

Research paper

Sense of coherence predicts adolescent mental health

Kristina Carlén^{a,b,*}, Sakari Suominen^{a,c}, Ulrika Lindmark^{d,e}, Maiju M. Saarinen^f,
Minna Aromaa^{c,g}, Päivi Rautava^{c,h}, Matti Sillanpää^f

^a School of Health Sciences, University of Skövde, Skövde, Sweden

^b The Research School of Health and Welfare, Jönköping University, Jönköping, Sweden

^c University of Turku, Department of Public Health, Turku, Finland

^d School of Health and Welfare, Department of Natural Sciences and Biomedicine, Centre for Oral Health, Jönköping University, Jönköping, Sweden

^e Department of Health Sciences, Karlstad University, Karlstad, Sweden

^f Department of General Practice, University of Turku and Turku University Hospital, Turku, Finland

^g City of Turku Welfare Division, Turku, Finland

^h Turku University Hospital, Turku, Finland



ARTICLE INFO

Keywords:

Adolescents

Development and well-being assessment scale

Follow-up study

Mental health

Sense of coherence

ABSTRACT

Background: Strong sense of coherence (SOC) has been shown to predict good mental health among adults whereas its predictive value in adolescence is unclear. This life-course oriented prospective study explores whether SOC predicts mental health in a three-year follow-up.

Methods: The data is part of the ongoing 'Finnish Family Competence Study' launched in 1986 in southwestern Finland (baseline $n = 1287$). The outcome variable was adolescent's mental health at 18 years of age, measured on the Development and Well-Being Assessment (DAWBA) scale. The main predictor was Antonovsky's SOC score (1987) measured at the age of 15. A total of 498 adolescents were included in the present analyses. Poisson regression was used by univariate and multivariable models using the parents' age and socioeconomic status and adolescents' gender as covariates.

Results: Multivariable analysis showed that a one-unit increase in SOC decreased the relative risk of a DAWBA-based diagnosis by 4 % (RR [95% CI] 0.96 [0.94–0.98], $p < 0.001$).

Limitations: Typical of very long follow-up, as in our study of nearly two decades, a substantial proportion of the original population-based cohort was lost to follow-up weakening the representability of our cohort.

Conclusions: Sense of coherence is a useful and clinically sensitive tool to predict mental health in adolescence. The easily administered, coping-oriented SOC questionnaire is an appropriate instrument in screening for adolescents who would benefit from supportive measures to strengthen their mental well-being.

1. Background

Mental health problems among adolescents are increasing. In comparison between two separate nationwide, register-based Finnish cohorts born in 1987 and 1997, the increase was 1.5-fold, from 10% to 15% in girls and from 6% to 9% in boys (Gyllenberg et al., 2018). The same trend also occurred globally (Bor et al., 2014). Mental disorders appear both as somatic and mental symptoms, like headaches, anxiety (especially among girls), sleep disorders, and learning difficulties. Negative strategies for coping with mental disorders can emerge as acts of self-harm, eating disorders, orthorexia, sexual issues, or even suicide (Brunner et al., 2014; Suchert et al., 2015).

Adolescent health is a priority area for the World Health Organization which in the Sustainable Development Goals declares the

importance of health and well-being in a global perspective, especially when health affects the next generation (WHO, 2017). According to a national follow-up cohort (Colman et al., 2009), mental health problems in adolescence are predictive of future mental distress and psychopathology. Investments in adolescent mental health and well-being will not only bring about immediate benefits but will also positively influence adult life and, hence, the next generation (Patton et al., 2016).

The theory of sense of coherence (SOC), that is, the salutogenic perspective (Antonovsky, 1987) aims at describing how human beings are able to deal with the various stressors of everyday life. This perspective focuses on factors that promote and maintain health as well as on resources like abilities and skills. The central concept of the theory consists of three sub-components: comprehensibility, manageability,

* Corresponding Author. School of Health Sciences, University of Skövde, 541 28 Skövde, Sweden. Tel.: +46500448478, ORCID ID: 0000-0002-0183-896X.

