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Stressor experience negatively affects life satisfaction in adolescents: the positive role of sense of coherence

Unni K. Moksnes[1,2] · **G. Haugan**[1,2]

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Abstract
Purpose The aim of the present study was to investigate the association between different normative stressors, sense of coherence and life satisfaction separately for gender in Norwegian adolescents. The interaction effect of stress by sense of coherence in relation to life satisfaction was also investigated.
Methods The data are based on a cross-sectional sample of 1239 adolescents (13–18 years) from public elementary and secondary schools in Central Norway. Hierarchical multiple regression analysis was used to evaluate the association between stressors, sense of coherence and life satisfaction, separately for gender.
Results The results showed significant differences between genders, where boys reported higher scores than girls on sense of coherence and life satisfaction, whereas girls scored higher than boys on five of seven stressor domains. All stressors were significantly and inversely associated with life satisfaction in both genders; however, all associations were stronger for girls compared to boys. Sense of coherence showed a significant strong and positive association with life satisfaction, controlled for age and each individual stressor. A significant although weak interaction effect of stress related to romantic relationships by sense of coherence was found in association with life satisfaction for boys; the other interaction effects were nonsignificant in both genders.
Conclusion The results give support for a significant unique role of stressor experience and sense of coherence in relation to life satisfaction in both genders during adolescence, where the associations were especially strong in girls.

Keywords Subjective well-being · Quality of life · Youth · Life events · Stressors

✉ Unni K. Moksnes
unni.k.moksnes@hist.no

[1] Center for Health Promotion Research, Trondheim, Norway

[2] Faculty of Nursing, Sør-Trøndelag University College, Trondheim, Norway

Introduction

Adolescence is a developmental phase characterized by significant changes and challenges in virtually every aspect of an individual's life, calling for new psychological adaptations [1, 2]. This period of life generates varying amounts of potential stressors such as changes in responsibilities, higher school demands and challenges in interpersonal relationships (peers and family) [3, 4]. The present study focuses on adolescents' *perceived* stress. In line with the transactional view, stress is the condition that results when person–environment transactions lead the individual to perceive a discrepancy—whether real or not—between the demands of a situation and the resources of the person to cope adequately [5]. *Stressors* signify situations and pressures that cause stress [6]. Normative stressors refer to events that are experienced by most adolescents, usually within a relatively predictable timescale. Examples of these include pubertal development, psychosocial changes related to school, family, peers and academic demands [4]. Although exposure to normative stressors is considered a normal part of development, especially interpersonal stressors (e.g., peers, family, romantic relationships) represent a potential threat to adolescents' well-being and healthy development [7]. An increase in stress is

seen from preadolescence to adolescence, and girls seem to experience higher levels of stress and thus suffer more negative psychological health effects (symptoms of depression) than boys [7–9].

"Satisfaction with life" (LS) is considered an important construct/indicator for the understanding of adolescents' psychological well-being [10, 11]. LS is defined as a judgemental process, in which individuals assess the quality of their lives (QoL) on the basis of their own unique criteria [12, 13]. LS is not considered to capture a permanent trait of the respondent but something present and contextual that involves comparative processes between the individual's current life situation and internalized standards. The individual's perception of LS is regarded as a key indicator sensitive to the entire spectrum of functioning, mental health and coping [13].

Similar to adult populations, children and adolescents report their LS to be positive; still, LS tends to decline slightly with the onset and progression of adolescence [13]. Demographic variables such as age, gender and SE status give weak predictions of LS; however, previous research on gender differences has shown that boys report higher LS scores than girls [13, 14]. Previous studies have shown that high LS relates to a range of positive personal, behavioral, psychological and social outcomes, just as low LS is associated with increased stress, psychological and behavioral problems [10, 11, 13, 15].

Research on the role of LS in relation to stress is limited. However, along with major life events, chronic everyday stressors correlate negatively with LS [13, 15–17]. In the school context, increased feelings of academic stress and negative interaction with teachers are seen to be related to lower LS [15, 18–20]. LS correlates with a number of interpersonal factors in adolescents' lives, such as quality of parent and peer relationships [10, 13, 14]. Proctor et al. [11] found that adolescents with high LS compared to those with average or low scores had significantly higher mean scores on all vital life domains including school (e.g., academic aspirations and achievement, attitude to education), interpersonal (social stress, parental relations, peer relations, social acceptance) and intrapersonal (e.g., self-esteem, life meaning, gratitude). Although few studies have used the term "stressors" in association with LS, young people's negative evaluations of academic/school variables and interpersonal variables could be perceived as potential stressors in adolescents' lives [1].

