

THE 13-ITEM SENSE OF COHERENCE SCALE IN DUTCH-SPEAKING ADOLESCENTS AND YOUNG ADULTS: STRUCTURAL VALIDITY, AGE TRENDS, AND CHRONIC DISEASE

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The present study focused on the structural validity of the Dutch 13-item sense of coherence (SOC) scale, examined age trends in SOC in adolescence and young adulthood, and investigated the potential impact of chronic disease on SOC. Eight samples of Belgian high school students, college students, and young adult employees were used (total $N = 2,781$); 380 of them aged 14-18 years were diagnosed with congenital heart disease. The SOC-13 scale proved to be structurally valid, as configural, metric, and scalar invariance was established. In line with salutogenic theory, SOC was found to increase with age through the teens and twenties. Relatedly, whereas high school and college students did not differ on mean SOC scores, employed young adults scored significantly higher. Having congenital heart disease was associated with higher levels of SOC in 14-18 year olds: they displayed similarly high scores on SOC as healthy individuals in their late twenties.

In contrast to the pathogenic paradigm focusing on the origins of disease, the salutogenic paradigm focuses on the origins of health and captures mechanisms through which individuals manage stress and stay healthy (Antonovsky, 1979). Sense of coherence (SOC), a key salutogenic construct, is defined as “a global orientation that expresses the extent to which one has a pervasive, enduring though dynamic feeling of confidence that (1) the stimuli deriving from one’s internal and external environments in the course of

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living are structured, predictable, and explicable; (2) the resources are available to one to meet the demands posed by these stimuli; and (3) these demands are challenges worthy of investment and engagement” (Antonovsky, 1987, p. 19). These three components are labelled comprehensibility, manageability, and meaningfulness, respectively. Collectively, they enable individuals to use functional coping strategies when confronted with substantial challenges and to resolve tension in a health-promoting manner (Eriksson & Lindström, 2006; Evans, Marsh, & Weigel, 2010; Schnyder, Büchi, Sensky, & Klaghofer, 2000).

A vast amount of studies testified to the relationship between SOC and health (and more consistently psychological health; Eriksson & Lindström, 2006). SOC has been found to be associated with less depressive and anxiety symptoms, less psychiatric diagnoses, less job burn-out, less involvement in health-risk behaviours, higher self-esteem, better self-reported and objective physical health, and greater psychological well-being (Amirkhan & Greaves, 2003; Ristkari, Sourander, Ronning, & Helenius, 2006; Surtees, Wainwright, Luben, Khaw, & Day, 2003). Although SOC continues to develop through the lifespan, researchers and theorists alike converged on the tenet that the second and third decade of life are crucial formative years partially determining the development of SOC and establishing one’s location on the SOC continuum (Antonovsky, 1987; Honkinen, Aromaa, Suominen, Rautava, Sourander, Helenius et al., 2009). Several challenging and potentially stressful developmental tasks have to be addressed by adolescents and young adults (Antonovsky, 1987). More specifically, they leave the parental home and may get a first full-time job or attend college while, at the same time, they experience a decline in institutional support and structure. Consequently, a proliferation of different life-paths and outcomes characterises this developmental period (Arnett, 2000; Luyckx, Schwartz, Goossens, Soenens, & Beyers, 2008; Schulenberg, Sameroff, & Cichetti, 2004), which makes it a crucial period in life for examining SOC and salutogenic functioning (Antonovsky, 1987; Luyckx, Schwartz, Goossens, & Pollock, 2008).

The full 29-item and especially the brief 13-item SOC scale are used to assess SOC in different age periods and their reliability and validity have been established in various regions of the world (Eriksson & Lindström, 2005). The Dutch version of these scales was developed by Pottie (1990) but, to the best of our knowledge, a systematic inquiry into the structural validity of this Dutch version in adolescents and young adults remains forthcoming.

