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von Bothmer, Margareta I K; Fridlund, Bengt

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Self-rated health among university students in relation to sense of coherence and other personality traits

Margareta I.K. von Bothmer[1,2] MScN, RNT and **Bengt Fridlund**[1,2,3] PhD, RNT

[1]School of Social and Health Sciences, Halmstad University, Halmstad, Sweden, [2]Department of Primary Health Care, Göteborg University, Göteborg, Sweden, and [3]Department of Nursing Science, Lund University, Lund, Sweden

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Self-rated health among university students in relation to sense of coherence and other personality traits

The aim of the study was to determine students' self-rated health in relation to sense of coherence and other personality traits. A cross-sectional descriptive design was used with questionnaires as the means of data collection. The study population comprised a randomized stratified sample of students from a small university in southern Sweden. Ethical approval was obtained from the vice chancellor, and the issues of informed consent, confidentiality, privacy and self-determination were respected. Two instruments were used for data collection; the 29-item Sense of Coherence (SOC) scale, and an instrument created for this study, named Personality and Health Instrument, containing 52 questions. Self-rated health was estimated by inverse number of health complaints. A factor analysis identified seven factors related to personality traits; the three most important were hardiness, positive affect/optimism and Type A personality. The personality trait variables were tested for correlation with each other as well as with self-rated health. The mean score for SOC was similar for female and male students, but a positive association between SOC and self-rated health was found only among women. Optimism was associated with less health complaints among female students. Type A personality was associated with poorer health both among women and men. The personality traits SOC, positive affect/optimism, hardiness and alienation showed high internal correlations. The SOC scale is discussed in relation to gender specificity and in relation to methodological and conceptual confounding. Further research is needed to explore the relation between SOC, optimism, hardiness, hostility and health. The significance of the study is that it raises questions about the validity and specificity of the SOC instrument and provides ideas for future research to develop the sense of coherence concept and instrument.

Keywords: hardiness, hostility, optimism, positive affect, personality trait, self-reported health, sense of coherence, student, type A personality.

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Introduction

Health-related behaviour in early life influences later risks for lifestyle-related disorders. It is, therefore, important to investigate the health behaviour among young people. University students represent a major segment of the young adult population (1). It makes sense to focus on them in a study of associations between health, motivation for a healthy lifestyle and different personality traits. The way people assess their own health has been shown to be a good predictor of mortality in many population studies. The predictive power of self-rated health is strong, irrespective of measurement method; some of the most important ones are self-rated symptoms, functional ability and global self-rated health (2).

Health is influenced by a range of factors, and the currently popular bio-psychosocial model claims that what influences a person's health is the interplay between biological, psychological and social aspects (3). As the causes of ill health have shifted in Western societies from infectious diseases to those caused by our lifestyles, more attention is given to the role of behaviour. Behaviour is influenced by attributes at individual level but also by social and societal conditions (4). Some of the theories and models trying to explain the intrapersonal determinants of health-related behaviours focus on different personality traits such as sense of coherence, hardiness, negative affectivity, positive affect/optimism, hostility and Type-A personality. The aim of the study was to determine students' self-rated health in

Correspondence to:
Margareta I.K. von Bothmer, School of Social and Health Sciences, Halmstad University, PO Box 823, S-301 18 Halmstad, Sweden.
E-mail: margareta.von_bothmer@hos.hh.se

relation to sense of coherence and other personality traits built on the following research questions:

- What are the relationships between self-rated health and Sense of Coherence (SOC), and between self-rated health and other personality traits such as hostility, hardiness and optimism?
- What are the relationships between SOC and other personality traits?
- Are there any gender differences in the relationships between self-rated health, SOC and other personality traits?

Theoretical aspects

Aaron Antonovsky presented the concept of SOC in 1979 and further elaborated it in 1987, and its point of departure was an opposition to the pathogenic orientation in medicine and social science (5, 6). Antonovsky focused instead on salutary factors, i.e. factors that promote health. He stated that a person uses generalized resistance resources when confronting a stressor and that a person with high SOC will be motivated to cope, will understand what is needed and will believe that resources to cope are available. This combination of cognitive, behavioural and motivational aspects form the concept of SOC and the three components are called meaningfulness, comprehensibility and manageability (7). Antonovsky declared that SOC is not a personality trait but instead a global orientation, expressing confidence in life and that a strong SOC is associated with good health (5). He claimed that the SOC construct contrasted other similar concepts such as hardiness, locus of control, and resilience and credited the SOC construct as follows: 'found to be consistently feasible, reliable and valid. This is true across cultures, social classes and ethnic groups, and for men and women of all ages' (6, p. 16).