The medical sociologist Aaron Antonovsky raised the question of why some people stay healthy despite major stresses and severe hardship while others do not [21]. The answer was formulated in terms of the salutogenic concept of sense of coherence (SOC). SOC is composed of three highly interrelated dimensions including *comprehensibility*, *manageability* and *meaningfulness*. Antonovsky viewed SOC as a dispositional orientation or a coping resource which reflects a person's capacity to respond to stressful situations and life events. The capacity to solve stressors and tension depends on the strength of an individual's SOC which is predicted by the individual's general resistance resources (GRRs, both material and non-material resources) [21–23]. The key factor is not only having the specific GRRs available but also being able to identify and use various resources for an intended purpose [22]. Individuals with a strong SOC will be confident that GRRs are available to meet the demands posed by stressful situations, and will thus consider a stressor to be more of a challenge than a threat [23]. Accordingly, Antonovsky perceived stress to be potentially health promoting. In line with this theory, adolescents with a strong SOC would when confronted with, for example, stress from academic pressure, perceive to have more GRRs available (e.g., social support from family and friends, and self-esteem) and would use these resources in order to cope successfully. From this perspective, SOC is seen as a coping resource, resolving stressors in a health-promoting manner.

Antonovsky [21] claimed that SOC develops during childhood and adolescence and becomes more or less stabilized in the period of early adulthood. A recent review [24] concluded with contradictory findings regarding gender and age differences in SOC during adolescence. While no gender differences were found in adolescents younger than 15 years, most of the studies involving adolescents 15–18 years reported higher levels of SOC in boys. The review also found SOC to be relatively stable during adolescence, at least for people with initially strong SOC [24]. However, some studies [22, 25] conclude that SOC seems to increase with age over the whole lifespan. The importance of SOC is underscored by decades of theory development and research supporting its link with mental health and QoL in both adolescent and adult samples [22, 25–27], as well as its positive association with LS in adults [28–30]. Nevertheless, studies are sparse on this particular subject among adolescents [31].

Previous studies have shown an inverse association between SOC and stressor experience in adolescence related to school [24, 32], home life and interpersonal stress with parents and peers [8, 18, 24]. SOC seems to have a stress-buffering role across different health outcomes [26, 33]; however, findings of the stress-moderating role of SOC in adolescent populations are less consistent. SOC is observed to exert a weak [34] or negligible role as a stress moderator related to subjective health complaints [35] and illness [36]. A recent study [18] revealed that SOC buffered the association between peer pressure stress and depressive symptoms. To the authors' knowledge, no studies have investigated SOC as a potential moderator of stress in relation to LS and potential gender differences in these

associations. Based on the present literature review, it seems plausible that SOC might play a moderating role for specific subtypes of stressors. Thus, distinguishing between different stress domains appears to be vital. The stress domains included in this study comprise normative stressors relevant in adolescents' daily life, using the Adolescent Stress Questionnaire [1, 18, 37]. The dimensions reflect stress of (1) teacher/adult interaction, (2) peer pressure, (3) home life, (4) romantic relationships, (5) school attendance, (6) school/leisure conflict and (7) school performance. Given that LS has been identified as a significant psychological factor associated with positive growth, health and well-being, generating a more thorough understanding of the associations between SOC, the different stress domains and LS might provide important guidelines for the reduction in stress, as well as bolstering SOC and LS in adolescents. Therefore, the aim of the present study was to investigate the associations between these specific stress domains, SOC and LS, and the potential stress-moderating role of SOC in relation to LS. The following hypotheses were proposed:

1. Stressors are significantly and inversely associated with LS, showing a stronger association for girls than for boys.
2. SOC is positively related to LS.
3. There are interaction effects of stressors by SOC in relation to LS.