The present study

The present study examined the structural validity of the Dutch version of the 13-item SOC scale (Antonovsky, 1987; Eriksson & Lindström, 2005) for Bel-

gian adolescents and young adults and compared mean scores on SOC among different subgroups of adolescents and young adults. More specifically, the present study was guided by four main research goals. Our first research goal was to examine whether full measurement equivalence (i.e., configural, metric, and scalar equivalence; Vandenberg & Lance, 2000) across gender and age could be established. Although configural and metric invariance of SOC-13 have been established previously in other regions of the world (e.g., Feldt, Leskinen, Kinnunen, & Ruoppila, 2003; Feldt, Lintula, Suominen, Kosenvuo, Vahtera, & Kivimäki, 2007), to the best of our knowledge, scalar invariance across gender and age remains to be established, irrespective of country of origin. Establishing scalar invariance allows for reliably interpreting mean-level differences among groups.

Second, provided that measurement equivalence can be established, we examined age differences in SOC across the age span of 14-30 years. With respect to age, we hypothesised, based on both theoretical and empirical contributions (Antonovsky, 1987; Feldt *et al.*, 2007), that levels of SOC would generally increase through the second and third decade of life. Individuals increasingly commit themselves to life choices and role patterns through the second and third decades of life which could strengthen their worldview as being comprehensible, manageable, and/or meaningful (Luyckx, Schwartz, Goossens, & Pollock, 2008).

Third, no previous study to date explicitly established whether the measurement structure of the SOC-13 is similar in individuals with and without a chronic disease, although a vast amount of previous research focused on SOC in individuals with chronic diseases. Hence, our third research goal was to assess whether full measurement equivalence across clinical status (i.e., community individuals vs. individuals with a chronic disease) also could be established. We focused on congenital heart disease, being the most common birth defect comprising simple to complex structural heart lesions (Hoffman & Kaplan, 2002). Due to advances in pediatric cardiology and cardiac surgery, the life expectancy of these children has increased substantially over the past decades (Moons, Bovijn, Budts, Belmans, & Gewillig, 2010). Due to these increased survival rates, increasing attention is being paid to psychological health because having congenital heart disease is accompanied by many medical, psychosocial, and behavioural challenges (Karsdorp, Everaerd, Kindt, & Mulder, 2007; Moons, Van Deyk, Marquet, Raes, De Bleser, Budts *et al.*, 2005), which can negatively affect quality of life in these patients (e.g., Lane, Lip, & Millane, 2002).

Finally, notwithstanding these potential detrimental influences of congenital heart disease on daily functioning, research also demonstrated that these individuals can have a relatively good quality of life (Moons, Van Deyk, De Bleser, Marquet, Raes, De Geest, *et al.*, 2006; Moons, De Bleser, Budts,

Sluysmans, De Wolf, Massin et al., 2004), which may be due to the presence of a strong SOC. Indeed, Moons and Norekval (2006) hypothesised that having a chronic disease such as congenital heart disease might be conducive to developing a strong SOC for certain individuals, provided that it is associated with experiences that enhance comprehensibility, manageability, and meaningfulness (e.g., experiencing competence in dealing with the disease, feeling supported by medical staff and parents). This hypothesis has recently been confirmed in a sample of Japanese adolescents (Nio, 2010). Hence, provided that measurement equivalence can be established, our fourth research goal was to examine the potential influence of chronic disease on adolescent levels of SOC. We hypothesised that SOC generally would be higher in adolescents with congenital heart disease than without congenital heart disease.

