AKADÉMIAI KIADÓ

Validation and psychometric properties of the sense of coherence scale in a Hungarian child and adolescent sample

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RESEARCH ARTICLE

ABSTRACT

Sense of coherence (SOC) is a relevant contributor and predictor of the individuals' mental and physical health. There are a number of studies about SOC, but only two validation articles of the sense of coherence scale (SOCS) were found on adolescents and none on children. The aim of this research was to validate the SOC scale in youth under 18. We hypothesized that younger children and children without psychiatric problems will have higher SOC than older ones, and children with psychiatric symptoms. We also wanted to examine the factor structure of both the 13 and the 29 item versions of the scale to study which is more valid in child and adolescent population. 199 children and 198 adolescents were included in the study; the mean age was 14.3 (SD 2.1) years. The sample included average youth from schools and youth under psychiatric treatment. Strength and Difficulties Questionnaire (SDQ) and Inventory of Life Quality (ILK) were used for validation of the SOCS. SOCS-13 was applied to compare SOC of children and adolescents. Children had higher SOC than adolescents in both samples. Males had higher SOC than females in children but not in adolescents. Psychiatric and behavioral symptoms were associated with a lower SOC regardless

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of age. Confirmatory factor analysis proved a three-factor structure model for both the 13 and the 28 item versions of the SOCS. The short form of the sense of coherence scale is valid and reliable to be used with children and adolescents from 10 to 18 years of age.

INTRODUCTION

One of the most prominent theoretical approaches that explain how to improve health in general is Salutogenesis. It is considered nowadays as an umbrella concept under which protective factors can be used as instruments to analyze and increase the quality of life (QoL). The cornerstone concept of Salutogenesis is the sense of coherence (SOC) which is "a global orientation, a pervasive feeling of confidence that the life events one faces are comprehensible, that one has the resources to cope with the demands of these events, and that these demands are meaningful and worthy of engagement" (Antonovsky, 1987, p.19).

Acquired through life experiences, SOC is also understood as a personality trait comprising three sub-components. Comprehensibility refers to the cognitive component meaning the way that the individuals perceive the internal and external world as structured rather than chaotic which help the individual to cope with it. Manageability refers to the instrumental aspect, the degree that one feels that there will be resources to solve the issues of life. Meaningfulness is the motivation to invest energy to overcome the challenges to be faced (Antonovsky, 1979, 1987).

SOC is widely recognized as a relevant contributor and predictor of the individuals' mental and physical health regardless of sex, age, nationality, ethnicity or design of study (Eriksson & Lindström, 2007). SOC was found to be associated with lower levels of stress, depression and anxiety (Schnyder, Buechi, Sensky, & Klaghofer, 2000) and enhanced psychological wellbeing (Pallant & Lae, 2002). Kouvonen et al. (2010) conducted a prospective cohort study on adults in which an initial strong SOC was associated with 40% lower risk of psychiatric morbidity 19 years later measured by hospital admission for psychiatric disorder, attempted or completed suicide. Longitudinal researches showed predictive validity of the SOC for better QoL (Eriksson & Lindström, 2007). A strong relationship was found between SOC, mental and physical health in patients with chronic illnesses in both adult (Galletta et al., 2019) and adolescent populations (Apers et al., 2013). The SOC has been also associated with the educational track (Kristensson & Öhlund, 2005), with perceived stress and subjective health complaints related to school (Jellesma, Rieffe, Terwogt, & Kneepkens, 2006). SOC may act as a school-stress preventive strategy and moderator in situations in which subjective health complaints are associated with perceived stress in school. Strong levels of SOC are usually associated with less symptoms and distress not only in adults but adolescents as well. Several researchers found SOC a significant predictor of adolescent mental health and psychiatric diagnosis (eg. Carlén et al., 2020; Moksnes & Espnes, 2020).

