & Rivera, 2013) point to the family context as the most influential scenario for SOC development. Specifically, support from family members (Margalit, 1985), the encouragement of personal growth (Marsh et al., 2007) and a positive climate of relationships (Olsson, Hansson, Lundblad & Cederblad, 2006), such as that indicated by trusting relationships with at least one of the parents (Cederblad, Dahlin, Hagnell & Hansson, 1994), emotional closeness among the family members (Olsson et al., 2006) and parent-child relationships characterized by open communication and high levels of affection and parental knowledge (García-Moya, Rivera, Moreno, Lindström & Jiménez-Iglesias, 2012) have significant positive influences on SOC levels.

Furthermore, in a longitudinal study that followed participants from childhood to adulthood, parental practices at age 14 showed a significant association with the adult SOC (Feldt, Kokko, Kinnunen & Pulkkinen, 2005).

Nevertheless, indicators of other developmental contexts also seem to make significant contributions to SOC development in adolescence (Rivera, García-Moya, Moreno & Ramos, in press), including support from classmates and teachers at school (Bowen, Richman, Brewster & Bowen, 1998; Natvig, Hanestad & Samdal, 2006), support from friends in the peer group (Evans et al., 2010; Marsh et al., 2007), and neighbourhood social cohesion (Marsh et al., 2007; Nash, 2002), among others.

To further understand the contributions of multiple factors to adolescent development, it is fundamental to analyse how those factors jointly operate (Cook, Herman, Phillips & Settersten, 2002). Consequently, the developmental study of adolescence is becoming more relational, with a greater focus on adolescents' relationships beyond the family (Smetana et al., 2006). Previous research suggests that the effects of multiple developmental contexts on adolescent adjustment and well-being seem to take place in an additive (not multiplicative) fashion. In this vein, a comprehensive and thorough analysis of the contributions from several factors from family, school, peers and neighbourhood to adolescent well-being found that each context additively influenced healthy development: A context quality could compensate for adversity in other contexts, but no multiplicative effect emerged from the combination of protective factors in several contexts (Cook et al., 2002).

To our knowledge, only two works (Evans et al., 2010; García-Moya et al., 2013) have tried to incorporate the aforementioned developmental psychology background into salutogenic research. These studies simultaneously analysed the effects

on SOC from contextual factors that originate from family, school, peers and neighbourhood, and both came to the conclusion that contextual factors in shaping SOC emerge from these multiple developmental contexts. García-Moya et al. (2013) found that the quality of parent-child relationships was the most influential factor, followed by the influence of positive models of behaviour in the peer group, support at school and neighbourhood assets. While the results of Evans et al. (2010) coincided in concluding that family was the most influential context, they showed that positive factors had an additive influence on SOC development, with the accumulation of positive resources leading to linear increases in the SOC of male and female adolescents. In addition, the more the contexts in which at least one positive factor was perceived, the higher the SOC of the participants, although this second finding must be cautiously interpreted because an unequal number of dimensions was employed in the assessment of each context.

The aforementioned studies employed a *variable-focused approach*, providing interesting findings about the average effects of several contextual factors and their relative importance to the adolescents' SOC. However, to our knowledge, no previous research on SOC dealing with the effects of contextual factors from multiple contexts has employed a *person-focused approach* (Bergman & Andersson, 2010), although this approach has been proven useful in the identification of typical trajectories of SOC stability and change (Feldt et al., 2011). Therefore, a person-focused approach would complement previous research, contributing to the expansion of our current knowledge about the factors that shape SOC development during adolescence, thanks to the identification of configural patterns in the life of real adolescents, resulting in differing SOC levels.