Method

Samples and procedure

Eight cross-sectional samples collected between 2005 and 2010 in Flanders, the Dutch-speaking part of Belgium, were used. Table 1 gives an overview of demographic characteristics for each sample. The total combined sample size was 2,914. For the present study, we focused on the 2,781 participants (64.8% female) who answered all items of the SOC-13 scale. Samples 2-4 consisted of college students from the Faculty of Psychology and Educational Sciences of a Flemish university. Participants received course credit for attending collective group testing sessions. Samples 5 and 6 were collected in 8 different high schools in 9th-12th grade students from different tracks. Participation was voluntary and anonymity was guaranteed. Questionnaires were administered during a regular class period. For Samples 1 and 7, questionnaires were distributed in different work settings, such as schools, hospitals, and private companies, and among students from different faculties of the aforementioned university. The questionnaires were completed at home and returned to the researchers in an enclosed, pre-stamped envelope. These data collections were approved by the Institutional Review Board of the author's home university.

Finally, of these 2,781 participants, 380 adolescents aged 14-18 years were selected from the database of pediatric and congenital cardiology of a large university hospital (i.e., Sample 8). Patients could be included if they met the following inclusion criteria: confirmed congenital heart disease, defined as structural abnormalities of the heart or intrathoracic great vessels that are actually or potentially of functional significance (Mitchell, Korones, & Berendes, 1971); aged 14 to 18 years; last cardiac consult at our tertiary care centre \leq 5 years ago; able to read and write Dutch; and valid contact

Table 1
Demographic Characteristics of the 8 Samples

<i>N</i>	Effective <i>N</i>	% females	<i>M (SD)</i> age	Age range	Sample description
Sample 1	340	70.1	23.89 (2.85)	18-30	41.4% college students; 58.6% employees (employees: 66.4% degree of post-secondary education; 67.8% working in social sector)
Sample 2	210	80.7	18.54 (1.12)	17-27	College students
Sample 3	253	83.3	19.49 (1.15)	18-30	College students
Sample 4	364	77.4	18.25 (1.27)	17-30	College students
Sample 5	600	52.0	15.70 (1.30)	14-20	High school students
Sample 6	321	60.3	18.29 (0.60)	17-21	High school students
Sample 7	352	65.0	23.28 (3.21)	17-30	55.7% college students; 44.3% employees (employees: 61.5% degree of post-secondary education; 29% working in social sector, 25% working in industrial sector)
Sample 8	429	46.6	15.75 (1.14)	14-18	Patients with congenital heart disease (93.9% high school students)

Note. The column with heading effective *N* indicates the number of participants that completed all items of the SOC-13 scale

details available. Of the 33,895 individuals included in the database on September 2, 2009, 498 patients met the inclusion criteria, 429 of which participated (response rate: 86%). The proposed study protocol was approved by the Institutional Review Board of the university hospital. All participants signed an informed consent form.

Measure

Sense of coherence. SOC was assessed using Antonovsky's (1987) 13-item Orientation to Life Questionnaire (Dutch translation by Pottie, 1990), which consists of four meaningfulness items (e.g., "How often do you have the feeling that there's little meaning in the things you do in your daily life"), five comprehensibility items (e.g., "Do you have the feeling that you are in an unfamiliar situation and don't know what to do?"), and four manageability items (e.g., "How often do you have feelings that you're not sure you can keep under control?"). All items were answered on a 7-point semantic differential scale, in which the response options range from, for instance, *very seldom or never* (1) to *very often* (7). Five negatively worded items were reverse-coded so that high mean scores reflected high levels of SOC. Cronbach's alphas in Samples 1-8 ranged between .74 and .83 ($M = .78$).

Results

Measurement analysis

Confirmatory Factor Analysis (CFA) using maximum likelihood estimation was conducted in Mplus 4 (Muthén & Muthén, 2007). We tested three measurement models (Feldt & Rasku, 1998): (1) a first-order one-factor model; (2) a first-order correlated-three-factor model; and (3) a second-order model with three first-order factors (in which the three latent factor correlations of the second model were substituted by a second-order general SOC factor with three factor loadings, one for each SOC component; Feldt et al., 2007). The latter two models are equivalent models accompanied by identical model fit values. We used standard fit indices (Hu & Bentler, 1999). The chi-squared index, which tests the null hypothesis of perfect fit to the data, should be as small as possible; the Root Mean Square Error of Approximation (RMSEA) should be less than .08; and the Comparative Fit Index (CFI) should exceed .90 (Kline, 2005).