Kobasa declared that persons who experience high degrees of stress without falling ill have a personality structure called hardiness. The hardy persons are characterized by the belief that they can control the situation, by being committed to the activities of their lives and by seeing change as an exciting challenge to further development (8). Antonovsky discussed one important difference between the SOC concept and the hardiness construct in that SOC is based on the assumption that people search for stability while Kobasa stressed that changes in life are regarded as challenges for development (5). Both Antonovskys's SOC construct and Kobasa's Hardiness construct have been criticized for being unitary constructs, as validating the scales by factor analysis have shown inconsistencies in the subscales (7, 9).

The associations between health and personality traits have been used also to claim that there is a 'disease-prone' personality that includes anger, hostility, aggression, anxiety and depression (10). Anger and hostility has been described as part of a Type A personality which is further characterized by competitive achievement orientation and time urgency (3). Several studies have shown that the component in Type A personality with the most power is the hostility component (11). Other personality traits that are said to influence health are optimism and pessimism, with a positive outlook associated with health and a pessimistic explanatory style with illness (12, 13). Scheier and Carver (14) discussed whether a sense of optimism might in fact underlie some of the health-related outcomes of hardiness; i.e. the concepts of hardiness, optimism and well-being are related to each other.

It has been discussed what SOC really measures (15), if it is anxiety and depression (16, 17), negative affectivity (18), or hardiness (7). A possible connection between SOC and hostility is discussed where a low SOC may be partially underlying the adverse effects of hostility on health (19).

Methods

Design and setting

A cross-sectional descriptive design was used, with questionnaires as the means of data collection. The study was carried out in the Southwest of Sweden at a small university with 5000 students.

Sample and selection

The sample of students comprised a random stratified sample from each department at the university. Eligible students were those studying on a full-term basis. Selecting every tenth person on each class list, starting with a randomly chosen number made the randomization. The response rate varied between 61% and 79% and was 69% for the total sample.

Instrumentation

The questionnaire consisted of two instruments; the SOC-scale (5) and a questionnaire created for this study based on published work.

The SOC scale used in this study was the full 29-item version, revised for good Swedish language style and tested for validity and reliability in Swedish samples (20, 21). The respondents were asked to select a response on a seven-point semantic differential scale with two anchoring phrases. The items were scored to one unitary scale ranging between 29 and 203 points. A high score on the total scale indicated a strong sense of coherence. The SOC questionnaire has shown acceptable results concerning reliability (7), stability (22–24), discriminating validity (17, 21) and predicting validity (19, 25).

The SOC scale was tested with factor analysis, and in order to find Antonovsky's original SOC components – meaningfulness, manageability and comprehensibility – a

three-factor solution was attempted. This resulted in only 45% of variance explained, and the factors did not correspond with the SOC components. The reliability was tested with Cronbach's alpha reliability coefficient and was 0.89, 0.84 and 0.49 for the three scales, respectively.

The next factor analysis performed on the SOC items, was not restrained to a fixed number of factors and resulted in five factors (see Table 1), which accounted for 53% of the variance. Several items loaded on more than one factor, but were referred to the factor where it had the highest loading. The loadings ranged from 0.38 to 0.82. The factors were named '1: Meaning of life', '2: Control of feelings', '3: Negative feelings', '4: Trust/distrust' and '5: Changing future'. The items belonging to the 'meaningfulness' scale according to Antonovsky (7) were all found in the 'Meaning of life' factor. The comprehensibility items of SOC loaded on all five factors, while the manageability items were found on factors 1–4. Cronbach's alpha reliability coefficients for the different factors ranged from 0.50 to 0.88 (see Table 1), and was 0.91 for the full SOC scale. The correlations between the five factors and SOC were for 'Meaning of life' and 'Control of feelings' 0.71, for 'Negative feelings' 0.66, for 'Trust/distrust' 0.60 and for 'Changing future' 0.39, all with $p = 0.001$.