In contrast, individuals with a weak SOC are predicted to be less able to cope effectively with daily problems of life (Antonovsky, 1993). Jellesma et al. (2006) examined 8–13 years old children

with many somatic complaints and found that sadness and low SOC differentiated them from children with few complaints. Adults diagnosed with Panic Disorder, Generalized Anxiety Disorder, or Major Depressive Disorder or having increased suicidal risk reported lower levels of SOC compared to participants without mental disorders (Paika, Ntountoulaki, Papaioannou, & Hyphantis, 2017). Ristkari, Sourander, Ronning, and Helenius (2006) found in a sample of 18-year-old males that SOC was more sensitive to diagnosed psychiatric disorders such as emotional disorders, delinquency, antisocial personality disorder than self-reported psychiatric symptoms. Studying the effect of COVID-19 pandemic Jung, Kneer, and Krüger (2020) found poor subjective coping and lower SOC in participants with pre-existing mental illness.

There are a number of studies on different adolescent samples, e.g., average population (eg. Modin, Östberg, Toivanen, & Sundell, 2011), physical illness (Apers et al., 2013), depressed youth (Blom, Serlachius, Larsson, Theorell, & Ingvar, 2010). In a review by Eriksson and Lindström (2007) post-traumatic stress disorder, anxiety, anger, hostility and hopelessness were strongly and negatively associated with SOC. Research on SOC in children is scarce even though it would be highly relevant based on the association of SOC and well-being found in adults and adolescents.

According to the review by Eriksson and Lindström (2005) SOC tends to increase along the whole life span. There are contradictory results in the literature for adolescent populations. Riveira, Garcia-Moya, Moreno, and Ramos (2012) analysed 68 studies and concluded that there was stronger support for the stability of SOC in adolescence. Other researchers investigating age-related differences found that older adolescents showed lower levels of SOC than younger ones (Buddeberg-Fisher, Klaghofer, & Schnyder, 2001; Moksnes, Espnes, & Lillefjell, 2012; Räty, Larsson, Söderfeldt, & Larsson, 2005). We found no studies comparing age-related changes in SOC in children to adolescents.

There are also sex-related differences in SOC. Female adolescents had lower SOC, more somatic and internalizing problems, were more withdrawn, self-destructive, and depressed compared with males (Räty et al., 2005). Riveira et al. (2012) conducted a combined analysis of the effect of sex and age on SOC and found no gender differences in adolescents younger than 15 while males had significantly higher SOC in groups aged 15–18 years.

MEASUREMENT OF SOC

Antonovsky created two different scales to measure SOC. The 29-item version, originally designated as Orientation to Life Scale (SOCS-29, Antonovsky, 1987) has received remarkable attention with researches supporting its reliability, validity and usefulness. The 13-item short version (SOCS-13) was created for its shorter administration time. Researches using SOCS-29 and SOCS-13 support the validity of the scales in adult populations (Feldt, Leskinen, Kinnunen, & Mauno, 2000; Mahammdzadeha, Pursharifi, & Alipour, 2010; Pallant & Lae, 2002). The intercorrelation between SOCS-13 and SOCS-29 was high (Eriksson & Lindström, 2005). Both scales were translated to several different languages, and have been used in different populations. Even though there are several studies using the SOC scales in adolescents, only a few of them were conducted specifically with young children and adolescent psychiatric populations. Only two validation studies of the SOCS-13 were found in adolescents (Lim, Oh, & Yeom, 2021; Moksnes & Haugan, 2013) and none in children.

Since the knowledge about SOC is continually growing, it is crucial to have reliable and valid measures for different populations, especially those difficult to assess. Considerable

literature suggests that improving SOC of children and adolescents may also enhance their QoL. Furthermore, a sound SOC in youth might be a strong protective factor against mental health problems. Therefore, the assessment of SOC under 18 years of age requires reliable and valid measures.

Antonovsky reviewed and summarized the research on the feasibility, reliability and criterion validity of SOCS and concluded that SOCS better fitted a one-dimensional model (Antonovsky, 1993). Comprehensibility, manageability and meaningfulness are actively interrelated, were developed to assess SOC as a global orientation and should not be measured separately (Antonovsky, 1987, 1993). In spite of the original idea, the latest researches proposed a complex and multidimensional construct of SOC rather than a single factor (Eriksson & Lindström, 2005). Studies on adolescent populations supported a three-factor solution (Lim et al., 2021; Moksnes & Haugan, 2013).