Methods

Participants

Every fifth year since 1996, a school-based survey has been conducted based on a convenience sampling of adolescents living in rural areas in the Sør-Trøndelag County, Central Norway. This cross-sectional study uses data collected in 2011, including schools from inland to coastal areas in five of the county's 25 municipalities. A total of 1924 students from 12 public lower and upper secondary schools were asked to participate, and $N = 1289$ completed the questionnaire (response rate 67 %). Non-responses were mainly due to students being absent from schools when the questionnaire was administered, or students who declined to answer the questionnaire. No detailed information is available on students who did not fill in the questionnaire. Students <13 or >18 ($N = 50$) were excluded, leaving $N = 1239$ (64 %) with an age range of 13–18 years. The sample comprised of 634 (51.2 %) girls and 603 (48.7 %) boys (gender was not identified for two participants), and age was distributed as follows: 13 years: $N = 293$ (23.7 %); 14 years: $N = 247$ (19.9 %); 15 years: $N = 250$ (20.2 %); 16 years: $N = 180$ (14.5 %); 17 years: $N = 149$ (12 %); 18 years: $N = 120$ (9.7 %). The total sample mean age was 15.00 (SD = 1.62): for boys 14.99 (SD = 1.63) and for girls 15.02 (SD = 1.63).

Procedure

The data collection was approved by the Regional Committee for Medical Research Ethics and the Norwegian Social Science Data Services. The headmaster at each school approved to participate in the survey. The students and parents of students <16 years received a letter that briefly explained the purpose of the study, emphasizing that participation was voluntary and anonymous, that participants were free to withdraw at any time, and that the collected information was confidential. Written consent was claimed from all participants and additionally from parents when students were <16 years old. Questionnaire administration was completed in whole class groups during one regular school period of 45 min during autumn 2011.

Measures

Life satisfaction (LS) was assessed using the satisfaction with life scale (SWLS) [38]. The SWLS consists of five items, rated on a seven-point Likert scale, ranging from (1) *strongly disagree* to (7) *strongly agree*; a higher score indicates higher LS. The scale has been extensively used in adult samples [12] as well as among adolescents [39]. The internal consistency has been found to be high, generally exceeding Cronbach's α values of .80 [12, 39]. The Norwegian version is from Ed Diener's official webpage (http://internal.psychology.illinois.edu/~ediener/SWLS.html). Norwegian validations have supported a single-factor structure; the SWLS has been observed to be appropriate for use across a broad age range, including adolescence [40, 41].

Adolescent stress was assessed using the Norwegian version (ASQ-N) of the original Australian version of the Adolescent Stress Questionnaire (ASQ). The ASQ is a 56-item inventory originally designed to measure normative stressors that adolescents may experience in their daily life [1]. The ASQ allows adolescents to report the extent to which any recent stressor experience has constituted a psychological challenge for them. All items are rated on a five-point Likert scale, ranging from (1) *not at all stressful or is irrelevant to me* to (5) *very stressful*; a higher score indicates a higher stress level. Further validations of the ASQ-N have reduced the scale to a 30-item version which has been appropriately tested with reference to internal consistency and construct validity [37]. The 30-item instrument reflects the seven stress dimensions earlier mentioned in this paper.

Sense of coherence (SOC) was measured by the Norwegian 13-item short version of the 29-item Orientation to Life Questionnaire [21]. Each item is rated on a seven-point scale, where a higher score indicates stronger SOC [21, 42]. The questionnaire seems to be a cross-cultural valid and reliable instrument in both adult and adolescent samples [22, 42, 43] with Cronbach's α's ranging between .70 and .92 [42].

Statistics

All statistical analyses were carried out using SPSS, version 21.0 (SPSS, 2003). Internal consistency for each original dimension was examined by means of composite reliability; values $\geq$.60 are acceptable, whereas values $\geq$.70 are considered to be good [44, 45]. Sum scores were calculated for all scales (Table 1). Descriptive analyses including means and standard deviations were carried out for the continuous variables, using independent sample *t* tests to compare means between genders. To evaluate the strength of the gender differences on the continuous variables, effect sizes were calculated [46]. Some guidelines for the strength of effects are given [46]: small (.20), medium (.50) and large (.80+). Pearson's product–moment correlation was used to test bivariate associations between the variables separately for gender.