E-mail address: kristina.carlen@his.se (K. Carlén).

<https://doi.org/10.1016/j.jad.2020.04.023>

Received 29 October 2019; Received in revised form 12 April 2020; Accepted 20 April 2020

Available online 11 May 2020

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and meaningfulness (Antonovsky, 1987; Eriksson and Mittelmark, 2017). From the perspective of the sub-components of SOC, comprehensibility refers to an individual's readiness to perceive the world as comprehensible, consistent, predictable, and explicable; manageability refers to an individual's ability to deal with the demands of life and to the perception of sufficient resources to meet internal and external stimuli; and meaningfulness refers to the perception of challenges as worthy of investment and engagement. These three sub-components are supposed to represent a basis for successful coping with stressors, and thus for remaining healthy. Further, a person with strong SOC is more likely to deal successfully with arduous situations than a person with poor SOC in corresponding situations (Antonovsky, 1987; Pallant and Lae, 2002; Patalay and Fitzsimons, 2016). To the best of the authors' knowledge, associations between SOC and subsequent mental health among adolescents have not been previously studied. A review (Lämsimies et al., 2017) emphasized the need for studies on associations between SOC and consequent health in adolescence.

The current study explores whether sense of coherence in adolescence is associated with mental health in prospective setting. The study hypothesis was that strong sense of coherence predicts good mental health in adolescence.

2. Methods

2.1. Data collection

The data for the present ongoing prospective population study, the 'Finnish Family Competence Study' (Rautava and Sillanpää, 1989), are based on stratified randomised cluster samples from the Province of Turku and Pori in southwestern Finland. The original study population consisted of families expecting their first baby and paying their first visit to a maternity health care clinic in 1986. The cohort is described in detail previously (Rautava and Sillanpää 1989; Honkinen et al., 2009). In brief, data were collected with questionnaires starting from the 10th week of pregnancy. A total of 1,287 babies were live-born and included in the 'Finnish Family Competence Study'. Totally 1,125 children with their families participated at the age of 12 years and of these 846 (75%) adolescents returned their questionnaires at the age of 15 years, and 599 (53%) participated in the DAWBA interview at age of 18. Of 15-year and 18-year participants, 498 participants had complete data on both SOC and DAWBA and were included in the present study.

The Joint Ethics Committee of the University of Turku and the Turku University Central Hospital approved the design of the 'Finnish Family Competence Study'.

2.2. Sense of coherence

Antonovsky's short version of the SOC 13-item questionnaire measuring sense of coherence (1987) was used when the children reached the age of 15 years. The questionnaire includes 13 items where each item is scored on a modified Likert scale ranging from 1 to 7, yielding a range of the total score from 13 to 91. A high score indicates strong SOC (Antonovsky, 1987). The SOC questionnaire has shown high validity and reliability (Eriksson and Lindström, 2005). For the statistical analysis, the scores of the 13 items were summed up to a total SOC score. Before summation, the scale of five items with a reversed scale was corrected. One or two missing values in the SOC items were accepted. In these cases, the missing values were replaced by the means of the responses from the remaining SOC scale.

2.3. The Development and Well-Being Assessment scale

The Development and Well-Being Assessment (DAWBA) scale (Goodman et al., 2000) was used to indicate the risk for psychiatric diagnoses. The DAWBA is designed to generate ICD-10 and DSM-IV psychiatric diagnoses in children and adolescents. This scale has been

used in various epidemiological studies (e.g., Aebi et al., 2012). The DAWBA is a package of questionnaires designed for structured interviews and primarily focuses on common emotional, behavioural, and hyperactivity disorders. It involves a mixture of closed and open-ended questions. Interviewers can also add comments to the transcript and use supplementary prompts to get the respondent to describe their problems in their own words. The computerised version of DAWBA was translated to Finnish. Back-translation was contributed to by Goodman et al. (2000), the creators of the DAWBA.

