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Sense of coherence and 22-year all-cause mortality in adult men

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ABSTRACT

Background: Sense of coherence (SOC) is a central construct in Antonovsky's salutogenic theory, which focuses on people's health-promoting and health-protecting characteristics. We examined prospectively the association of SOC with all-cause mortality during 22 years (1989–2011).
Methods: The data of 585 men from the Israel longitudinal study of Glucose Intolerance, Obesity, and Hypertension (The Israel GOH) comprised the analytic sample. Participants were 48–67 years old at study entry (1989). Information on sociodemographic, medical history and health-related risk factors were obtained at baseline through a face-to-face interview. Participants completed Antonovsky's 29-item SOC scale. Information on all-cause mortality was obtained from the Israeli Mortality Register (1989 through 2011). We evaluated the effect of SOC on time-to-death using multiple Cox proportional hazard regression.
Results: Controlling for sociodemographic, smoking status and morbidities, there was strong evidence of an association between SOC and 22-year all-cause mortality [adjusted hazard ratio (aHR) = 0.992, 95% CI 0.986–0.998 per unit]. Strong SOC was associated with a 35% reduction in all-cause mortality relative to weak SOC (aHR = 0.653, 95% CI 0.454–0.939). There was no convincing evidence of a survival advantage for individuals with intermediate level of SOC relative to persons reporting weak SOC (aHR = 0.821, 95% CI 0.595–1.134).
Conclusions: Our study provides strong evidence of an association between SOC and mortality, above and beyond potential confounding factors and established risk factors. Considerable more research is needed on the role of SOC in health and survival and the potential pathways linking SOC and health.
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Introduction

There has been a growing interest in the impact of positive mental states and dispositions such as optimism [1], emotional well-being [2] and life-satisfaction [3] on morbidity and mortality and how these promote resilience.

The concept of sense of coherence (SOC) was introduced by Antonovsky as a part of the salutogenic theory, which focuses on people's health-promoting and health-protecting characteristics. Sense of coherence is defined by Antonovsky as "a global orientation that expresses the extent to which one has a pervasive, enduring, though dynamic feeling of confidence that (1) stimuli deriving from one's internal and external environments in the course of 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" [4]. These three dimensions comprising SOC are referred to as, comprehensibility, manageability, and meaningfulness.

Antonovsky [1979] maintained that in order to develop to its full strength, SOC needs generalized resistance resources (GRRs) which he defined as any characteristic of a person, a group, or an environment that can help people to cope successfully. GRRs play a central role in the development of SOC during childhood, adolescence, and adulthood. Previous research has shown that socioeconomic and psychosocial circumstances influence SOC [5–9]. He further suggested that SOC develops during childhood and early adulthood while stabilizing around age 30 years; it remains relatively stable throughout life thereafter [4]. Previous research has shown high test-retest stability for SOC in adults, [10–13] although some studies have documented changes in level of SOC over time after age 30 years [10,14,15].

Antonovsky developed the SOC scale to test the implications of the salutogenic model empirically (Antonovsky, 1987). The original SOC scale comprises of 29 items (SOC-29), 11 measuring comprehensibility, 10 manageability and 8 measuring meaningfulness with a 7-point rating. A substantial number of studies have shown that the SOC-29 and the 13-item shortened version of the SOC scale (SOC-13) have good reliability and validity in a variety of populations [16]. Several population based studies used a modified version of the SOC scale (SOC-3) although

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empirical evidence point to low reliability and validity of the SOC-3 [17,18] and only moderate correlation with the original scales.

A growing number of studies examined the relationship between SOC and various indicators of health. In one large study [19] high SOC was associated with a reduction in risk of psychiatric disorders over 19 years though other studies found no association between SOC and psychiatric morbidity [20]. In another study, weak SOC was associated with 8-year cancer incidence [21] but after 12 years there was no evidence of an association. Similarly, lower SOC was associated with higher risk of diabetes over 18 years in younger (18–50 years at study entry) but not in older participants [19].

Previous studies addressing mortality as an outcome are few and vary considerably in methodology. Using the SOC-3, Surtees et al. [22] reported that a strong SOC was associated with a 25% (RR 0.76, 95% CI 0.76–0.87) reduction in all-cause mortality during six years relative to weak SOC in 20,579 men and women aged 41–80 years adjusting for age, social class, morbidity smoking and neuroticism. However, Super et al. found an inverse association between participants' score on the SOC-3 scale and mortality among 12,024 men and women aged 20–65 years over 15 years adjusting for sociedemographic factors alone. After adjustment for health status there was weak evidence of an association of SOC score and mortality [23]. Lundman [24] reported an inverse association between SOC-13 and one-year mortality in 190 older adults from the Umea 85+ study adjusting for age and sex but there was no convincing evidence of an association of SOC score with four-year mortality. However, another study reported an association between SOC-13 score and mortality among 7,933 men and women aged 25–74 years up to 17 years later adjusting for sociodemographic, lifestyle factors and for chronic illness but there was no evidence of an association following adjustment for depression [25]. Poppius et al. [26] found that scoring in the lowest tertile of the SOC-29 scale was associated with 35% increased 8-year mortality (RR 1.35, 95% CI 0.97-1.87) relative to scoring at the top tertile among 4,405 men, 40–55 years at baseline, from the Helsinki Heart Study, although the result was associated with chance after adjusting for age, smoking, alcohol consumption and occupation. Stratification showed that occupation was a moderator in this association.