Multiple hierarchical linear regression analyses tested the associations between the independent variables of stress total score, each of the stressors, SOC and the dependent variable LS, controlling for age. Separate analyses were conducted for gender. The interaction effect of each stressor by SOC was also examined. The continuous variables in the interaction term were centered by calculating the mean score for each scale and subtracting the mean on each scale. The total stress score and each stressor were entered in separate analyses along with the SOC score, testing totally eight regression models. The independent variables were included in four steps in each analysis: (1) age, (2) stressor, (3) SOC and (4) stressor $\times$ SOC. *P* values $\leq$.05 were considered statistically significant.

Results

Descriptive statistics

Composite reliability for the scales indicated good internal consistency, with values ranging between .71 and .87 (Table 1). Table 1 presents the means and standard deviations for all measures separately for gender. Independent sample *t* tests showed that boys reported significant higher mean scores on LS and SOC, whereas girls scored significantly higher on all the seven stress domains, except from stress of teacher/adult interaction and stress of romantic relationships.

Table 2 lists the correlations separately for gender. The correlations between the stressor domains were significant, positive and moderate in both genders. There were significant strong and positive correlations between SOC and LS, and significant strong and negative correlations were found between all stressor domains and each of SOC and LS for both boys and girls.

Regression analysis

Table 3 presents the results from the separate hierarchical multiple regression analyses, investigating the association between age, the total sum of stress, the separate stress

Table 1 Gender differences on life satisfaction, stress and sense of coherence

	Mean (SD)		Composite reliability	Range	*t* value	Cohen's *d*
	Girls	Boys				
Satisfaction with life	22.29 (5.99)	24.00 (6.15)	.87	5–35	4.63***	.28
SOC	57.17 (12.41)	62.15 (12.16)	.85	13–91	6.67***	.44
Teacher/adult interaction	7.83 (4.14)	7.37 (4.08)	.73	4–20	1.87	.11
Peer pressure	12.00 (5.06)	9.87 (4.69)	.83	5–25	7.42***	.44
Home life	8.40 (4.04)	7.47 (3.68)	.86	4–20	4.06***	.24
Romantic relationships	7.70 (4.88)	7.78 (4.57)	.86	4–20	.30	.02
School attendance	8.69 (3.57)	8.21 (3.57)	.71	4–20	2.28*	.13
School/leisure conflict	11.04 (4.35)	9.67 (4.28)	.72	4–20	5.33***	.32
School performance	10.71 (4.10)	9.30 (3.85)	.84	4–20	6.00***	.35

Composite reliability $\rho c = \frac{(\sum \lambda)^2}{(\sum \lambda)^2 + \sum(\theta)}$

Cases are excluded pairwise

*** $p \leq .001$

Table 2 Correlations between the variables in the study separately for gender

	SWL	SOC	TAI	PP	HL	RR	SA	SLC	SP	Age
Satisfaction with life (SWL)	–	.63**	−.26**	−.39**	−.42**	−.14**	−.37**	−.24**	−.35**	−.01
Sense of coherence (SOC)	.62**	–	−.31**	−.43**	−.46**	−.18**	−.45**	−.33**	−.45**	−.04
Teacher/adult interaction (TAI)	−.08	−.19**	–	.69**	.56**	.53**	.66**	.57**	.57**	.09*
Peer pressure (PP)	−.20**	−.34**	.69**	–	.64**	.54**	.59**	.59**	.61**	.03
Home life (HL)	−.22**	−.31**	.57**	.71**	–	.39**	.62**	.51**	.59**	.10*
Romantic relationships (RR)	−.12**	−.25**	.56**	.62**	.52**	–	.40**	.33**	.33**	.15*
School attendance (SA)	−.22**	−.30**	.66**	.64**	.64**	.51**	–	.61**	.70**	.13**
School/leisure conflict (SLC)	−.02	−.16**	.58**	.64**	.58**	.44**	.61**	–	.70**	.20**
School performance (SP)	−.16**	−.27**	.55**	.58**	.59**	.35**	.71**	.65**	–	.21**
Age	−.19**	−.09*	−.05	−.03	.01	.01	.02	−.04	.09*	–