For most disorders in the DAWBA interview, the point prevalence was within the time frame of the previous month. However, the time frame was three months for eating disorders, six months for generalised anxiety disorder, and 12 months for conduct disorder. Sections for specific phobias and separation anxiety were not included in the study. Apart from actual diagnoses, the interviewers also defined sub-threshold cases: cases with clinically relevant symptoms but still not meeting the criteria of a diagnosis. The interviews were done face to face or on the phone by trained psychiatric nurses. The latter method was chosen if the interviewee was reluctant to do an interview or did not show up at the planned interview time. The interviews lasted from 60 to 90 minutes. After completion of the computer aided interview the interviewer evaluated the result and took the final decision of whether a diagnosis should be given and hence, followed the DAWBA rating procedure (Aebi et al., 2012). Adolescents with urgent psychiatric problems were informed where they could get immediate help, if needed.

The participants for the present study were divided into three groups: those with no DAWBA-based symptoms, those with DAWBA-based symptoms but not fulfilling the criteria of the diagnosis, and those with one or more DAWBA-based diagnoses. The last group is later referred to as the *DAWBA-based diagnosis* group.

2.4. Statistical methods

Univariate and multivariable modified Poisson regression analyses for binary data (Zou, 2004) were used. The outcome variable was adolescent's mental health at 18 years of age, measured with the DAWBA scale with a dichotomous rating "any diagnosis vs. no diagnosis". Of the background variables, participants' gender (female vs. male), parents' age at the child's birth (per 1-year decrease), basic education (≤ 9 years vs. > 9 years), potential additional vocational education (up to vocational school vs. college/university), and their socioeconomic status (SES) – determined according to professional status (up to blue-collar vs. higher) – were included in the analyses. The covariates' associations with DAWBA were checked with single predictor models. If significant (inclusion criteria $p < 0.1$), they were entered in the initial multivariable models. The initial multivariable models also included pairwise interactions of the covariates with SOC to find out whether the association between SOC and DAWBA was modified by the covariate values. None of the interactions reached the required significance level ($p \geq 0.14$ for all); thus, the final multivariable models consisted of main effects only. The results are given as risk ratios (RR) with 95% confidence intervals (CI). Statistical computations were done using SAS System for Windows, release 9.4 (SAS Institute, Cary, NC, U.S.A.).

3. Results

A slight majority of the 498 participants were girls (57%). Of all participants, 56% ($n = 277$) did not show any DAWBA-based symptoms, 33% ($n = 167$) reported some DAWBA-based symptoms, and 11% ($n = 54$) received a DAWBA-based psychiatric diagnosis. The mean SOC scores were over five units higher in the group with DAWBA-based symptoms in relation to the group with a DAWBA-based diagnosis [mean (SD) 61.6 (11.9) and 56.2 (12.7), respectively]. The corresponding difference between the mean scores of the group with no

Table 1

Distribution on Development and Well-Being Assessment (DAWBA) scale of 18-year-old adolescents by parental data at child's birth, gender, and sense of coherence (SOC), range 13–91 at age 15 years (n = 498).