An instrument was created for this study in order to cover areas that are deemed important for studying health and personality factors. Face and content validity of the questionnaire was established through building the questionnaire on literature reviews of health influencing factors such as optimism (13, 14), sense of control (26), and hardiness (8, 9). The instrument comprised questions on socio-demographics, health complaints, health beliefs, motivation for a healthy lifestyle, and on different personality traits and perceptions of self. The latter part of the instrument, opinion and attitude questions were tested for construct validity with factor analysis. Twelve questions did not fit well in a first factor analysis and were, therefore, excluded. The instrument then comprised the following areas and number of items:

- Socio-demographics: gender, age, height, weight, family situation (living alone or with partner or parent, having children or no children), father's education, mother's education, department at university, term; nine questions.
- Health complaints (headache, stomach ache, cold, flu, symptoms from muscles, back-pain, anxiety, coughing, fatigue, sleeplessness, stress, constipation, diarrhoea, allergy or others); the question was: 'Have you during the last month been bothered by any of the following symptoms?' (listed as above); 16 questions. Response alternatives were 'Yes' and 'No'. The 'Yes' answers were computed together for each individual and formed the composite variable 'Health complaints', which in this study corresponds to self-rated health. As self-rated health, the health complaint scale is reversed.
- Questions related to outlook on life, moods, perceptions of self, sense of control; 20 questions on a seven-point semantic differential scale with endpoints: 'strongly disagree' and 'strongly agree'.
- Beliefs related to health: three questions about the respondents' views on the influence from own thoughts, feelings and actions on health; the format as described above.
- Motivation for a healthy lifestyle: four questions with the format as described above.

The questionnaire was tested with a pilot study on 50 nurse students and some revision was made, i.e. the exclusion of 37 superfluous questions. The questionnaire was sufficiently tested for construct validity through a second factor analysis using the SPSS computer program, and the Varimax was used as rotation model (27, 28). The factor analysis gave seven factors, called 'Hardiness', 'Positive affect/optimism', 'Type A personality', 'Health influence', 'Motivation for a healthy lifestyle', 'Sense of control' and 'Alienation', which accounted for 61% of the variance (see Table 2). The internal consistency was tested with Cronbach's alpha reliability coefficient and was acceptable at 0.76 (29), with reliability coefficients for the different factors ranging from 0.52 to 0.84. This 52-item instrument is hereafter called the Personality and Health Instrument (PHI).

Data collection

As the university concerned did not have a separate ethical committee, permission was obtained from the vice chancellor, who first requested information about the research aims, procedures and reporting of results, and then gave permission on condition that the students did not have any objections. All respondents were informed about confidentiality, freedom to participate and the right to withdraw from the study at any point. The information sheet also gave information about the purpose of the study, the use of code numbers and the researchers.

The address list was obtained from the student union, but eight envelopes were returned due to unknown addresses or the students not being registered after all. The questionnaires were successfully sent to 479 students and 332 responded. The questionnaires were distributed by post with a stamped envelope attached. In order to encourage quick and full answers, the students who returned the first 100 completed questionnaires were offered a small incentive (lottery ticket). All questionnaires were sent back to the researchers with anonymity preserved. Code numbers were used in order to facilitate reminders. Reminders were sent to 225 students after 2 weeks and resulted in 60 additional responses. No further reminder was sent as it was at the end of the term, and it was considered unlikely that the students would respond later.

Table 1 The SOC scale; construct validity through factor analysis, reliability testing with Cronbach's α (α = 0.91 for the full SOC scale)

Factor interreliability	*1. Meaning of life, Cronbach's α = 0.88*	*2. Control of feelings, Cronbach's α = 0.79*	*3. Negative feelings, Cronbach's α = 0.69*	*4. Trust/distrust, Cronbach's α = 0.63*	*5. Changing future, Cronbach's α = 0.50*
Factor loadings	The future is dull/ fascinating[11], 0.82	Can see proportions in life[26], 0.66	People I trusted have disappointed me[6], 0.79	Cooperation possible[2], 0.76	Life is full of changes[10], 0.74
	Life has/has no purpose[8], 0.77	Unpleasant things happens – let go/grieve a lot[18], 0.62	I am surprised by the behaviour of people I thought I knew[5], 0.66	People do not understand me[1], 0.62	The future is full of changes[17], 0.71
	Life is meaningful/not meaningful[22], 0.77	Not certain that I can cope with my feelings[29], 0.57	I know most of the people I meet[3], 0.44	People will help me in the future[23], 0.45	I do not know what is going to happen[24], 0.50
	Life is interesting/ routine[7], 0.74	Feel like sad losers[25], 0.54	Treated unfairly[9], 0.39	In unfamiliar situations, I do not know what to do[12], 0.43	
	Life is meaningless/nice to live[14], 0.67	Will overcome future difficulties[27], 0.50	Many changing and confusing feelings[19], 0.39		
	Daily activities joyful/ boring[16], 0.64	Feel good, feeling will last/ will disappear[20], 0.48			
	Solutions available/not available for difficulties in life[13], 0.63	I do not want to recognize feelings I have[21], 0.45			
	Daily activities not meaningful[28], 0.63				
	I do not care what happens[4], 0.47				
	Solutions of problems are clear/confusing[15], 0.38				

Each question has its number from Antonovsky's SOC scale (5) from [1] to [29].