Correlations for boys are below the diagonal, and correlations for girls are above the diagonal

** $p < .01$

Table 3 Summary of the hierarchical regression analysis for variables predicting life satisfaction separately for boys and girls

Step		Satisfaction with life					
		Girls			Boys		
		β	ΔF	ΔR^2	β	ΔF	ΔR^2
1	Age	−.00	.01	.00	−.18***	16.56***	.03
2	Stress total	−.40***	101.68***	.15	−.19***	17.84***	.04
2	Teacher/adult interaction (TAI)	−.26***	39.29***	.07	−.09*	4.24*	.01
2	Peer pressure (PP)	−.39***	100.01***	.15	−.22***	23.77***	.05
2	Home life (HL)	−.42***	59.89***	.18	−.23***	26.06***	.05
2	Romantic relationships (RR)	−.14**	10.06**	.02	−.13**	8.15**	.02
2	School attendance (SA)	−.37***	85.79***	.13	−.23***	27.20***	.05
2	School/leisure conflict (SLC)	−.25***	34.42***	.06	−.04	.68	.00
2	School performance (SP)	−.37***	83.35***	.13	−.16***	13.03***	.03
3	SOC (Stress total)	.57***	240.67***	.25	.61***	259.23***	.33
3	SOC (TAI)	.60***	296.74***	.33	.61***	280.37***	.36
3	SOC (PP)	.56***	231.88***	.25	.60***	250.08***	.32
3	SOC (HL)	.54***	127.57***	.23	.59***	248.49***	.32
3	SOC (RR)	.62***	334.18***	.37	.61***	274.24***	.35
3	SOC (SA)	.58***	239.46***	.26	.59***	248.05***	.32
3	SOC (SLC)	.61***	298.24***	.33	.62***	291.69***	.37
3	SOC (SP)	.58***	240.02***	.26	.61***	265.95***	.34
4	Stress total × SOC	.04	1.03	.00	.05	1.65	.00
4	Teacher/adult interaction × SOC	.02	.37	.00	.02	.45	.00
4	Peer pressure × SOC	.04	1.10	.00	.05	1.93	.00
4	Home life × SOC	.05	2.05	.00	.04	1.27	.00
4	Romantic relationships × SOC	−.01	.03	.00	.08*	4.71*	.01
4	School attendance × SOC	.00	.01	.00	.05	1.70	.00
4	School/leisure conflict × SOC	.03	.97	.00	−.00	.01	.00
4	School performance × SOC	.00	.01	.00	.01	.02	.00

Cases excluded listwise

SOC sense of coherence

* $p \leq .05$; ** $p \leq .01$; *** $p \leq .001$

domains and SOC, and the dependent variable LS. First, a nonsignificant association of age with LS was found for girls, while age was negatively and significantly associated with LS for boys. However, the age variable did not explain much variance in LS. In the second step, a significant and inverse strong association was found between total sum stress and LS for girls controlled for age. The same association was also significant and negative for boys; meanwhile, the β-coefficient was twice as strong for girls ($\beta = -.49$) as for boys ($\beta = -.19$). All the stressor domains made a significant increment to the model for both genders controlled for age. In girls, stress of home life was most strongly related to LS ($\beta = .42$), followed by stress of peer pressure ($\beta = -.39$), school performance ($\beta = -.37$) and school attendance ($\beta = -.37$). In boys, stress of home life ($\beta = -.23$) and stress of school attendance ($\beta = -.23$) were strongest related to LS ($\beta = -.23$), followed by stress of peer pressure ($\beta = -.22$). Stress of school/leisure conflict was nonsignificant in association with LS for boys. In both genders, SOC showed a strong, positive association with LS in all regression models when controlling for age and each stressor domain (β-coefficients ranging between .54 and .62 in girls and between .59 and .61 in boys). A significant interaction effect was found of stress of romantic relationships $\times$ SOC for boys, showing that the strength of the association between perceived stress of romantic relationships and LS depends on the level of SOC. However, the β-coefficient of the interaction effect was .08, indicating a weak moderating effect of SOC on the association between stress and LS.