	DAWBA at the age of 18 years		
	No DAWBA-based symptoms (n = 277)	DAWBA-based symptoms (n = 167)	DAWBA-based diagnosis (n = 54)
SOC			
SOC scores at the age of 15 years (n = 498)	Mean (SD) 66.2 (11.6)	Mean (SD) 61.6 (11.9)	Mean (SD) 56.2 (12.7)
Gender			
Girls (n = 286)	n (%) 133 (48)	n (%) 109 (65)	n (%) 44 (81)
Boys (n = 212)	144 (52)	58 (35)	10 (19)
Parental data at child's birth			
Mother's age (n = 486)	Mean (SD) 27.2 (3.5)	Mean (SD) 26.8 (4.0)	Mean (SD) 25.9 (4.2)
Father's age (n = 457)	29.5 (4.2)	29.3 (4.3)	28.4 (4.8)
	n (%)	n (%)	n (%)
Mother's basic education > 9 years (n = 265)	144 (52)	94 (56)	27 (50)
Mother's basic education < 9 years (n = 233 total n=498)	133 (48)	73 (44)	27 (50)
Father's basic educational > 9 years (n = 159)	98 (35)	46 (28)	15 (28)
Father's basic educational < 9 years (n = 339 total n=498)	179 (65)	121 (72)	39 (72)
Mother's vocational training college/university (n = 221)	123 (44)	78 (47)	20 (37)
Mother's vocational training < college/university (n = 277 total n=498)	154 (56)	89 (53)	34 (63)
Father's vocational training college/university (n = 156)	97 (35)	47 (28)	12 (22)
Father's vocational training < college/university (n = 342 total n=498)	180 (65)	120 (72)	42 (78)
Mother's SES white-collar (n = 56)	33 (12)	19 (11)	4 (7)
Mother's SES < white-collar (n = 442 total n=498)	244 (88)	148 (89)	50 (93)
Father's SES white-collar (n = 130)	80 (29)	42 (25)	8 (15)
Father's SES < white-collar (n = 368 total n=498)	197 (71)	125 (75)	46 (85)

Table 2

Risk ratios (RR) with 95% confidence intervals (CI) for a DAWBA-based diagnosis of mental disorder (reference group: adolescents totally without or with only DAWBA-based symptoms) among adolescents at age 18.

	Univariate			Multivariable		
	RR	95% CI	p	RR	95% CI	p
SOC at age 15, 1-unit increase n = 498	0.95	0.93–0.97	<0.001	0.96	0.94–0.98	<0.001
Gender, girl vs. boy n = 498	3.26	1.68–6.33	<0.001	2.58	1.31–5.07	0.006
Mother's age, 1-year decrease n = 486	1.08	0.99–1.17	0.073	1.07	0.99–1.15	0.079
Father's age, 1-year decrease n = 457	1.06	0.98–1.15	0.175	-	-	-
Mother's basic education > 9 years vs. lower n = 498	1.14	0.69–1.88	0.616	-	-	-
Father's basic education > 9 years vs. lower n = 498	0.82	0.47–1.45	0.491	-	-	-
Mother's vocational training college/uni-versity vs. lower n = 498	0.74	0.44–1.25	0.254	-	-	-
Father's vocational training college/uni-versity vs. lower n = 498	0.63	0.34–1.16	0.135	-	-	-
Mother's SES white collar vs. blue-collar n = 498	0.63	0.27–1.69	0.358	-	-	-
Father's SES white collar vs. blue-collar n = 498	0.49	0.24–1.01	0.055	-	-	-

symptoms [66.2 (11.6)] and the group with a DAWBA-based diagnosis was 10 units. The risk of a DAWBA-based diagnosis was fourfold in girls versus boys. The parents' higher vocational training and higher professional status were less common in the group with a DAWBA-based diagnosis than in the other two groups. The distribution of SOC scores and the background variables in the three DAWBA groups are given in Table 1.

The risk ratios for a DAWBA-based diagnosis are given in Table 2. On multivariable analysis, a one-unit increase in SOC decreased the relative risk of a DAWBA-based diagnosis by 4%. Of the background variables, nearly a threefold risk was associated with female adolescent

gender, while a one-year decrease in mother's age at birth of child increased the relative risk of a DAWBA-based diagnosis at child's age of 18 years by 7%. Father's age or either parent's educational or professional status did not predict the offspring's risk of getting a DAWBA-based diagnosis.

The mean SOC scores for boys and girls at 15 years of age within the three groups of DAWBA-based mental health at age 18 are given in Figure 1. The average SOC score reduced slightly more for boys than for girls with increased mental health problems, but gender did not affect the association between SOC and DAWBA (SOC-to-gender interaction $p = 0.14$).