Table 2 The 'Personality and Health Instrument'; construct validity through factor analysis, reliability with Cronbach's α (α = 0.76 for the full instrument)

Factor interreliability	*Hardiness, Cronbach's α = 0.84*	*Positive affect/optimism, Cronbach's α = 0.78*	*Type A personality, Cronbach's α = 0.74*	*Health influence, Cronbach's α = 0.80*	*Motivation for a healthy lifestyle, Cronbach's α = 0.58*	*Sense of control, Cronbach's α = 0.64*	*Alienation, Cronbach's α = 0.52*
Factor loadings	Like challenges, 0.82	Happy, 0.82	Impatient if I have to wait, 0.80	My feelings influence my health, 0.90	Motivated to change lifestyle, 0.70	I can influence my health, 0.76	Difficulties to understand everyday life, 0.79
	Easily find solutions, 0.74	Much loved, 0.74	Want things done in a haste, 0.72	My thoughts influence my health, 0.88	Possibilities to change behaviour, 0.70	I can influence my life, 0.71	Often treated unfairly, 0.63
	Endure hardship, 0.69	Satisfied with relations, 0.68	People tell me to calm down, 0.69	My actions influence my health, 0.68	Seek information to improve health, 0.58		
	Like to work hard, 0.68	Optimistic, 0.58	Hurrying when unnecessary, 0.66		Valuing lifestyle change, 0. 58		
	Can see solutions when others cannot, 0.68		Easily angry, 0.56				
	Adapt easily, 0.64						
	Self-confident, 0.63						

Statistical procedure and analysis

In order to analyse the data; the SPSS programme (SPSS for Windows, version 10.0) was used (28). Descriptive statistics (frequency distributions, cross-tabulations with two-dimensional tables) were used to illustrate the preliminary information. Chi-square statistic was used as a test of independence between groups, and Cramér's V was used as a measure of association in order to quantify the strengths of the relationships (28). The items loading on each factor in the PHI were computed together to create composite variables, and then each composite variable was scaled in three degrees: 'low degree', 'medium degree', and 'high degree'. The computed variables were then tested for correlation with each other. Correlations were measured by Spearman's Rho, as data were rank-ordered. To explore the association between SOC and other personality traits a multiple regression analysis was undertaken with SOC as dependent variable (28, 30). Statistical significance was denoted by $p < 0.05$.

Results

Description of the sample

The sample comprised 49% women and 51% men. Seventy-one per cent were younger than 30 years of age, 23% were in their thirties and 6% in their forties. A majority (59%) lived by themselves. Seventy-six per cent did not have children. More women than men had a partner and had children (see Table 3). The most common reported symptoms among the students were stress (60%), tiredness (57%), headache (52%), pain in back and neck (51%) and common cold (43%). Stomach pain was reported by 34%, allergy by 28%, anxiety by 26%, sleeping disorders by 22% and depression by 11%. Women reported headache, stomach pain and stress more often than men ($p = 0.001$, Cramér's $V = 0.22$) and single women reported depression to a higher degree ($p = 0.01$, Cramér's $V = 0.24$). No significant differences were found between younger and older students. There was no association between SOC and fathers' and mothers' level of education.

Self-rated health, sense of coherence and other personality traits

A number of associations between self-rated health and different personality traits were found (Table 4). The mean score for SOC among women and men was similar, irrespective of study department or study term. Women with children and women living with a spouse had higher SOC-means (see Table 5). A negative association between Type A personality and self-rated health were found both for men and women and it was stronger for students older than 30 years ($p = 0.001$, Cramér's $V = 0.31$). Among

Table 3 Description of the sample of university students; socio-demographic variables and self-rated health

	Women (n = 160)			*p-value (CV)*	*Men (n = 168)*			*p-value (CV)*
Age	<30 years	≥30 years	Total		<30 years	≥30 years	Total	
	n (%)	n (%)	n (%)		n (%)	n (%)	n (%)	
	106 (66)	54 (34)	160 (49/100)		127 (76)	41 (24)	168 (51/100)	
Civil status								
Living alone	65 (62)	12 (22)	77 (48)	*	97 (76)	18 (44)	115 (69)	*
Couple	40 (38)	42 (78)	82 (52)	(0.38)	30 (24)	23 (56)	53 (31)	(0.30)
Children								
Without children	99 (94)	11 (20)	110 (69)	*	120 (95)	20 (49)	140 (83)	*
With children	6 (6)	43 (80)	49 (31)	(0.76)	7 (5)	21 (51)	28 (17)	(0.53)
Self-rated health								
Good health	37 (35)	21 (39)	58 (36)	ns	61 (48)	18 (44)	79 (47)	ns
Medium	49 (46)	27 (50)	76 (48)		50 (39)	18 (44)	68 (41)	
Poor health	20 (19)	6 (11)	26 (16)		16 (13)	5 (12)	21 (12)	