We tested for configural, metric, and scalar invariance and examined whether the measurement model obtained would be invariant for males versus females and for different age groups (i.e., 14-18 year olds, 19-25 year olds, and 26-30 year olds). Configural invariance examines whether the

number of factors and the pattern of factor loadings is equivalent in these different groups as based on the aforementioned fit benchmarks (Vandenberg & Lance, 2000). Metric invariance examines whether factor loadings for the respective items are equivalent in different groups. Scalar invariance examines whether model fit is affected by constraining intercepts of latent factor indicators (i.e., items) as equivalent across groups.

To test for metric and scalar invariance, we compared the fit of multigroup (e.g., males and females as groups) CFA models without constraints (i.e., models with metric or scalar variance) to constrained models (i.e., models with metric or scalar invariance). For such model comparisons, the use of multiple criteria has been advocated by Vandenberg and Lance (2000). Because the χ^2 -statistic is known to be overly sensitive to sample size and model complexity (e.g., Cheung & Rensvold, 2002), we relied on two other commonly used fit indices: the delta (Δ) CFI and the Δ RMSEA. Relatedly, Marsh and Hocevar (1985) already stated that the χ^2 -difference test is so powerful that minimal differences may lead to significant chi-square values and therefore is not optimal to distinguish, for instance, between statistical invariance and practical invariance. Hence, we concluded to measurement invariance if Δ CFI was smaller than .010 and Δ RMSEA was smaller than .015 (Chen, 2007).

Table 2 presents fit indices of the CFA models estimated. Analyses indicated that all three models using the SOC-13 had a less than adequate model fit. The modification indices indicated that this was mainly due to the substantial error covariance between comprehensibility item 5 (*Has it happened in the past that you were surprised by the behaviour of people whom you thought you knew well?*) and manageability item 6 (*Has it happened that people you counted on disappointed you?*). Hence, in line with previous research (e.g., Feldt *et al.*, 2003), we discarded these two items. Using this reduced set of 11 items, CFA indicated that the first-order one-factor model had a poor fit to the data. The two remaining models had an adequate fit to the data. Figure 1 presents the factor loadings and latent factor correlations of the first-order correlated-three-factor model. As detailed above, in the second-order model, the three components of meaningfulness, comprehensibility, and manageability loaded on a single second-order factor, with factor loadings of .58, .93, and 1.00, respectively.

As can be seen in Table 2, configural invariance for age and gender was established as the measurement model yielded an acceptable fit in different gender and age groups. Multigroup tests indicated that metric invariance was obtained for males and females (Δ CFI < .010; Δ RMSEA < .015) and for the three age groups (Δ CFI < .010; Δ RMSEA < .015). Next, to test scalar invariance, the baseline model was the metric invariant model in which intercepts were freely estimated. This model was compared to a model in which inter-

Table 2
Fit Indices of the Various Measurement Models

Model	df	χ^2	RMSEA	CFI	SRMR
<i>SOC-13</i>					
First-order one-factor model	65	2020.591	.104	.760	.066
First-order correlated-three-factor model	62	1473.85	.090	.827	.054
Second-order model	62	1473.85	.090	.827	.054
<i>SOC-11</i>					
First-order one-factor model	44	1024.197	.090	.835	.064
First-order correlated-three-factor model	41	457.678	.060	.930	.043
Second-order model	41	457.678	.060	.930	.043
<i>Configural invariance</i>					
Males	41	198.692	.063	.924	.046
Females	41	281.925	.057	.936	.042
14-18 year olds	41	225.151	.060	.915	.048
19-25 year olds	41	203.014	.064	.916	.050
26-30 year olds	41	85.931	.076	.899	.070
Community	41	395.452	.060	.923	.045
CHD	41	126.790	.074	.916	.057
<i>Metric and scalar invariance</i>					
Gender variant	82	480.617	.059	.932	.043
Gender metric invariant	90	496.849	.057	.930	.046
Gender scalar invariant	98	580.551	.060	.917	.047
Age variant	123	514.096	.063	.913	.051
Age metric invariant	139	522.070	.059	.915	.052
Age scalar invariant	155	580.274	.059	.907	.051
Clinical variant	82	522.242	.062	.922	.047
Clinical metric invariant	90	538.572	.060	.920	.050
Clinical scalar invariant	98	573.381	.059	.915	.047