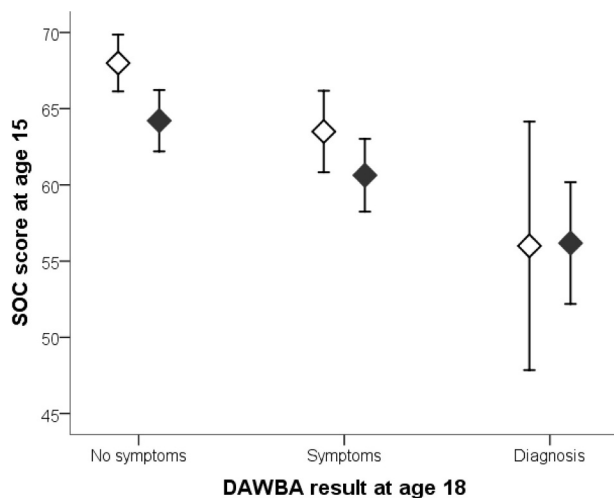


Figure 1. Mean (95% confidence interval) SOC scores at age 15 categorised by later DAWBA result at age 18. Open diamonds, boys; black diamonds, girls.

4. Discussion

Our prospective long-term cohort study showed that a one unit higher SOC score in persons aged 15 years decreased the relative risk of a DAWBA-based psychiatric diagnosis by 4% during following three years. Thus, the result confirmed our hypothesis that a strong sense of coherence protects subsequent mental health in adolescence. The 13-item SOC questionnaire proved to work as a useful instrument in screening for adolescents who may benefit from supportive actions to strengthen their mental well-being. Of our knowledge, no previous prospective studies of SOC as a predictor of adolescent mental health have been carried out.

In a longitudinal study on the development of adult attention-deficit/hyperactivity disorder (ADHD) symptoms, *Edbom et al. (2010)* also underlined the protective nature of strong SOC in adolescence. A systematic review analysing SOC in adolescence (*Braun-Lewensohn et al., 2017*) concluded that SOC can also be considered a resilient factor. Furthermore, the same review added that strong SOC predicts reduction in stress and decrease in internalising or externalising problems. A poor SOC also predicts risk behaviour among adolescents (*Humphrey and McDowell, 2013*). *Eriksson et al. (2007)* found that SOC is an indicator of mental health as well as a resource that supports development and maintenance of a positive state of health. Persons who had higher levels of SOC tended to have higher self-esteem, felt being more in control of their lives and adopted a more positive and optimistic outlook (*Pallant and Lae, 2002*). Positive associations between SOC, self-esteem, and perceived control were found consistent with Antonovsky's conceptualisation of SOC as a generalised resistance resource (*Pallant and Lae, 2002*).

The association between mental health and SOC among adolescents has likewise been found in cross-sectional studies (*Moksnes et al., 2014; Moksnes et al., 2012; Nielsen and Hanson, 2007*) and in a review by *Braun-Lewensohn et al., 2017*. A cross-sectional school-based survey from Sweden found that SOC was inversely associated with both depression and anxiety, and furthermore that SOC was associated with adolescents' health dimensions, such as psychosomatic health, mental health, sense of satisfaction, and social support (*Myrin and Lagerström, 2008*). Our study found that SOC scores between adolescents in the group with no symptoms compared to the group with a DAWBA-based diagnosis were 10 units higher, which also indicates that SOC characterises health-relevant factors. In clinical settings, a high SOC score tends to be a sign of fewer psychiatric symptoms, which is in line with findings from *Henje Blom et al. (2010)*, particularly among adolescent girls. This strengthens the validity of the SOC questionnaire

as a predictor of mental health in adolescence. SOC also seemed to be stable from 15 to 18 years of age (*Honkinen et al., 2009*).