ns = non-significant; p-values: * = 0.001; CV = Cramér's V-index as a measure of association based on chi-square values, estimating the magnitude of the differences between the groups of younger and older women and men respectively. One woman did not answer the question if she lived with or without children.

women there was a positive association between self-rated health and positive/optimistic personality ($p = 0.01$, Cramér's V= 0.23) in that, high levels of optimism related to fewer symptoms and vice versa. Among women, a low degree on the SOC scale was associated with more health complaints and a high SOC with fewer health complaints; it was stronger for older than younger students ($p = 0.001$, Cramér's $V = 0.51$) and stronger for women with children ($p = 0.001$, Cramér's $V = 0.43$) than without children ($p = 0.01$, Cramér's $V = 0.28$). The number of health complaints was not related to having children or not, *per se*. A low SOC was significantly associated with the complaints 'high anxiety' ($p = 0.001$, Cramér's $V = 0.35$ both for men and women) and 'depression' ($p = 0.01$, Cramér's $V = 0.26$ for women, $p = 0.001$, Cramér's $V = 0.36$ for men). The association between SOC and anxiety was 0.36 and between SOC and depression 0.29 ($p = 0.001$ for both associations). A high degree of positive affect/optimism was associated with a low degree of anxiety ($p = 0.01$, Cramér's $V = 0.29$ for women and $p = 0.001$, Cramér's $V = 0.35$ for men).

Sense of coherence and other personality traits

The association between SOC and 'Positive Affect/Optimism' was strong (for women $p = 0.001$, Cramer's $V = 0.42$; for men $p = 0.001$, Cramér's $V = 0.53$) as well as the association between SOC and 'Hardiness' (for women $p = 0.001$, Cramér's $V = 0.25$, for men $p = 0.001$, Cramér's $V = 0.45$). The scores on the scales for 'Positive Affect/Optimism' and 'Hardiness' were related, here too stronger for men ($p = 0.001$, Cramér's V for women 0.27 and for men 0.36). 'Alienation' was also found to be associated with SOC ($p = 0.001$, Cramér's $V = 0.31$, almost the same for women and men) and furthermore 'Sense of control' ($p = 0.001$, Cramér's $V = 0.28$, only for men). To investigate further the relationships between SOC and the personality variables, multiple stepwise regression analyses were performed with SOC as dependent variable and the grouping variables 'Positive affect/optimism', 'Alienation', 'Hardiness', 'Type A personality', and 'Sense of Control' as independent variables. For the total sample and for the subgroups of women and men, 'Positive Affect/Optimism', 'Alienation' and 'Hardiness' entered into the regression analysis and together accounted for 58.4% (total sample), 51.6% (women) and 66.5% (men) of the variance in SOC (see Table 6). The partial correlation coefficients indicated that 'Positive Affect/Optimism' had the highest relative importance of the independent variables on SOC. The partial correlation between 'Positive Affect/Optimism' and SOC was 0.49 for women and 0.64 for men.

Discussion

Methodological issues

The technique of sampling and data collection is deemed to be applicable to the aim of the study. The design is weak, as it is a cross-sectional study and hence no causal conclusions can be drawn. The sample is not population representative as it comprised university students, and therefore caution in generalization of the results is necessary. The sample was of a large enough size, and was equal in size between genders. The attrition rate was an acceptable 31%. The response rate indicates that the students did not

Table 4 Correlation matrix for all composite variables for the total sample of university students and for women and men