In the present report, we examined prospectively the association of SOC with all-cause mortality during 22 years (1989–2011) in 585 males aged 48–67 years at baseline from the Israel longitudinal Study of Glucose Intolerance, Obesity, and Hypertension (The Israel GOH Study). We used the original 29-item SOC scale as a continuous measure. Antonovsky viewed sense of coherence a dimensional construct and has not expressed the level of a normal SOC; he pointed out that the SOC should be examined without dividing the total score into low or high levels [4]. Subsequently, we used the SOC scale as categorical measure for comparability with previous research.

Methods

Design and participants

Participants were drawn from a target population of men who belonged to an ongoing population based longitudinal study: The Israel Study of Glucose Intolerance, Obesity, and Hypertension (The Israel GOH Study) described in detail elsewhere [27,28]. In summary, the GOH study began in 1969, aiming to study the prevalence, risk factors and complications of hypertension, glucose Intolerance and obesity in the Jewish Israeli population. Of 2,800 men born in 1922–1941, randomly sampled from the Israel Population Registry according to age and ethnic origin distribution 2,000 (71%) were actually recruited for Phase-1 of the study and 1,200 (63%) of them survived and consented to participate in Phase-2 of the GOH study. They were the target population for the present study, where 797 men were randomly sampled for an interview on SOC in 1989. Non participation during Phase-1 (1969–1971) was mainly due to limited study funds (20%) failure to trace sampled individuals (7%) and refusal (3%). Similarly, non-participation during Phase-2 (1979–1982) was mainly due to limited study funds (15%), loss to follow up (9%), refusal (3%), and death (2%). Participants in both study phases did not differ from the original sample in terms of age, ethnic origin distribution, length of residence in Israel, blood pressure and BMI [27,29].

We included in the analytic sample only individuals who completed at least half of the items of the SOC scale, resulting in 585 individuals (73.4% of the intended sample) aged 48–67. Exclusion was due to failure to trace sampled individuals ($n = 149$), migration ($n = 8$), refusal ($n = 33$), hospitalization ($n = 10$), completed less than half of the SOC items ($n = 4$) and death ($n = 8$). Participants and men from the target population who did not participate in this study did not differ on age ($p = 0.4$), smoking habits ($p = 0.1$), and systolic ($p = 0.7$) or diastolic ($p = 0.9$) blood pressure. The mean BMI of participants was higher than that of the rest of the cohort ($p = 0.001$) and the distribution of ethnic origin was different between the two groups ($p = 0.002$).

The study obtained approval from the Institutional Review Board (IRB) of the Sheba Medical Center. All participants signed informed consent prior to assessment.

Measures

We collected data on sociodemographic variables including age in years, marital status (single, married, widowed, divorced), ethnic origin (Asia, Yemen, North Africa, Europe/America), socioeconomic status [indexed by level of education (years of schooling), employment status (full-time, part-time, retired, unemployed other), number of rooms in the household], and religiosity (orthodox, religious, observant, secular). To obtain information on relevant morbidities participants were asked if they have had a history of any of a list of medical conditions including cardiovascular disease, diabetes, cancer and hypertension. Participants also reported if they were current smokers, past smokers (stopped smoking six or more months before assessment), or non-smokers. Participant-reported height and weight were used to calculate body mass index (BMI). Information was obtained at baseline through a face-to-face interview conducted in the participant's home by a senior investigator – Y.D. The interview lasted approximately 45 minutes, followed by approximately 30 minutes of self-completed questionnaires including the SOC scale.

Sense of Coherence (SOC) was measured using Antonovsky's 29-item SOC scale [30]. Each item is scored on a 7-point scale (1–7) and the total score of the SOC scale is a sum of the ratings on all 29 items; it can range between 29 and 203 while higher score indicates a stronger SOC. The SOC scale was originally developed by Antonovsky in English and in Hebrew; it has been reported to have good psychometric properties [16].

Information on all-cause mortality was obtained by merging the study file with the Israeli Mortality Register. The Mortality Register contains all records of Israeli residents who died in Israel since 1948. Mortality data were obtained by linking the Mortality Register with the Israel National Population Register using individuals' national identification number. Mortality records were reviewed through July 2011.

Statistical methods

For each individual, we calculated the sum of all 29 items of the SOC scale. For participants who had missing data on the SOC items ($n = 21$) we replaced the missing items with their mean, provided they had completed at least 50% of the SOC items.

We used Cronbach's alpha to assess the internal consistency of the SOC scale.

We used t-test and Pearson chi-square tests for comparing participants on continuous and categorical baseline variables, respectively (Table 1).

The outcome variables are death and time-to-death after completion of the SOC scale in 1989–1990.

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