The participants in the present study were divided into different groups based on the presence of DAWBA-based symptoms. However, the DAWBA method is only validated to detect subjects with increased risk of a psychiatric diagnosis (*Goodman et al., 2000*). Thus, the group with DAWBA-symptoms, yet below the threshold for a diagnosis, is included only in the descriptive examination to show the ordinal scale in the association between SOC and DAWBA. In the main analyses, the groups with and without DAWBA-based symptoms but without a DAWBA-based diagnosis were brought together.

The risk of a psychiatric disorder was nearly threefold for girls in relation to boys in the multivariable analyses. The results from the current study are in line with previous studies (*Moksnes et al., 2014; Lämsimies et al., 2017*). In a cross-sectional study of 1,183 adolescents in Norway, the girls had higher scores on anxiety and depression, whereas the boys scored higher on SOC. In both genders, SOC was strongly and inversely associated on emotional symptoms (*Moksnes et al., 2014*).

The parents' age at childbirth and SES (basic and vocational education and professional status) were included in the multivariable analysis process in our study, but the parents' data did not eliminate the significance of SOC as a predictor of adolescent mental health. While the offspring of younger mothers had a slightly increased risk of a DAWBA-based diagnosis, the association was overruled by SOC in the multivariable model. Hence, the impact of a mother's young age as a risk factor for the child's subsequent mental health might be mediated via the child's less efficient coping methods, or weak SOC. *Aitken et al. (2016)* highlighted that children of young mothers, and particularly of teenage mothers, show an increased risk of subsequent poor mental health compared to children of mothers aged 25 years or more. Previous research on the mother's age at childbirth has, up to now, focused more on the mothers' health than the child's.

A limitation of the study is the attrition of the original, population-based study cohort. However, loss of follow-up is inevitable in all longitudinal studies. In the current study, the original consent for participation was given by the parents, and had to be renewed by the offspring as the cohort passed their childhood. Considering this double recruitment process during the follow-up, a 40% rate of participants with complete data from two separate data collection rounds after nearly two decades may be regarded satisfactory. Yet, the loss of follow-up may have biased the representability of the cohort.

Our study has some strengths. First, the prospective time directionality allows for early detection of mental health problems, while the adolescents are still at school-age and within the reach of wide-ranging supportive services before transition to adulthood and independent life. Second, the DAWBA enables an early and easily applicable method to reduce the time for diagnosis. Third, as a questionnaire, SOC probably makes it easier to adolescents, who are often reserved to answer sensitive health questions, to communicate on them. Its adequate and neutral questions may be applied also by non-physicians working with adolescents.

5. Conclusions

SOC is a sensitive and well-applicable instrument for predicting mental health and its disorders in adolescence and represents a coping focused approach to mental health among adolescents. The SOC questionnaire, which is easily administered by even non-clinicians who work with adolescents, is a useful screening tool for mental problems. As a neutral mode of approaching adolescents with mental problems, it may enhance the detection of increased risk at an early stage to enable effective care.

Author Statement

Limitations

A limitation of the study is the attrition of the original, population-based study cohort. However, loss of follow-up is inevitable in all longitudinal studies. In the current study, the original consent for participation was given by the parents, and had to be renewed by the offspring as the cohort passed their childhood. Considering this double recruitment process during the follow-up, a 40% rate of participants with complete data from two separate data collection rounds after nearly two decades may be regarded satisfactory. Yet, the loss of follow-up may have biased the representability of the cohort.

Funding

The data collection of the study was financially supported by the Päivikki and Sakari Sohlberg Foundation and the Governmental Research Grant (EVO) allocated to the city of Turku.

Declaration of Competing Interest

None

Acknowledgements

We owe Professor Solja Niemelä, for her contribution to the collection and organization of the data and Taneli Peni, MD, for the list of the definitions of clinical and subclinical DAWBA diagnoses.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at [doi:10.1016/j.jad.2020.04.023](https://doi.org/10.1016/j.jad.2020.04.023).

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