Note. df = degrees of freedom; RMSEA = Root Mean Square Error of Approximation; CFI = Comparative Fit Index; SRMR = Standardised Root Mean Square Residual; SOC = sense of coherence; CHD = congenital heart disease.

cepts were constrained to be equal for all groups (i.e., the scalar invariant model). The scalar invariant model could be retained for the different age groups ($\Delta CFI < .010$; $\Delta RMSEA < .015$). For males and females, $\Delta RMSEA$ (.003) pointed to scalar invariance, whereas ΔCFI (.013) seemed to point to scalar variance. However, due to the fact that the scalar invariant model for males and females had an adequate model fit, we proceeded with caution in interpreting mean-level differences on SOC between males and females. Finally, again as demonstrated in Table 2, configural invariance for individuals with versus individuals without congenital heart disease was established

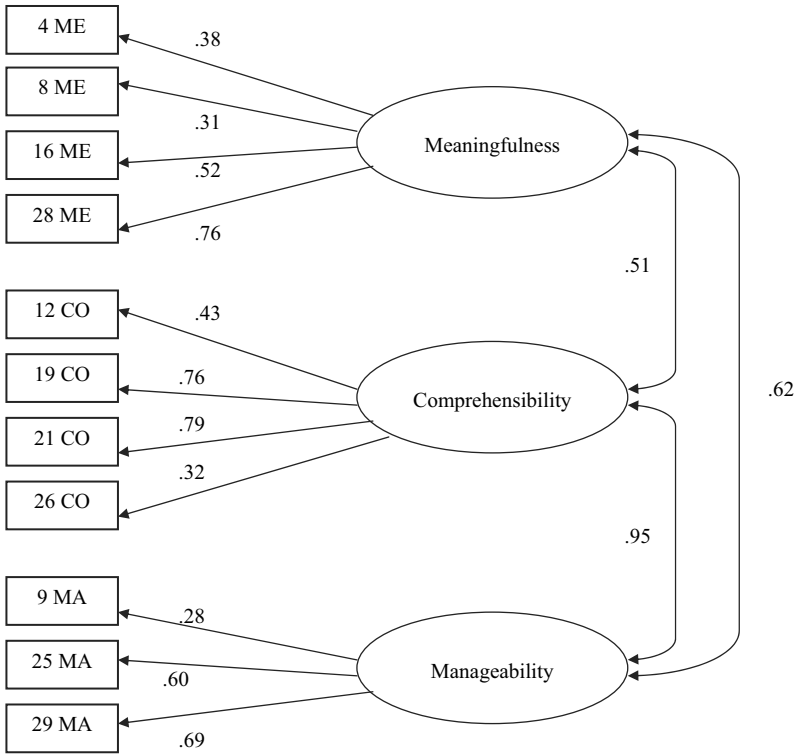


Figure 1

First-order correlated-three-factor model on the 11 items of the SOC scale. The indicators are numbered according to their item numbers as presented in Antonovsky's (1987) 29-item version of the SOC scale. ME = meaningfulness; CO = comprehensibility; MA = manageability

as the measurement model yielded an acceptable fit in both groups. Subsequent analyses pointed to both metric and scalar invariance ($\Delta CFI < .010$; $\Delta RMSEA < .015$) for both groups of individuals.