	1	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*
1 Self-rated health									
T	1.0								
w									
m									
2 Perceived health influence									
T	ns	1.0							
w	ns								
m	ns								
3 Motivation for a healthy lifestyle									
T	ns	0.27***	1.0						
w	ns	0.30***							
m	ns	ns							
4 SOC									
T	0.21***	ns	ns	1.0					
w	0.34***	ns	ns						
m	ns	ns	ns						
5 Positive affect/optimism									
T	ns	ns	ns	0.54***	1.0				
w	0.21**	ns	ns	0.48***					
m	ns	ns	ns	0.60**					
6 Hardiness									
T	ns	ns	0.25***	0.41***	0.39***	1.0			
w	ns	0.21**	0.33***	0.30***	0.34***				
m	ns	ns	0.20**	0.51***	0.44***				
7 Sense of control									
T	ns	0.29***	ns	0.23***	0.28***	0.29***	1.0		
w	ns	0.33***	ns	ns	0.27**	ns			
m	ns	0.26***	0.21**	0.35***	0.28***	0.39***			
8 Alienation									
T	ns	ns	ns	−0.38***	−0.29***	−0.21***	−0.20***	1.0	
w	−0.24**	ns	ns	−0.40***	−0.26**	−0.24**	ns		
m	ns	ns	ns	−0.36***	−0.30***	ns	−0.30***		
9 Type A personality									
T	−0.27***	ns	ns	ns	ns	ns	ns	0.22***	1.0
w	−0.27***	ns	0.21**	ns	ns	ns	ns	ns	
m	−0.23**	ns	ns	ns	ns	ns	ns	0.34***	

ns = non significant; p-values: ***0.001, **0.01, *0.05. T = total sample, w = women, m = men.

object to participating in the study, which was an ethical demand from the vice chancellor.

A weakness in the present study is that health was measured only by self reports. On the other hand, it has been convincingly shown that self-rated health predicts mortality (2, 31) and thus functions as a valid measure of health, and that symptoms reporting is a valid method in assessing self-rated health (2, p. 72).

Cronbach's alpha coefficient for the SOC scale was 0.91 in this study and underlines Antonovsky's argument that the instrument is reliable as it consistently shows high internal consistency in a variety of studies (7). The validity of the SOC scale has been disputed (7, 22, 32). Langius et al. (20) stated that SOC is a valid and reliable tool, although their samples were small (between 13 and 22 subjects) and SOC was measured both in VAS and Likert format showing moderately high correlations between SOC and two other psychometric scales. Tishelman (15) doubted if we really know what the SOC scale measures, and argued further that there is no evidence for validity in congruence in results between SOC and other instruments. She questioned the construct validity of SOC and also its specificity and sensitivity.

Many researchers have tried to validate the SOC construct by exploratory and confirmatory factor analysis, and have reached contrasting results. Sandell et al. (32) found that SOC neither measures one single factor, nor the three original components. Feldt et al. (22) arrived at similar results but their conclusion was that SOC measures one general factor (sense of coherence) whose

Table 5 SOC, means, standard deviations and ranges, for the sample of university students, women and men, in relation to socio-demographic variables

	Women					*Men*				
	n	*Mean*	*SD*	*Range*	*p-value (CV)*	*n*	*Mean*	*SD*	*Range*	*p-value (CV)*
Total	157	142.5	21.4	47–187		162	142.6	21	82–187	
<30 years	104	140.3	21.5	47–187	* (0.21)	121	143	21.8	82–187	ns
≥30 years	53	146.9	20.9	97–180		41	141.6	20.5	88–171	
Without children	107	139.7	22	47–187	* (0.23)	135	142.8	21	82–186	ns
With children	49	149	19	85–180		27	141.9	21.2	88–187	
Single	76	137.9	20.3	83–180	** (0.28)	109	140.8	21.8	82–184	ns
Couple	80	147.2	21.7	47–187		53	146.3	19	88–187	

No significant difference between women and men. ns = no significant differences between groups; p-values: **0.01, *0.05. CV = Cramér's V-index as a measure of association based on chi-square values, estimating the magnitude of the differences between the groups younger/older, without/with children and single/couple.

Table 6 Multiple regression analysis: SOC and other personality traits among the total sample of university students and among women and men

Sample	*Step*	*Grouping variables*	*Adjusted R^2*	*R^2 change*	*F change*	*F (final model)*	*Beta (final model)*	*Partial correlation (final model)*	*Tolerance*
Total	1	PAO	0.50	0.502	295.24**		0.52**	0.55	0.68
	2	Alienation	0.55	0.046	29.55**		−0.21**	−0.29	0.85
	3	Hardiness	0.58	0.036	25.52**		0.23**	0.30	0.74
	4	Type A	0.59	0.010	7.29*	106.22**	−0.10*	−0.16	0.96
Women	1	PAO	0.45	0.450	121.06**		0.49**	0.49	0.66
	2	Hardiness	0.48	0.033	9.26*		0.21*	0.25	0.78
	3	Alienation	0.51	0.033	9.84*	51.72**	−0.20*	−0.25	0.82
Men	1	PAO	0.58	0.555	197.78**		0.58**	0.64	0.66
	2	Alienation	0.65	0.082	28.16**		−0.27**	−0.42	0.93
	3	Hardiness	0.69	0.028	11.09**	97.78**	0.19**	0.27	0.69