The aim of the present study was to analyse how different constellations of contextual resources that resulted from the main developmental contexts in adolescence are related to adolescents' SOC. To acquire a deeper understanding of this issue, the Classification Tree Analysis, which allows for a person-focused analysis, was employed for statistical analyses. Tree analysis has a long trajectory in the field of biomedical sciences, but it is comparatively novel in the social sciences. Nevertheless, it has been deemed particularly suitable to explore the effects of different meaningful combinations of a given number of factors on a dependent variable of interest. Furthermore, this technique makes apparent cases in which a given variable has different effects for diverse population subgroups. Thanks to those strengths, Classification Tree Analysis will provide valuable information regarding the following research questions:

- Which constellations of contextual factors are associated with high and low levels of SOC?
- How do the examined factors jointly affect SOC (e.g., cumulative effects, compensatory effects, etc.)?
- Are there any contextual factors whose impacts on SOC are significant only for certain subgroups of adolescents?

Methods

Participants

In accordance with the international protocol (Roberts et al., 2009), random multi-stage sampling stratified by conglomerates was used to draw a representative sample of Spanish adolescents as part of the 2010 edition of the WHO international survey *Health Behaviour in School-aged Children (HBSC)* in Spain. Sampling was stratified to ensure representation by geographic area (northern, eastern, central and

southern regions of Spain), educational level (considering the three pairs of grades distinguished in Spanish secondary education) and school type (62.9% state schools and 37.1% private schools, mirroring the actual percentages in the country). The current study focused on the 4943 participants (47.9% boys and 52.1% girls) aged 13 to 18 ($M = 15.43$, $SD = 1.41$) that had answered all the items herein analysed. The distribution of the sample by age was as follow: 31.8% adolescents aged 13-14 years, 43.6% aged 15-16 years and 24.6% aged 17-18 years. Younger adolescents were excluded because the SOC scale was not part of the 11-12-year-old participants' questionnaire. As for socioeconomic status, 82.6% of the participants rated their family wealth as average (For further information on sample characteristics and other methodological details, see Moreno, Ramos, Rivera, Jiménez-Iglesias & García-Moya, 2012).

Measures

The measures employed are part of the 2010 HBSC Spanish questionnaire. The instrument and the procedures employed in the Spanish part of the HBSC study have been approved by the Experimentation Ethical Committee of the University of Seville. For the purpose of the present study, the following variables were employed:

Quality of parent-child relationships.

A composite factorial score ($M = 5$, $SD = 2$) including indicators for the main dimensions on the assessment of the quality of parent-child relationships (perceived affection, ease of communication with parents, parental knowledge and satisfaction with family relationships) was employed (García-Moya, Moreno & Jiménez-Iglesias, in press). This measure has been considered to be a useful tool in global assessments of parent-child relationships as perceived by the adolescents and showed good reliability in this sample ($\alpha=.77$). In the present study, tertiles were used to classify adolescents into

three groups according to their obtained levels on quality of parent-child relationships: low (lower than 4.4571), medium (from 4.4571 to 6.1420) and high (higher than 6.1420)

Classmate and teacher support.

Supportive climate at school was measured by means of two well-known scales whose original versions were developed and validated within the international HBSC network (see Torsheim, Wold & Samdal, 2000). Examples of items for classmate support are *Most of the students in my class(es) are kind and helpful* and *Other students accept me as I am*. Teacher support includes items such as *My teachers are interested in me as a person* and *My teachers encourage me to express my own opinions in class*. Both scales have been slightly modified according to the last improvements in the HBSC protocol and are now answered in a 5-point Likert scale from 1-*strongly disagree* to 5- *strongly agree*. Cronbach's alpha for the classmates' and teachers' support scales were .71 and .85, respectively. In the present study, levels of support were coded as high (mean values from 3.01 to 5.00), medium (from 2.01 to 3.00) and low (from 0 to 2.00) using a meaning-based criterion for 5-point likert scales (in which strongly agree and agree as well as strongly disagree and disagree are grouped together) that is frequently employed within the HBSC network (e.g., Brooks, Magnusson, Spencer & Morgan, 2012).

Positive models of behaviour in the peer group.