There have been two validation studies of the Hungarian version of the SOCS previously, both on adult populations. SOCS-29 was translated and validated by Jeges and Varga (2006). SOCS-13 was studied by Balajti, Vokó, Ádány, and Kósa (2006). The second study identified a 3-factor solution explaining 56% of the variance. No studies were published on Hungarian children or adolescents previously.

Since there is no validated instrument at present to study the sense of coherence of children under 14 years of age, our aim was to validate SOCS-13 in this age group. Further, we compared the SOC of children and adolescents as well as the scores of school and psychiatric samples with this instrument. We hypothesized that younger children and children from school without psychiatric problems will have higher SOC than older ones, and children with psychiatric symptoms. Both the 13 and the 29 item scales are used with adolescents in the literature. Children and adolescents with poor SOC may require more elaborate support and teaching in order to achieve the educational goals and a healthy lifestyle. By offering reliable instruments to access the SOC it may be possible to identify these individuals. Our last aim was to examine the factor structure of both versions of the scale to study which is more valid in child and adolescent population.

The purpose of the study is to examine whether SOCS is a valid and reliable instrument to be used with children and adolescents. We also wanted to compare the sense of coherence of children and adolescents under psychiatric care to an average sample of youth. Finally, we aimed to clarify whether SOCS was better fit in a one single factor or a three-factor solution. Specific research questions were the following:

- Is SOCS-13 a valid and reliable instrument to be used to assess the sense of coherence of children and adolescents?
- Is SOC of a psychiatric youth sample different from an average school sample?
- Which SOC concept was better fit, a unidimensional SOCS model or a three-factor solution?

METHODS

Participants

The sample was composed of 397 subjects, their age ranged from 10 to 18 years; mean age was 14.3 (SD 2.1) years. Part of the sample ($N = 272$) was recruited from elementary, vocational and

high schools in Szeged, Hungary and the other 38.6% ($N = 125$) were collected from patients of the Child and Adolescent Psychiatric Unit of Szeged University, Hungary with the purpose of enriching the sample with youngsters who have psychological problems. Data was collected simultaneously for the psychiatric and the school group. For the psychiatric sample data was collected from April 2019 to March 2021. For the school sample data was collected from January 2021 to June 2021.

There were 199 children and 198 adolescents; the cut-off between the two age groups was established by elementary vs high school attendance (ages 14–15 years). Youth and parents were given information about the study and agreed to participate by signing the consent form. Inclusion criteria were studying in fifth grade or above in school and normal intelligence. The psychiatric sample completed the questionnaires in paper-pencil format, the school sample answered questions on-line due to COVID restrictions. Prior to conducting the study, the approval of the Institutional Review Board of the University of Szeged was obtained. Confidentiality and anonymity were carefully protected and ensured during all stages of the study.

For the psychiatric group, initially the head of the Child and Adolescent Psychiatric Unit of Szeged University was informed and the consent for the research was obtained. Parents and youth attending the in- or outpatient child and adolescent psychiatry clinic were informed about the ongoing research and invited to participate. Youth and parents who agreed to participate were asked to sign the consent form and received the questionnaires to answer.

For the school group, the head of every school was contacted and informed about the research. After the consent of the principal was obtained, written information about the research with contact information of the researchers was sent home with the children. Youth and parents who agreed to participate were asked to sign the consent form and following that received the link to complete the questionnaires. Parents and children received separate links.

Instruments

1. Sense of Coherence Scale (SOCS)

Children completed the 13-item version; adolescents completed the 29-item version of SOCS. The response alternatives were on a Likert scale from 1 to 7 points. Scores for SOCS-29 range between 29 and 203 points, scores for SOCS-13 range between 13 and 91 points, higher scores indicate stronger SOC. Literature shows good reliability data for both scales on adult populations (internal consistency of SOCS-29 was between 0.82 and 0.95 (Antonovsky, 1987, 1993)), (internal consistency of SOCS-13 ranged from 0.70 to 0.92, test-retest reliability scores were between 0.69 and 0.72 (Eriksson & Lindström, 2005)). In order to compare adolescents to children, the 13 items of SOCS-13 were extracted from SOCS-29.