Age, gender, and congenital heart disease

An analysis of variance (ANOVA) was conducted to examine age and gender differences on mean SOC scores, and to examine whether adolescents with congenital heart disease would differ on mean SOC scores from their peers. Hence, eight groups of participants were created (i.e., based on the groups used to assess measurement equivalence): 14-18 year old boys, 14-18 year

old girls, 14-18 year old boys with congenital heart disease, 14-18 year old girls with congenital heart disease, 19-25 year old men, 19-25 year old women, 26-30 year old men, and 26-30 year old women. An ANOVA with SOC as dependent variable and these eight groups as fixed factor yielded a significant effect ($F(7, 2772) = 31.97; p < .001, \eta^2 = .08$). The accompanying effect size (η^2) was moderate (Cohen, 1988). Table 3 presents post-hoc comparisons using Tukey HSD tests. On SOC, 14-18 and 19-25 year olds scored lowest (irrespective of gender), whereas 14-18 year olds with congenital heart disease and 26-30 year olds scored highest (irrespective of gender). In sum, as demonstrated in Figure 2, mean levels on SOC were mainly dependent on age (with, generally, older individuals having more favourable scores) and whether or not individuals were diagnosed with congenital heart disease (with individuals with congenital heart disease having substantially higher scores than their same-aged peers).

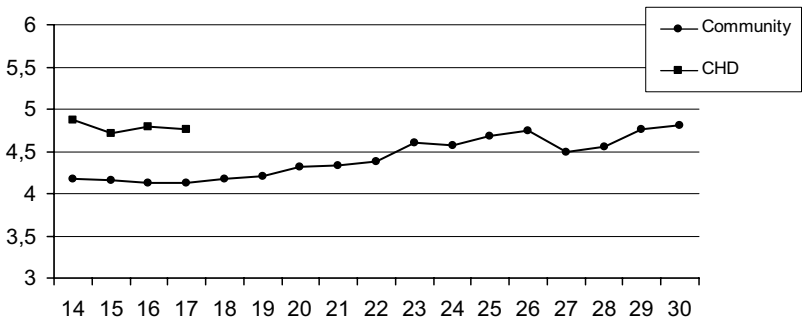


Figure 2

Mean scores on SOC for the different ages assessed in the combined sample, separately for community participants and for patients with congenital heart disease (CHD). For patients with CHD, the group of 18 year olds consisted only of 10 individuals and, hence, are not displayed as a separate group but are combined with the 17 year olds

An ancillary ANOVA focused on whether high school students, college students, and young adult employees differed on SOC ($F(2, 2778) = 33.51; p < .001, \eta^2 = .03$). The accompanying effect size was small (Cohen, 1988). Post-hoc comparisons indicated that young adult employees ($M = 4.66, SD = 0.77$) scored significantly higher on SOC as compared to high school and college students. The latter two groups did not differ significantly on SOC ($M = 4.35, SD = 0.90$; and $M = 4.25, SD = 0.75$, respectively).

Table 3
Univariate Analysis of Variance and Post-hoc Cluster Comparisons Based Upon Tukey HSD Tests

Variable	Groups								F-value	η^2
	14-18 male	14-18 female	14-18 CHD male	14-18 CHD female	14-18 CHD male	14-18 CHD female	19-25 male	19-25 female		
SOC	4.23 ^a (0.82)	4.12 ^a (0.76)	4.86 ^b (0.94)	4.72 ^b (0.93)	4.36 ^a (0.78)	4.35 ^a (0.77)	4.72 ^b (0.78)	4.62 ^b (0.80)	31.97***	.08

Note. Group means significantly ($p < .05$) differ if they have different superscripts. Standard deviations in parentheses. SOC = sense of coherence; CHD = congenital heart disease.
^a $p < .05$. ^b $p < .01$. ^{***} $p < .001$

Discussion

The present study extended our knowledge on SOC and resilient functioning through adolescence and young adulthood in three important ways. First, the SOC-13 scale proved to be a structurally valid and invariant instrument for males and females, for different age groups in the late teens and twenties, and for individuals with and without congenital heart disease. Second, congenital heart disease was associated with higher scores on SOC in adolescents. Third, in line with core tenets of salutogenic theorising (Antonovsky, 1987), SOC tended to increase across the 14-30 year age span.