PAO = positive affect/optimism; p-values: **0.001, *0.01.

influence is shared with the highly interrelated first-order factors (meaningfulness, comprehensibility, manageability). The factor analysis made in the present study on SOC showed results similar to the study of Sandell et al. (32) (Table 1). The first factor comprised almost the same items as the first factor in the study of Sandell et al. (items 7, 8, 11, 13, 14, 16, 22) and identified the meaningfulness component. Their conclusion that the components meaningfulness and comprehensibility are validated is, however, refuted in the present study, as the factor analysis showed inconsistencies between the theoretical concepts and the identified factors.

Another problem is how the items on future change correspond to the SOC scale. In this study, the factor analysis gave a five-factor solution, with a low Cronbach's alpha coefficient for the factor called 'changing future'. Antonovsky reported already in 1993 (7) that colleagues were troubled with the two items 10 and 17, and Sandell et al. (32) could not fit them in a three-factor solution. Feldt et al. (24) found that item five and item six did not fit the three-factor solution and then simply discarded them in the following analysis. It would be interesting to test the SOC scale by omitting 'future changing' items and run an exploratory factor analysis and also compare this new scale with self-rated health and with the concepts positive affect/optimism and hardiness.

The personality traits measured by the PHI are defined as they are operationally defined by factor analysis, and may, therefore, lack in validity and reliability. Hardiness research has been 'plagued by measurement problems' (33, p. 73) and many different hardiness instruments have been tested (9, 33) to find a valid and reliable instrument. One of them, the Cognitive Hardiness Scale (CHS) (34) comprises questions about personal beliefs about life related to commitment to family and self, and to challenges and control. All these areas were covered in the PHI but only six items loaded on the 'hardiness' factor and the rest loaded on 'Health Influence', 'Motivation for a healthy lifestyle' and 'Sense of control' (Table 2). The PHI factor 'Hardiness' could be looked upon as bearing the meaning of the concept hardiness and with an acceptable reliability coefficient of 0.84 it is strong enough to be measured

against SOC and other personality trait variables in this study.

The 'Positive Affect/Optimism' factor with a reliability coefficient of 0.78 corresponds to one factor in the Positive and Negative Expectancy Questionnaire (PANEQ) developed by Olason and Roger, which measures happiness, contentment and optimism (35). The PANEQ scale was constructed for refinement of the measurements of optimism and pessimism, as studies have challenged the unidimensional construct of optimism–pessimism by Scheier and Carver (35).

The items loading on the factor 'Type A personality' in the PHI corresponded to characteristics for a Type A personality e.g. impatient, sense of time urgency, restlessness and anger (3, 36), and with an alpha coefficient of 0.74 this factor is considered to be valid for measuring the Type A personality trait in this study.

Reliability coefficients for 'Motivation for a healthy lifestyle', 'Sense of control' and 'Alienation' were not acceptable and hence minor attention is given to these constructs in the present study. The PHI showed a moderately good but not perfect accuracy (27), as Cronbach's alpha was 0.76 for the full instrument and the factors together explained 61% of the variance. However, a reliability of 0.70 is considered acceptable for a newly developed instrument (30).

To denote the importance of statistically significant results, they are reported together with Cramér's V as a measure of association although chi-square-based measures are difficult to interpret. As the sample is rather large, it is easy to get statistical significances, and in order to obtain some estimation of magnitude, Cramér's V-index was used (28, p. 354). It was also used because it is not dependent on the number of cells or on equally large sample sizes, and because it is suitable for data on both nominal and ordinal level measurement (37), which makes chi square values from different tables comparable (28). According to Kerlinger (27, p. 189), a correlation between 0.20 and 0.30 could be of interest, if it is statistically significant, when n is larger than 100. As the sample was more than 300, statistically significant correlations >0.20 are reported. The correlations were measured with Spearman's Rho coefficient, as data were on nominal and ordinal levels, respectively. In order to compare the results from this study with other similar studies, a multiple regression analysis was used as the assumptions for doing such an analysis were met (28).