This measure has been developed from a set of HBSC optional items assessing behaviours in the peer group (Gaspar de Matos et al., 2009). In particular, the scale included the following examples of positive behaviours: getting on well with parents, doing well at school and participating in sport or cultural activities, which were rated by

the adolescents as absent (most of their friends exhibit the behaviour *never or almost never*, coded as 0), occasional (most of their friends exhibit the behaviour *sometimes*, coded as 1), or usual (most of their friends exhibit the behaviour *often*, coded as 2). Values were averaged and three groups were identified according to the presence of positive models of behaviour in their peer group: low (from 0 to 0.99), medium (from 1.00 to 1.50) and high (from 1.51 to 2.00). Although internal consistency for this scale was modest ($\alpha = .44$), previous analyses supported the good functioning and unidimensionality of this scale (García-Moya et al., 2013).

Neighbourhood assets.

This scale assesses the presence of various assets, as perceived by the adolescents, in the area where they live. It consists of 6 items (*You can trust people around here, There are good places to spend your free time, e.g., leisure centres, parks, shops...*) that are answered on a 5-point Likert scale and were developed within the HBSC network, partially based on the items used to assess social capital by Kawachi et al. (1997). The content of this scale has been conceptualized as a neighbourhood sense of belonging, one of the dimensions of social capital (Morgan, 2011; Morgan, Rivera, Moreno & Haglund, 2012). In this study, the scale showed a good reliability ($\alpha = .82$). Mean scores in this scale were coded as high (from 3.01 to 5.00), medium (from 2.01 to 3.00) and low (from 0 to 2.00) presence of neighbourhood assets, using a similar criterion to the one described for the classmate and teacher support scales.

Sense of coherence.

SOC was assessed by means of the SOC-29 Scale (Antonovsky, 1987). This scale consists of 29 items answered in a 7-point Likert scale with bipolar anchoring phrases. The SOC-29 has shown good reliability and validity in several countries

(Antonovsky, 1993; Eriksson & Lindström, 2005) and across various cultural groups (e.g., Braun-Lewensohn & Sagy, 2011). Cronbach's alpha in the present study was .87. Although SOC-29 provides both a global score and separate scores for each component (comprehensibility, manageability and meaningfulness), the former is preferred, given the inextricable relationships among the three dimensions (Antonovsky, 1993). SOC scores were coded as low (1 to 4.2069), medium (from 4.2070 to 4.8620) and high (from 4.8621 to 7) according to the cut-off points derived from a previous study with the HBSC Spanish sample (García-Moya, Moreno & Rivera, in press).

Procedure

Information was obtained by means of anonymous on-line questionnaires that were filled in by the students during a regular school hour in accordance with the HBSC international standardized procedure (Roberts et al., 2009): The sessions were supervised by teaching staff, passive consent was obtained from the parents and students' anonymity was ensured. The Decision Tree method was used for statistical analysis. Specifically, we ran a Classification Tree Analysis in SPSS 15 (SPSS Inc., Chicago, IL) to analyse how the contextual factors best combined to predict SOC. This procedure identifies mutually exclusive and exhaustive subgroups of the population whose members share common predictors that influence a given dependent variable. The exhaustive Chi-squared Automatic Interaction Detector (CHAID) algorithm and default stopping rules were used to select a set of predictors that distinctively predicted high and low SOC.

The quality of the obtained tree is indicated by the misclassification risk: the lower its value, the higher the reliability of the estimated classification. Additional procedures can be employed to assess to what extent different random samples from the

same population would produce different trees (Lemon, Roy, Clark, Friedmann & Rakowski, 2003). In this respect, we employed 10-fold cross-validation. For that purpose, data are broken into 10 subsets. Next, a tree is calculated using all of the data except from one of the subsets. The obtained tree is applied to the remaining subset and the misclassification risk is calculated. The process is repeated with the remaining 9 subsets and, as a result, an average value of the misclassification risk is obtained.

Results

The obtained Classification Tree is reproduced in Figure 1. The misclassification risk was .264 ($SE = .008$), which indicates that, by using the information on the examined contextual factors, the obtained tree would be able to correctly classify the SOC of 74.6% adolescents in this sample. Ten-fold cross-validation provided similar results, with misclassification risk being .275 ($SE = .008$), which indicates that the obtained results would not significantly vary among several random subsamples of the same population.