Numerous research efforts to date focused on the structural validity of the SOC-13 scale (Eriksson & Lindström, 2005) and seemed to converge on the conclusion that the first-order correlated-three-factor model and the equivalent second-order model best represent its factor structure (e.g., Feldt et al., 2007). Previous studies also indicated that the factor structure is not flawless because two items (i.e., comprehensibility item 5 and manageability item 6) demonstrated a strong error covariance, instigating some researchers to proceed with a reduced set of items (e.g., Hakanen, Feldt, & Leskinen, 2007; Veenstra, Moom, & Roysamb, 2007). The problems with these two specific items were also identified in the present study. When proceeding with 11 items, both factor models aforementioned provided an adequate fit. In addition, the present study substantially extended previous factor-analytical studies of the SOC-13 scale by establishing measurement invariance (i.e., configural, metric, and scalar invariance) across age, gender, and clinical status (i.e., having a chronic illness or not). It should be noted, however, that, in line with the literature (Antonovsky, 1993; Eriksson & Lindström, 2005), the Dutch version of the SOC-13 scale proved to be suitable especially to measure total SOC scores and seemingly less so to assess the separate components of SOC, due to the very high correlation between the latent factors of comprehensibility and manageability in the first-order correlated-three-factor model (Feldt et al., 2007).

Due to the fact that configural, metric, and scalar invariance was established to a sufficient degree, we could reliably interpret mean differences among different groups of participants. In interpreting these mean-level differences, readers should note that the accompanying effect sizes were small to moderate in range and, hence, did not point to very large differences in mean SOC levels among the different groups assessed. Notwithstanding, two findings need to be emphasised. First, some age-related increases in SOC were found (Hakanen et al., 2007; Nilsson, Leppert, Simonsson, & Starrin, 2010). Analyses of variance indicated that age differences in community individuals were primarily identified between 14-18 and 19-25 year olds on the one hand and 26-30 year olds on the other. Ancillary analyses indicated that

employed young adults scored highest on SOC (Luyckx, Schwartz, Goossens, & Pollock, 2008), whereas high school and college students did not differ in their SOC scores.

Although the latter finding might come as a surprise, readers should note that the transition from high school to college is a challenging one with potentially differential influences on the three SOC components (Montgomery & Côté, 2003). College students have to rebalance their lives and find their way into adult life. Most freshmen can no longer rely fully on their existing network of friends and family and have to deal with many life changes and choices. Consequently, identity redefinitions are common in college students (Luyckx, Goossens, & Soenens, 2006), potentially leading to increases in life purpose and, hence, the SOC component of meaningfulness for some individuals. However, the increase in life possibilities and outcomes characteristic for college life can render this period in life more difficult to navigate as compared to the more structured life of high school (Arnett, 2000), potentially resulting in lowered feelings of the SOC components of comprehensibility and/or manageability for some individuals. The end result of such potential differential influences of college life on the SOC components (i.e., potential increases for the one component and decreases for the other) could be that total SOC scores indeed do not differ between high school and college students, as observed in the present study.

Second, in line with previous research (Nio, 2010), SOC was somewhat higher among adolescents with congenital heart disease than among their same-aged peers. These findings suggest that experiencing moderate amounts of stress and life-shaping experiences can be conducive to the development of SOC (Evans *et al.*, 2010; Moons & Norekval, 2006). In addition, the present study demonstrated that adolescents with congenital heart disease experienced similar levels of SOC as community individuals in their late twenties. Apparently, living with congenital heart disease can be accompanied with positive functioning in adolescence and might lead individuals to perceive life as comprehensible and manageable. It remains to be investigated which specific mechanisms account for these findings. As previously stated, increased feelings of SOC might emerge if adolescents feel supported by parents and clinicians and if they experience competence in dealing with their condition (Moons & Norekval, 2006; Nio, 2010).