2. Strength and Difficulties Questionnaire (SDQ)

SDQ is a brief behavioral screening questionnaire used for children and adolescents 11–18 years old (Goodman, 2001) which consists of 25 items. Total problem score is calculated by adding the four problem subscales which are emotional symptoms, behavioral problems, hyperactivity/inattention and peer relationship problems; it ranges from 0–40 with lower scores meaning less problems. Reliability of SDQ in the present study was in the acceptable range; Cronbach α for children was 0.72, for adolescents was 0.70.

3. Inventory of Life Quality (ILK)

The Inventory of Life Quality is a self-report scale which measures QoL in healthy, as well as in psychologically ill children and adolescents from 6 to 18 years old (Matttejat & Remschmidt, 1988). The instrument inquiries about satisfaction in 7 areas of life: school, family, social contact with peers, time spent alone, physical and mental health and health in general. Each item is rated on a 1–5 Likert scale, scores range from 0 to 28 points, higher numbers represent better QoL. Earlier results of the ILK validation in Hungary showed acceptable internal reliability (Cronbach alpha: 0.66 in children, and 0.73 in adolescents) (Kiss et al., 2007).

All questionnaires were completed by children and adolescents about themselves.

Statistical analysis

Demographic variables were compared between children and adolescents. Mean scores and standard deviations were calculated separately in the two age groups. Due to the nonparametric distribution of the scale variables, Mann-Whitney test was used to compare children and adolescents on SOC, QoL and emotional/behavioural problems. Internal consistency was measured by Cronbach alpha which is acceptable between 0.7 and 0.95 (Tavakol & Dennick, 2011). Pearson product-moment correlation was used to test bivariate associations between SOC and psychological/behavioural symptom groups.

Confirmatory factor analysis (CFA) was performed to examine the fit of the original 3 factor models and the unidimensional models of SOCS-13 and SOCS-29 on both child and adolescent samples. Due to the non-parametric distribution of the variables, we used a robust estimator (the maximum likelihood estimation with robust standard errors and a mean- and variance adjusted, MLMV) for CFA, which appropriately corrects for the standard errors of the parameters. The following indices were calculated to evaluate the model fit and the recommended criteria were adopted: chi-square (χ^2). degree of freedom (df), χ^2/df (<5.0) (Tabachnick, 2007), root mean square error of approximation (RMSEA <0.06), comparative fit index (CFI >0.95 good, >0.90 acceptable), Tucker-Lewis Index (TLI >0.95 good >0.90) (Hu. 1999).

The following softwares were used for the statistical analyses: IBM SPSS 25 and 27 (Apache Software Foundation. USA) and MPlus 6.12 (Muthen and Muthen. USA).

Results

Sample description is shown in Table 1. Significant difference was found between the two age groups in sex distribution, divorce rate of the parents and being under psychiatric care.

SOCS-13 and ILK scores were significantly higher, while SDQ showed lower scores for children, compared to adolescents (Table 2). Similar differences were found between the school sample and youth under psychiatric care. Children and adolescents without psychological and behavioral problems had higher SOCS-13 and ILK scores and lower SDQ scores than the other group. Children in the school sample showed the highest while adolescents under psychiatric care the lowest comprehensibility, manageability and meaningfulness scores of the SOCS-13.

Males had higher SOC scores than females in the whole sample (mean SOCS-13 males: 59.8, sd 13, females: 53.6, sd 16.2, $P < 0.000$). When the two age groups were examined separately, significant sex difference was present only in children (mean SOCS-13 males: 62.4, sd 12.4, females: 57.4 sd 16.2, p: 0.004) but disappeared in adolescents (mean SOCS-13 males: 54.2, sd 12.8, females: 50.6 sd 15.7, p: 0.186) (Fig. 1).