Additional chi-square analysis, including effect size tests and the examination of corrected standardized residuals, indicated that no significant differences associated with gender nor age existed regarding the likelihood of classification into the different terminal nodes.

(Figure 1)

As seen in Figure 1, the quality of parent-child relationships emerged as the best predictor of adolescents' SOC. Specifically, the average percentages of adolescents with a high SOC were 79.4 % in the high-quality group (node 3), 58.3 % in the medium-quality group (node 2) and 24.7 % in the low-quality group (node 1). Nevertheless, significant within-group variability was found in the tree groups based on the quality of

parent-child relationships. Specifically, depending on the factors from the remaining developmental contexts, the percentage of adolescents from the high-quality group that showed a high SOC ranged from 40.7% to 88.7%. Similarly, the percentage of adolescents from the medium-quality group with a high SOC ranged from 30.8% to 73.5%. Finally, in the group of low-quality parent-child relationships, the percentage of adolescents with a high SOC ranged from 2% to 43.4%. As seen in Figure 1, that variability depended on the combinations of levels in the remaining variables.

The obtained tree allowed identifying six distinct and representative constellations leading to predominantly high and low SOC levels (see Figure 1). Table 1 summarizes those representative constellations, indicating their terminal node, their constituting predictors and the percentage of high-SOC adolescents in each of them. Subgroups consisting of less than 4% of the sample were considered atypical. As shown in Table 1, medium to high quality of parent-child relationships tended to result in predominantly high levels of SOC whereas low quality resulted in predominantly low SOC levels. In addition, high perceived teacher support was a common element in the three constellations leading to predominantly high SOC.

(Table 1)

Results in Figure 1 provide further information about how the examined contextual factors typically combined in the prediction of SOC levels. In this respect, three types of patterns can be distinguished in the obtained tree: patterns of accumulation of SOC-promoting contextual resources (for 19.6% adolescents, see terminal node 23); patterns characterized by the cumulative absence or low levels of those contextual resources, though this was a very atypical constellation corresponding to only 1.6% adolescents (see terminal node 11) and, most frequently, patterns which

consisted of the combination of both negative and positive contextual resources (e.g., terminal node 27). Appendix 1 provides a separate in-detail description of the patterns in the three main branches in the tree.

Finally, the obtained tree also made apparent the differential role of some contextual factors across subgroups of adolescents (see Figure 1). Specifically, classmate support was a significant factor for one in two adolescents reporting low-quality parent-child relationships (terminal nodes 11, 12, 24 and 25), but it was absent in the constellations for adolescents reporting high-quality and medium-quality parent-child relationships. In contrast, the significance of teacher support diminished as the quality of parent-child relationships decreased: teacher support made a significant contribution to the SOC of 95% of the adolescents with high-quality parent-child relationships (terminal nodes 22, 23, 30 and 31), 46% of the ones with medium-quality parent-child relationships (terminal nodes 28 and 29) and less than 30% of adolescents with low-quality parent-child relationships (terminal nodes 26 and 27).

Discussion

This study sought to increase the current understanding of the joint effects of several contextual resources (quality of parent-child relationships, teacher and classmate support, models of behaviour in the peer group and neighbourhood assets) on SOC. Research objectives included the identification of the most prevalent constellations related to high and low levels of SOC, an analysis of how joint effects took place, and the examination of the potential differing importance of contextual resources across subgroups of adolescents. We will elaborate on each aspect separately, thereby presenting and discussing the findings in three distinct subsections.

Which constellations of contextual factors are associated with high and low levels of SOC?

Six distinct and representative constellations resulting in predominantly high and low SOC levels were identified in the present study. Quality of parent-child relationships seemed to be a crucial element, with reported medium to high quality of parent-child relationship resulting in predominantly high levels of SOC and low-quality parent-child relationships leading to predominantly low SOC levels. High exposure to positive models in the peer group or high neighbourhood assets as well as high perceived teacher support used to be part of the constellations predominantly leading to a high SOC as well. Those factors also seemed to increase the likelihood of showing a high SOC for some of the adolescents reporting low-quality parent-child relationships. Classmate support seemed to be a valuable resource for some of these adolescents as well.