Discussion

This paper furthers our understanding of the role of stressor experience in association with LS in adolescents 13–18 years, as well as the impact from SOC in relation to stressor experience and LS. In line with the first hypothesis suggesting a negative association between stressor experience and LS, especially in girls, the results revealed that both total sum stress and the majority of the different stress domains were negatively related to LS, controlled for age in both genders. The stressors related to home life and peer pressure, followed by stressors related to school performance and school attendance showed the strongest associations with LS in both genders. However, the standardized beta coefficients were considerably stronger for girls than for boys. The second hypothesis proposing a positive association between SOC and LS was supported, where SOC was strongly associated with LS in both genders controlled for age and each unique stressor domain. Weak support was found for the third hypothesis implying that SOC would moderate the association between stressors and LS. The majority of the interaction effects of each stressor by SOC were nonsignificant in both genders; however, a significant interaction effect of stress of romantic relationship by SOC was found in boys.

Adolescence is a period of change and transition. Consequently, it brings a large number of potential normative stressors such as changes in responsibilities, increased school demands and challenges in interpersonal relationships [18, 37]. The present findings of a negative association between stressors and LS are in line with related studies showing that the experience of cumulative and simultaneous stressors, especially those in an interpersonal context, significantly affects emotional well-being, particularly in girls [7–9, 47].

Regarding the role of interpersonal stressors, the importance of peers, friends and romantic relationships increases during adolescence; however, the form and function of relationships may vary between gender and across development. Whereas female peer relationships and friendships tend to be characterized by high levels of self-disclosure, intimacy and emotional support, male peer relationships and friendships are often based on companionship and joint activity [48, 49]. Because of girls' reliance on peers for emotional support and intimacy, the disruptions in social networks and the shifts in interpersonal roles that often accompany the transition into adolescence are likely to create higher levels of stress within female than male relationships [9, 49]. Further, adolescence may be a time of heightened stress within parent–child relationships, notably in girls, owing to a potential mismatch between the adolescents' perception of increased autonomy from parents along with parents' restrictions to grant this autonomy. Given the increasing significance of social relationships along with increased autonomy from parents, difficulties in adjusting to these changes and the perception of conflict in social relationships may be perceived as stressful, affecting adolescents' LS [10, 15].

Experiences in the school context are prominent for adolescents' LS [10, 32]. As teenagers make the transition to a higher school level, they might perceive the academic demands as more competitively stressful and put greater emphasis on academic achievement, which can impact negatively on adolescents' psychological health and well-being [1, 50]. Support for the role of LS in relation to stress of school performance is sustained by related findings showing that high LS is positively associated with cognitive engagement, academic achievement and perceived academic competence [11, 51–53]. Moreover, increased negative attitudes toward school and teachers have been found to be related to lower LS [15, 19, 20]. The transactional view of stress comprehends that the individual's cognitive judgment of a stressor along with perceived available resources is fundamental for the impact of the

stressor and the response taking place, affecting the individual's health and well-being. These processes involve adjustments and interactions between the individual and the environment and involve behavioral, cognitive and emotional strategies. Hence, the number of stressors, the timing and synchronicity of events are all key features of any one's experience [5, 7, 9].

The positive associations found between SOC and LS in the present study find support in previous studies among adult samples [28–30]. The same association has been found in adolescents [31]; however, to the authors' knowledge, no studies have investigated this association controlling for relevant stressor domains in adolescents' daily life. The present findings are also in line with previous studies showing that a strong SOC is associated with positive mental health and QoL in both adults and adolescents [25–27]. The present study showed gender differences on SOC, where boys scored higher than girls. The SOC mean scores are comparable with previous findings of studies investigating adolescent gender differences on SOC [18, 24, 31, 54]. The development of SOC is a lifelong process [22], likely to vary during the adolescent period. Finding explanations for the gender differences found is not easy, but the present findings and previous studies [7, 9, 18, 48, 49] indicate that girls in some areas are found to adjust more negatively to stressors which may lead to a feeling of personal inadequateness and psychological ineptness. These aspects may contribute to explaining why girls experience life as less coherent than boys.