Table 1. Description of the whole sample, children and adolescents separately

	Child mean (SD)	Adolescent mean (SD)	P	All sample mean (SD)
Subjects' age (years)	12.6 (1.3)	16.1 (1.2)	0.000	14.3 (2.1)
	N (%)	N (%)	p	N (%)
Females	83 (53.9)	105 (76.1)	0.00	188 (64.4)
Parents' divorced	45 (29.6)	62 (45.3)	0.006	107 (37)
Average income				
below average	10 (6.6)	18 (13.4)	ns	28 (9.8)
average	125 (82.8)	100 (74.6)		225 (78.9)
above average	16 (10.6)	16 (11.9)		32 (11.2)
Psychiatric care	55 (33.1)	70 (44.3)	0.039	125 (38.6)

Table 2. Means and standard deviations of test scores with significances in the whole sample, children and adolescents separately

	Children mean (SD)		Adolescents mean (SD)		School ch vs adol P	Psychiatry ch vs adol P
	School	Psychiatry	School	Psychiatry		
SOCS 13	62.3 (12.8)	52.4 (15.6)	54.2 (14.3)	48.3 (15.1)	0.00	0.13
SOCS-13 Compr	23.2 (5.8)	19.5 (6.4)	18.9 (5.9)	17 (6)	0.00	0.02
SOCS-13 Manag	18.4 (4.7)	15.9 (5.7)	17 (5.2)	15.3 (5)	0.04	0.53
SOCS-13 Mean	20.7 (4.4)	17 (5.7)	18.4 (5.4)	15.9 (5.9)	0.00	0.33
SDQ	10.3 (4.8)	16.4 (6.2)	12.8 (5.4)	16.5 (6.1)	0.001	0.95
ILK	12.7 (3.2)	17.7 (4.6)	14.4 (4.5)	19.2 (4.9)	0.003	0.08

Note: SOCS13: Sense of coherence scale, SDQ: Strength and difficulties questionnaire, ILK: quality of life scale, Compr: Comprehensibility, Manag: Manageability, Mean: Meaningfulness, ch: children, adol: adolescent.

RELIABILITY

Internal consistency

SOCS-13 showed good reliability in both child and adolescent groups (0.872 and 0.886, respectively). Subscales for adolescents (Comprehensibility 0.73, Manageability 0.773, Meaningfulness 0.802) had higher internal consistencies but they were also in the acceptable range for children (Comprehensibility 0.719, Manageability 0.667, Meaningfulness 0.759). SOCS-29 was examined only in adolescents; it showed excellent reliability (Cronbach alpha 0.936). Internal consistency was also good for all three subscales of SOCS-29 (Comprehensibility 0.824; Manageability 0.855, Meaningfulness 0.889).

Test-retest reliability

A subsample of the original sample ($N = 78$) completed the SOC scale a second time. Test-retest time was 154 days (SD 53) on average. Retest time was shorter for adolescents than for children (120 vs 195 days). Pearson correlation coefficient for SOCS-13 was 0.692 for the whole subsample, 0.562 for children and 0.794 for adolescents.
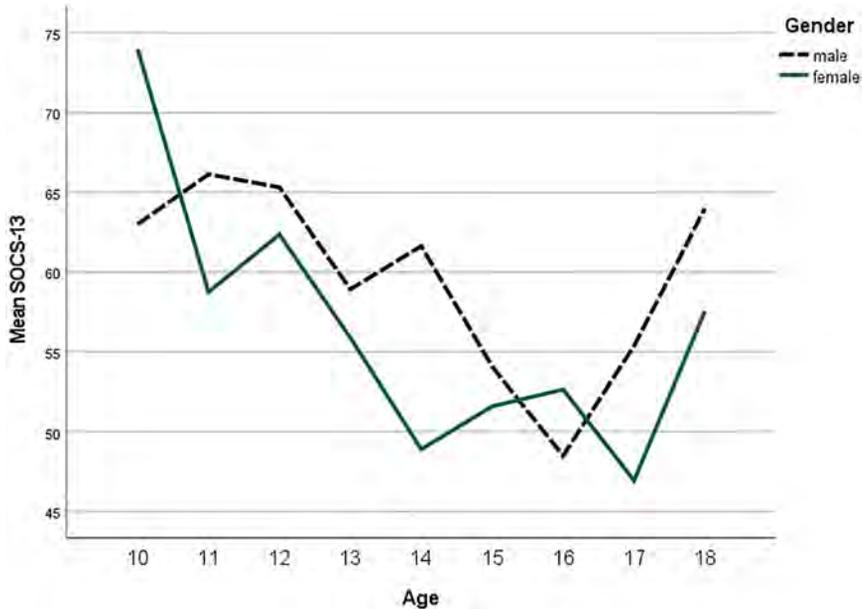
Fig. 1. SOCS-13 mean scores by age and gender