Those findings are consistent with the primary role attributed to family in SOC development (Antonovsky, 1987; García-Moya et al., 2012). Nevertheless, high-SOC adolescents were also found within the low quality of parent-child relationships group. The former suggests that quality of family relationships is not completely determining and consequently underscores the need to consider other developmental contexts for understanding SOC development. Thus, indicators of other contexts such as models provided by peers, neighbourhood assets and support at school also seem to make significant contributions to the adolescent SOC, which is consistent with developmental literature (Lerner & Steinberg, 2009) and previous SOC research (see Rivera et al., in press).

Finally, the fact that certain adolescents maintained a high SOC even in the less favourable constellations points to the relevance of complementing research on contextual resources with the examination of individual assets. In this vein, previous research suggests linkages between SOC and several individual factors, such as self-efficacy (Posadzki, Stockl, Musonda & Tsouroufli, 2010; Tsuno & Yamazaki, 2007) and personality traits (Ruiselová, 2000), that should be further studied. Furthermore, the incorporation of other contextual influences whose importance for adolescent well-being has been well documented by developmental research, such as structured leisure time activities (Coatsworth et al., 2005, Eccles & Templeton, 2002; Larson, 2000) important non-parental adults (Beam, Chen & Greenberg, 2002; Sterrett, Jones, McKee & Kincaid, 2011) and intimate friendships (Laible, Carlo & Roesch, 2004; Schneider, 2000; Wilkinson, 2004), would also be beneficial in this respect.

How do the examined factors jointly affect SOC?

The joint effects of the contextual factors seemed to predominantly act in an additive fashion, which is consistent with previous SOC research (Evans et al, 2010). Thus, as the presence of positive contextual resources repeatedly appeared in several contexts, stepped significant increases took place in the percentage of high-SOC adolescents. Nevertheless, the identified constellations were usually more complex than the cumulative summation of either positive or negative effects, and support was found for the existence of compensatory effects as well; when a contextual positive resource was lacking, the presence of another resource or the combinations of several of them seemed to compensate for it, at least to some extent.

Two alternative models have been proposed to represent the joint effects of contextual factors on development (Cook et al., 2002; Parcel, Dufur & Zito, 2010): (1) a

model characterized by tight contextual coupling, in which it is stated that individuals are consistently exposed to either favourable or unfavourable experiences across contexts, with snowball effects resulting in adolescents living in consistently better or worse contexts and little place for compensation; versus (2) a model of loose contextual coupling, in which the quality of experiences of any context does not reliably predict the quality of others and resources across contexts are viewed as substituting, in the sense that favourable conditions in a given context can compensate for the absence of positive resources in others.

The identified constellations of contextual factors predicting SOC in the present study (patterns of positive accumulation or cumulative absence of SOC-promoting contextual resources; and patterns in which compensatory effects took a relevant part) are overall consistent with the aforementioned models. However, results showed that these patterns were not equally prevalent. Thus, our findings are consistent with a tendency of positive factors to accumulate for about one in five adolescents, but not that much with the existence of negative vicious circles in which disadvantage tends to be followed by further disadvantage consistently across contexts (that was a very atypical constellation). Constellations that included compensatory effects were the most frequent, supporting the conclusion that, at the individual level, within-context variability (i.e., loose contextual coupling) is the norm in the adolescents' lives, with the differing constellations herein analysed having meaningful distinct effects on adolescents' SOC.