Limitations and suggestions for future research

The present study was characterised by several limitations which provide avenues for future research. First, the present study was cross-sectional in nature and, hence, observed age effects could be confounded with birth cohort effects. Future research focusing on SOC should follow up cohorts of adoles-

cents as they make the transition to adulthood in order to make authoritative claims with respect to the development of SOC. Future research should also examine the predictive value of SOC towards biopsychosocial functioning. In doing so, researchers should focus on the added value of SOC over and above other, related constructs such as self-efficacy and hardiness. Although SOC is hypothesised to be quite unique in terms of its breadth, explanatory power, and applicability (Amirkhan & Greaves, 2003; Schnyder et al., 2000), such tenets need to be investigated thoroughly to allow for authoritative conclusions (Geyer, 1997).

Second, the present study likely excluded those individuals who might experience great difficulties in transitioning to adulthood, such as school drop-outs and unemployed people. The experience of striving to find employment yet being unable to do so indeed is frustrating and demoralising for young adults (Vastamäki, Moser, & Paul, 2009). As such, future research should focus on more representative samples to capture the diversity of challenges with which young people are confronted.

Third, the present study was not equipped to provide information about the exact processes or mechanisms that accounted for some of the observed findings. For instance, a particularly intriguing finding was the elevated levels of SOC in 14-18 year olds with congenital heart disease as compared to their same-aged peers. Hence, future longitudinal research should examine potential mediators of these observed differences and ascertain if these findings are limited to adolescence or whether they extend well into adulthood. Relatedly, future research should focus on other chronic diseases as well, such as neurological disorders or diseases with severe lifestyle restrictions. Previous research indicated that diseases such as epilepsy can lead to impairment in SOC in the transition to adulthood (Gauffin, Landtblom, & Rätty, 2010). Consequently, person-centred longitudinal research is needed to focus on the variability within the group of chronically ill individuals in order to investigate why adolescents with chronic diseases develop differently with regard to SOC and positive functioning (*cf* Feldt, Leskinen, Koskenvuo, Suominen, Vahtera, & Kivimäki, 2011; Hauser, 1999).

Finally, in line with the literature focusing on SOC (Antonovsky, 1993; Eriksson & Lindström, 2005), in the present study we focused on total SOC scores. However, research also pointed to the differential clinical and physiological correlates of the three SOC components and to their differential susceptibility to interventions (e.g., Bergstein, Weizman, & Solomon, 2008; Lindfors, Lundberg, & Lundberg, 2006; Vastamäki et al., 2009). Relatedly, Nio (2010) found differences between healthy adolescents and adolescents with congenital heart disease primarily on the SOC components of comprehensibility and manageability, and less so on meaningfulness. However, the present study indicated that the SOC-13 scale might not be well suited to dif-

ferentiate among the three components, as Antonovsky (1987; 1993) already emphasised. Two of the three components indeed were very highly correlated at the latent level in the present study, which questioned their practical distinctiveness. Although a lot of versions of the SOC-scale already exist (Eriksson & Lindström, 2005), Antonovsky (1996) pointed out that, ideally, a new measure should be designed if researchers want to focus on the three separate components of SOC.

Despite these limitations, the present study has provided valuable information regarding the structural validity of the Dutch SOC-13 scale and the ways in which SOC seems to increase throughout the late teens and twenties. Further, having a chronic disease such as congenital heart disease was associated with higher levels of SOC in 14-18 year old adolescents, even to the extent that they displayed similarly high scores on SOC as community individuals in their late twenties.

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