Convergent validity

Convergent validity measures the association between the construct and similar measures. Since there is a strong association between SOC and QoL (Eriksson & Lindström, 2005, 2007), we used the ILK scale for validity measure. Results showed a strong positive correlation between the two test scores for the whole sample (Pearson r: 0.712, $P = 0.000$) and for children and adolescents separately (Pearson r: 0.624, $P = 0.000$; Pearson r: 0.762, $P = 0.000$, respectively). Every 1-point increase in SOCS-13 resulted in 2.2 (95% CI 1.96, 2.44) point increase in ILK score.

Discriminant validity

It has been shown that behavioral and mental problems have a negative effect on SOC (Jellesma et al., 2006). Therefore, we compared SOCS-13 to SDQ. Results showed a strong negative correlation for the whole sample (Pearson r: -0.739, $P = 0.000$) and also for both age groups (children: Pearson r: -0.642, $P = 0.000$; adolescents: Pearson r: -0.81, $P = 0.000$). Every 1-point increase in SOCS-13 resulted in 1.86 (95% CI -2.04, -1.67) point decrease in SDQ.

Comparison of average and psychiatric sample

The most frequent clinical diagnosis in the psychiatric sample was emotional disorder (79.8%) and anxiety disorder (35.5%). ADHD was present in 8.1%, conduct disorder in 3.8%, eating disorder in 2.5%.

SOCS-13 clearly and significantly differentiated between average children/adolescents and youth under psychiatric care. Children in the school sample had higher SOCS-13 scores than in

the psychiatric sample (mean SOCS-13: 62.6, SD 12.7; 53.2, SD 15.6, $P < 0.000$, respectively). Adolescents in the school sample also had significantly higher SOCS-13 than in the psychiatric sample (mean SOCS-13: 54.1, SD 14.3; 47.9, SD 15, $P = 0.011$, respectively).

Confirmatory factor analysis (CFA)

CFA was performed to examine the fit of the original 3 factor model and the unidimensional model both on children and adolescent. The 3-factor model seemed superior to the unidimensional one on both samples; however, the unidimensional model was acceptable on the children sample and it was close to the predefined acceptable range on adolescents (Table 3). We compared the 29 item and the 13 item scales on adolescents by CFA. As it is shown in Table 3, SOCS-13 showed better model fit than SOCS-29.

DISCUSSION

This study intended to validate the SOCS-13 for use in children because this population was lacking a reliable and valid instrument to study the sense of coherence. We also aimed to study the sense of coherence in children and psychiatric populations.

We found that children without mental health problems had higher overall SOC than adolescents. When looking at subcomponents separately, all three components were significantly higher in children in the school group. A different scenario was observed in youth under psychiatric care. Sense of coherence was not different between the two age groups. Significant difference was only found in comprehensibility where children had higher scores than adolescents. Manageability and meaningfulness were not different in the two age groups with psychiatric problems. According to Antonovsky (1987), a healthy individual emerges from childhood with a starting basic SOC that becomes stable around the age of 30 years. It seems that a relatively higher SOC characterizes average children which may be less permanent during the passage from childhood to adolescence as a consequence of the developmental transformation. Our results in the healthy average population are in line with other researchers who studied the relationship of age and SOC. Räty et al. (2005) found a steady decrease in SOC from the age of 13–22. Moksnes et al. (2012) reported that older adolescents had lower SOC compared with

Table 3. The confirmatory factor analysis was performed by using the maximum likelihood estimation with robust standard errors and a mean- and variance adjusted

SOCS	χ^2	χ^2/df	RMSEA	95% CI of RMSEA	CFI	TLI
Adolescents 29 items unidimensional	549.842	1.46	0.054	0.044–0.064	0.770	0.752
Adolescents 29 items 3 factors	511.914	1.37	0.049	0.038–0.059	0.816	0.800
Adolescents 13 items unidimensional	114.371	1.73	0.068	0.047–0.089	0.905	0.888
Adolescents 13 items 3 factors	*83.234*	*1.34*	*0.047*	*0.012–0.071*	*0.958*	*0.947*
Children 13 items unidimensional	89.923	1.38	0.048	0.019–0.071	0.935	0.921
Children 13 items 3 factors	*78.643*	*1.27*	*0.040*	*0–0.065*	*0.956*	*0.945*

Note: SOCS: Sense of coherence scale, χ^2: chi-square, df: the degree of freedom, RMSEA: root mean square error of approximation, CI: confidence interval, CFI: comparative fit index; TLI: Tucker-Lewis Index.

younger ones. The lower SOC in older adolescents may be related to biological, emotional and social adjustments in which these individuals are going through (Buddeberg-Fisher et al., 2001).