The finding that at least one contextual factor (often more than one) tended to compensate to some extent for the lack of meaningful resources in a given context is consistent with the view that *arenas of comfort* may appear in certain domains of adolescents' lives that compensate for less positive circumstances in others (Call &

Mortimer, 2001). More specifically, the finding that contextual resources beyond the family seemed, to some extent, to compensate for low-quality parent-child relationships is consistent with the evidence from connectedness (Witherspoon, Schotland, Way & Hughes, 2009) and resilience (e.g., Fergusson & Linskey, 1996) studies. Despite that, high SOC was still underrepresented among those adolescents compared to the ones showing a higher quality of parent-child relationships which is in line with the resilience literature's portrayal of family relationships as one of the fundamental elements in basic human adaptational systems (Fergus & Zimmerman, 2005; Luthar, Cicchetti & Becker, 2000; Masten, 2001). Consequently, these compensatory effects should be further studied in future research.

Are there any contextual factors whose impacts on SOC are significant only for certain subgroups of adolescents?

Overall, the presence of any of the examined contextual factors was associated with an increased likelihood of high SOC, whereas their absence was related to an increased likelihood of low SOC. This is no surprise, given that this salutogenic-guided study employed as predictors potential SOC-promoting factors, and previous research had suggested that the ones herein examined have significant positive associations with SOC (García-Moya et al., 2013). The quality of parent-child relationships, which appeared as the strongest predictor of SOC, positive models of behaviour in the peer group and neighbourhood assets made significant positive contributions to the SOC of the vast majority of adolescents. In contrast, the contribution of social support at school varied across groups. Specifically, social support at school (either from teachers or classmates, but not for both of them) only conditioned the SOC to some extent for three in four adolescents.

Interestingly, significant differences existed regarding the role of teacher and classmate support depending on the contextual profile of the adolescents. Classmate support was a significant factor only for adolescents reporting low-quality parent-child relationships, but it was absent in the constellations for adolescents reporting high or medium quality of parent-child relationships. Conversely, although teacher support was a relevant factor for adolescents in several different constellations, it is noteworthy that its significant role seemed to diminish as the quality of parent-child relationships decreased.

The former provides some evidence for non additive effects, which have been previously reported in studies on the role of teacher support in adolescents' well-being. Thus, different views have been held in previous research regarding teacher support. Some authors state that support from teachers may have an increased importance for adolescents who lack strong relationships with adults within their families (e.g., Lempers & Clark-Lempers, 1992) because these non-related adults would provide similar functions to parents that would be able to compensate for inept or absent parenting (Rhodes, 1994). In contrast, Darling, Hamilton and Hames (2003) claim that teachers are not emotionally salient for most adolescents, but they can become important non-related adults for some of them, especially in instrumentally-focused relationships.

Because teacher support was relevant to the SOC of adolescents predominantly reporting high or medium quality in parent-child relationships and was not relevant for most adolescents reporting low-quality parent-child relationships, our results seem to be more consistent with the hypothesis that instrumental support from non-related adults may be more critical for adolescents with stronger family relationships, acting in a

complementary way; i.e., addressing different needs to the ones fulfilled by parents (Darling et al., 2003).

In addition, the fact that no significant effects of teacher support on SOC were found for adolescents reporting low-quality parent-child relationships may be due to their models on relationships with adults. Parent-child relationships act as a reference for the development of internal models of personal relationships, thereby conditioning the adolescent's ability to build subsequent trusting relationships with significant others (Bowlby, 1988; McElhaney, Allen, Stephenson & Hare, 2009) and their ability to express positive feelings and manage negative emotions in close relationships (Hershenberg et al., 2011). Perceptions of support within the family environment tend to be generalized to new social relationships (Lakey & Dickinson, 1994), and several studies on the sources of social support have suggested that subjective perceptions of teacher support are to some extent dependent on templates developed within parent-child relationships (e.g., Reddy, Rhodes & Mulhall, 2003). Therefore, negative experiences in parent-child relationships may hamper adolescents' ability to establish meaningful relationships with their teachers or to take advantage of the support provided by them.

In sum, results suggest that whereas certain SOC-promoting factors act in a similar way for the vast majority of adolescents, others can have a relevant role for the SOC of only specific subgroups of adolescent populations, which points to the value of person-focused analyses (Bergman & Andersson, 2010; O'Brien, 2005).