Interestingly, this study disclosed that in boys, the impact from stress of romantic relationships in relation to LS was weaker for those with stronger SOC than for those with weaker SOC. Antonovsky suggested that individuals with strong SOC have an overall broader set of internal and contextual resources (e.g., being more aware of emotions, more open in describing them and less threatened by them, social support), which can be used to manage tension related to potential stressors, in this context being in a romantic relationship [21, 22, 26]. However, the moderation effect did not explain much of the variance in LS. Thus, it seems unreasonable to overstate the substantive significance of the present moderation effect. Explaining the nonsignificant moderation effects is not straightforward. Statistically, it can partly be explained by a lack of statistical power and amplification of measurement error. Theoretically, it could possibly be explained by the generality of the SOC construct. As SOC is not a particular coping style, SOC may moderate stress through domain-specific beliefs about response outcomes, which may be affected by a host of other situational factors. Griffith and colleagues [23] concluded that in SOC terms, dealing with relationship-oriented problems is distinct from dealing with non-relationship-oriented problems, highlighting the possibility that a strong SOC may not be applied with equal effectiveness to all challenges in people's lives [23]. Previous studies have displayed inconsistent findings regarding SOC's role in stress moderation in adolescents [18, 34, 36].

The present study gives support for the view that salutogenic factors represented by SOC have positive implications in relation to LS in adolescents, despite adolescents' experience of stressors in daily life. The results provide insight into the importance of increasing adolescents' awareness of their potential, their internal and external GRRs and their ability to use and benefit from them in order to increase their SOC [21, 36, 42]. Over a period of time, individuals with a strong SOC are more likely to cope adequately and experience shorter periods of harmful tension associated with potential negative stressors, leading toward higher LS [55]. High LS may also actively foster other resources such as self-esteem, self-efficacy, hope and social support, which further may strengthen adolescents' LS [10, 11, 13].

The inverse associations found between the school stressors (school performance and school attendance) and LS underpin the importance of promoting adolescents' coping in the school context. A supportive and positive school climate along with motivating and good learning conditions might support students' coping [55]. Furthermore, when confronted with interpersonal stress in the family and the peer context, LS seems more strongly affected among girls than among boys. Accordingly, gender-specific strategies aimed at strengthening specific resources relevant for coping with interpersonal stress are required. Such strategies should involve family, after-school programs and the local environment to integrate important setting that adolescents are part of. Specifically, parents need to be in close dialogue with their child and being seen as crucial actors in relation to their children's development. Systematic approaches aiming to reduce high levels of negative stress, as well as to develop and strengthen adolescents' GRR, will potentially facilitate positive developmental outcomes and LS in adolescence.

Limitations

All findings were based on self-reports and therefore subjected to potential self-reporting bias. First, self-reports require that adolescents are at a level of cognitive development where they are able to reflect and understand concepts of health and illness. Second, there is a challenge regarding the adolescents' ability to evaluate and report reliably on feelings and complaints through self-report (e.g., social desirability). This can especially be relevant in the youngest ones where the abstract concepts might be difficult to reflect over and therefore be subject to over- or under-reporting. However, the study of Haugland and

Wold [56] concluded that adolescents 14–16 years are able to evaluate and give reliable information about their subjective health by use of questionnaires.

The response rate of the present study was 67 %, and no information was obtained on students who declined to participate, something which limits the generalizability of the findings. Nevertheless, the large sample size can partially protect against the influences of potential random error related to self-reporting [57]. Moreover, the cross-sectional design does not allow for conclusions regarding causality. A longitudinal design would have strengthened this study by allowing changes to be assessed and compared over time.

Conclusion

This study revealed significant inverse associations between all stressor domains and LS in both genders, except from stress of school/leisure conflict. All of these associations were stronger in girls than in boys, especially the stressors related to peer pressure, home life, school performance and school attendance. Moreover, SOC was strongly, significantly and positively associated with LS controlled for age and each unique stressor domain. A significant, weak interaction of stress of romantic relationships by SOC was found in boys, providing a weak support for SOC as a moderator of the stress–LS relationships. Thus, the present research provides support for SOC and stressor domains as strongly and independently associated with LS in both genders. These results support the idea that SOC represents a salutary resource in relation to LS despite stressor experience in adolescents. Longitudinal studies focusing on associations between stress, SOC and LS are suggested to investigate the causality of the results.

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