Psychological and behavioral problems disrupt the normal course of development. Based on our results manageability and meaningfulness are more sensitive to changes in mental health than comprehensibility. Manageability, the belief that there will be resources to solve the issues of life might be strongly connected to emotional problems in which the individual has low self-esteem, and pessimism. Meaningfulness, the motivation to invest energy to overcome the challenges of life, an essential part of sense of coherence according to Antonovsky (1987) can also be disrupted by emotional and anxiety symptoms where motivation and energy is lost. Other psychological and behavioral symptoms can also lower the energy and motivation of the individual on the one hand while increasing the challenges of life on the other. Since our sample included a high percentage of children and adolescents with emotional and anxiety problems, this can explain the evidenced negative effect on SOC in both age groups. Comprehensibility, the view of the world as structured and organized, requires higher level cognitive development and is probably more susceptible to psychological difficulties at older ages. This would explain the stable significant difference in this subcomponent of SOC between children and adolescents with mental health problems.

Males in our sample had higher scores than females but this difference was only significant in children. Sex differences were observed in the literature regarding adolescent samples; males had higher SOC than females in average populations (Myrin & Lagerström, 2006; Räty et al., 2005) and in psychiatric ones (Carlén et al., 2020). A possible explanation for the different SOC by sex is the different ability to handle stressors such as emotional and somatic problems, internalization, social withdrawal and depression, found more commonly in females than in males (Räty et al., 2005). Furthermore, males tend to diminish reporting mental problems and amplify their own coping resources and competences, therefore the higher SOC in males might reflect gender differences in styles of self-reporting (Buddeberg-Fisher et al., 2001). Our sample included a high percentage of youth with psychological and behavioral problems who were treated as psychiatric in- or outpatients. Since mental health problems are associated with lower SOC in both males and females, this could explain the lack of sex difference in SOC in adolescents. Furthermore, males in our sample were probably more openly reporting mental health problems and related issues than others who were not treated.

The main aim of the present study was to examine and analyze the psychometric properties of the Hungarian version of SOCS-13 and SOCS-29 in children and adolescents. The validation of the SOCS in its original short form is highly relevant in this population because there are only a few validation studies published specifically on adolescents and none on children.

The 13-item SOCS had good reliability in both age groups. Test-retest results showed higher correlation in adolescents than in children which could be explained by the shorter test-retest time and by the more reliable self-report style of adolescents. Our results are in line with earlier ones in adolescents (Eriksson & Lindström, 2005).

QoL refers to the subjective individual perception of health status, physical, psychological and social functioning (Matza, Swensen, Flood, Secnik, & Leidy, 2004) being an important health marker particularly for those with psychiatric disorders. We found a strong positive correlation between the SOC and QoL of youth which was supported by previous cross-sectional and longitudinal studies. Studying QoL in adolescents with congenital heart diseases, Neuner et al. (2011) found that SOC is an independent predictor of QoL. In a review by

Lansimies, Pietila, Hietasola-Husu, and Kangasniemi (2017) concluded that higher SOC in adolescents was a predictor of all health dimensions, QoL among them. Validity of the SOCS-13 in children is underlined by the strong correlation with the quality-of-life measurement in this age group. Our results add to the literature by extending these findings to youth under 14.