Strengths, limitations and future research directions

The present investigation provides significant insights into the understanding of the factors contributing to SOC development during adolescence. In particular, this

study goes far beyond previous variable-based linear analysis, as it captured meaningful constellations of contextual factors in the life of real adolescents leading to differing SOC levels. The incorporation of factors from the four main developmental contexts during adolescence is another strength of the present study because research on the factors that contribute to SOC development has been dominated by single-setting analyses, and there is an increased awareness of the importance of analyses that include other contexts beyond the family for the understanding of adolescent development (Smetana et al., 2006). Identifying contextual factors that seem to have differing significance for SOC development across subgroups of adolescents is another strength of the present work.

However, this study has some limitations that should be taken into account for the interpretation of its findings. First, a cross-sectional study does not allow for conclusions to be drawn about the directionality of the analysed relationships. Second, incorporating additional factors and better measures of certain aspects would enrich the current findings. For instance, although the extent to which peers identify with conventional social goals as interpreted by adults has been viewed as an important aspect of the quality of friendship groups (Cook et al., 2002), it represents only an specific facet of the relationships with peers, which also did not show optimal psychometric properties. Similarly, although the indicators included in the global assessment of the quality of parent-child relationships have been found to be among the most significant family dimensions in the explanation of SOC (García-Moya et al., 2012), the use of a composite measure, though undoubtedly beneficial in terms of parsimony, may have obscured interesting specifics regarding parent-child relationships that would deserve in-depth examination in future research. Third, information in this study came exclusively from adolescents' self-reports, which may result in shared

method variance and could be viewed as a source of bias. However, several works suggest that adolescents are a reliable and objective source of information (Parra & Oliva, 2006) and that adolescents' perceptions are more predictive of their health and well-being than objective measures (Maurizi, Gershoff & Aber, 2012; Laursen & Collins, 2009).

Finally, it is important to acknowledge that Classification Tree Analysis is an exploratory technique. Consequently, although the employed 10-fold cross-validation procedure supported the reliability of the obtained results, it is important to conduct future research to replicate these findings. Additionally, sample size did not allow for a separate analysis across genders or different age groups. However, previous research shows more commonalities than differences between adolescent boys and girls regarding SOC-promoting factors (García-Moya et al., 2013). Furthermore, chi-square analysis, including effect size tests and the examination of corrected standardized residuals, indicated that neither gender nor age were significantly associated with constellation membership, which seems to support the adequacy of a single model for the whole sample.

Findings from the present study suggest some future research directions as well. In our view, the simultaneous analysis of individual assets and contextual factors, the improvement of measures employed in this type of analyses and the exploration of the interplay of risk factors and contextual resources in shaping the SOC may contribute to further increase our knowledge on the origins and development of SOC. Additionally, resilience studies may contribute to shed light to those cases in which a strong SOC is maintained despite the lack of important contextual resources.

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Table 1

Representative constellations resulting in predominantly high and low SOC levels

| Terminal node | Predictors (in order of importance) | High-SOC adolescents |
|---------------|---|----------------------|
| 23 | High-quality parent-child relationships, high positive models of behaviour in the peer group and high teacher support | 88.7% |
| 31 | High-quality parent-child relationships, medium to low positive models of behaviour in the peer group, high neighbourhood assets and high teacher support | 73.9% |
| 29 | Medium-quality parent-child relationships, high neighbourhood assets, high positive models of behaviour in the peer group and high teacher support | 73.5% |
| 27 | Low-quality parent-child relationships, high positive models of behaviour in the peer group, high neighbourhood assets and high teacher support | 43.4% |
| 25 | Low-quality parent-child relationships, medium positive models of behaviour in the peer group, high neighbourhood assets and high classmate support | 29.4% |
| 12 | Low-quality parent-child relationships, low positive models of behaviour in the peer group and high classmate support | 12.6% |

Figure captions

Figure 1. Classification Tree Analysis with contextual factors as predictors of high and low SOC levels