Result issues

The most interesting result from this study is not the results *per se*, but what the results say about personality trait measures. This study showed that SOC was highly correlated with positive affect/optimism (see regression analysis, Table 6), which had the highest relative importance of the independent variables on SOC. The higher female students scored on the SOC scale and on positive affect/optimism, the fewer symptoms they had. That positive emotions seem to be linked to health is shown in other studies (12, 38), and this may be one of the explanations for high scores on SOC being associated with good health, as SOC and optimism show strong internal correlations (38). Is high SOC then the same as a positive outlook on life, or is it something else underlying SOC, that is the acting, health enhancing factor? The Pallant & Lae (38) study showed a negative correlation between SOC and symptoms for both genders, and a correlation between SOC and optimism that was greater for females than for males, which is in contrast to this study. It could be discussed whether optimism and a strong sense of coherence are health enhancing only for women, or if it is the instrument that is gender biased (15, 16). Is low SOC then acting against health or is it like Kivimäki et al. (23, p. 594) suggested, that SOC and pathogenic psychological traits (depression and anxiety) refer to the same phenomenon.

In contrast to Kivimäki et al. (23) we found that both ends of the SOC scale were related to ill-health among women, but similar to that study we found a gender difference in that SOC was not correlated to health among male students. However, this differs from other studies where no gender differences in the relation between SOC and health were detected or reported (25, 38). It has been argued that a gender difference in the SOC scale implies that the SOC theory suffers from a true limitation (23, 39).

Antonovsky stated that the SOC scale was a construct not bound to culture, social class, gender or age (6), which has been challenged by Tishelman (15) and Geyer (16). The present study showed a gender difference but further research is needed to fully explore gender differences.

An age difference in SOC means were found only for female students and this contrasts the findings of Feldt et al. (24), who argued that their findings underscore the need of a revision of Antonovsky's theory. However, as men comprise 91–93% of their studied populations and the 'older group' was between 35 and 40 years, this issue needs to be further investigated. The age of the studied group may have influenced the SOC scores in this study, although the age range was greater than in the study by Feldt et al. (24), who found that age did not play a role in the SOC levels.

There has been argument about whether the relation between SOC and health could be related to methodological or conceptual confounding (23, 39). Conceptual confounding has been discussed in relation to negative affectivity (18, 38), anxiety, depression (16, 17), psychological well-being (39), hostility (19), self-esteem, perceived control and optimism (38). Possible methodological confounding is presented in the discussion of methods.

The relation between health and hostility is explained by Vahtera et al. (40) as hostility hampers the individual to

benefit from psychosocial resources and this could lead to greater health risks. Riska (36) discussed the origin of the hostility concept and its relation to health by following the development of the concept 'Type A man' to 'Type A personality'. Later on the link between Type A and illness was said to be due to the hostility component (11, 19). Langius et al. (20, p. 170) found that 'those with lower scores on the SOC scale seem to be more anxious and hostile', the evidence for this is a Pearson r-value of −0.619 ($p = 0.05$) for the relation between SOC and anxiety proneness in the Karolinska Scales of Personality (KSP) and −0.763 ($p = 0.01$) between SOC and hostility on the same scale for 12 individuals. This is referred to as evidence by Kivimäki et al. (19) who wanted to verify their hypothesis that SOC has a mediating role between hostility and health. The present study did not measure hostility, but one item in the 'Type A personality'-factor of our instrument is one part of Kivimäki et al.'s (19) definition of hostility, and this correlated significantly with self-rated health, and was also found to have partial correlation with SOC in the regression analysis, but explained no more than 1% of the variance of SOC. This needs further investigation as the results are not unequivocal.

Conclusions

The present study showed a positive association between self-rated health, positive affect/optimism and SOC only for female university students. As the correlations were strong between sense of coherence, positive affect/optimism, and hardiness, it is difficult to draw any conclusions about what actually influences health among personality variables in this population group. The impact of optimism and anger/hostility on health needs to be further explored. The results indicate a need to further validate and develop the SOC scale in relation to possible confounders and especially to the concepts positive affect/optimism and hardiness; and to assess what the global orientation of sense of coherence actually is. There is a need to investigate if the SOC scale is gender biased and if so, in what respects, and also to test the construct validity with respect to conflicting findings of the scale as unidimensional or comprising three different components. The significance of the present study is that it raises questions related to the validity and specificity of the SOC instrument and points at possible directions for future research in the field.

Implications

Future research needs to consider the gender differences in the relationships between measures of health and the SOC scale, as well as with other scales. One way to test the validity and sensitivity of the SOC concept would be to use method triangulation: for example, test the original SOC scale together with interviews. Ideally, the research should use big community-based samples rather than university students, and have prospective and longitudinal designs in order to make causal conclusions possible. Universities, in general, and student health organizations could support students in different ways so that feelings of alienation are minimized and self confidence and a sense of optimism is nourished, as this probably is health promoting.

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