Psychological and behavioral symptoms were strongly associated with SOC regardless of age in our sample. The strongest relationship was shown between SOC and emotional symptoms. Other researchers also found inverse relation between SOC and depressive symptoms (Jellesma et al., 2006; Lim et al., 2021), depression and anxiety (Blom et al., 2010; Moksnes et al., 2012), hyperactivity and inattention (Edbom, Malmberg, Lichtenstein, Granlund, & Larsson, 2010) and various other psychiatric diagnoses (Carlén et al., 2020). The early negative effect of stress and adaptation problems in childhood might lead to poor SOC and a wide range of psychiatric disorders. Psychological and behavioral problems result in difficult adjustment to stressors such as negative life events, peer problems, family and romantic relationships (Hampel & Petermann, 2006) and stressors related to school context (Garcia-Moya, Rivera, & Moreno, 2013). Furthermore, behavioral problems create difficult interactions and ruin social support that could help to cope with the environment. The strong connection between sense of coherence and psychological symptoms found in children justifies the validity of the SOCS-13 instrument in this age group.

Furthermore, we aimed to shed light on the conflicting results about the factor structure of the SOC scales found in the literature. We compared SOCS-13 and SOCS-29 in children and adolescents in order to decide whether SOC is a one-dimensional or a multidimensional concept.

The debate on the factor structure of SOCS has a long history. Antonovsky (1993) had the assertion that the components of SOC should be used as unified construct since they are interconnected. This view was supported by some researchers but debated by others (for a summary, see Eriksson & Lindström, 2005). The factor structure of the SOCS on children and adolescents was seldom studied. We aimed to compare the one-dimensional and the three-dimensional structures of the SOCS to aid future analyses on this age group. According to our results, the 3-factor model was superior to the one-dimensional in both age ranges. Other researchers had similar results on adult samples (Balajti et al., 2006; Gana & Garnier, 2001; Saravia, Iberico, & Yearwood, 2014). Three studies investigated the factor structure of SOCS-13 in adolescents, one concluded in a 2-dimensional structure (Zimprich, Allemand, & Hornung, 2006), while two found the three-factor solution better (Lim et al., 2021; Moksnes & Haugan, 2013). Our results support the use of the three-dimensional model of the 13-item SOCS for both adolescents and children with the original dimensions of comprehensibility, manageability, and meaningfulness. A possible reason behind the differences in the factor structure of SOCS might be the different statistical and sample compositions employed (Zimprich et al., 2006) as well as the cultural meaning associated with the concept.

Lastly, we compared the 13- and the 29-item versions of the SOCS in adolescents. Children were not asked to complete the longer version of the scale due to the higher administration time and the increased complexity of the questions. Even though SOCS-29 showed excellent reliability, results of the confirmatory factor analysis of the 13-item SOCS proved to be superior. Our results support the use of SOCS-13 in both children and adolescents.

Limitations

The sample in our study included psychiatric patients and therefore was not representative of the Hungarian population. The psychiatric sample had a high percent of emotional diagnosis

which is known to negatively influence SOC. A wider distribution of psychological and behavioral problems would enable the study of the differential effect of mental health problems on SOC. The completion of the test battery was done in a paper-pencil style for the psychiatric patients while the school sample was tested on-line due to COVID restrictions. The different testing methods might have resulted in minor differences, however, since our findings were in line with the literature, this difference seemed negligible. Despite these limitations, the present study validated SOCS-13 in children from the age of 10 and updated the knowledge about the factor structure of both versions of the SOCS in Hungarian children and adolescent.

Self-reported data were used in this study which might reflect a subjective bias on the part of the reporter. However, according to the literature emotional symptoms and sense of coherence are best described by the persons themselves, and having one informant for all data increase reliability.

CONCLUSION

The SOCS proved to be sound in psychometrical parameters in youth from 10 to 18 years of age. Its structure seems to have a multidimensional essence rather than a one-dimensional character. SOCS-13 is valid and reliable to be used with children and adolescents. SOC is changing across childhood and adolescence as an emotional and cognitive assessment of the relationship between the individual and one's world. The consideration and inclusion of SOC concept in educational contexts deepens and broadens the understanding of the teaching and learning process in a healthy way and opens the potential to create a sound educational environment characterized by improved mental health and higher levels of achievement. Youth with a strong SOC believe in their own potentials, therefore they intentionally seek to structure their lives and confront any challenge no matter how hard it can be (Margalit & Eysenck, 1990). Long-term follow-up studies are needed to understand and explain the development of SOC through different ages.

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