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Change in sense of coherence mediates the association between economic recession and mortality among middle-aged men: A population-based cohort study from Eastern Finland

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ABSTRACT

A financial recession has been associated with a decrease in all-cause mortality, but little is known about how psychosocial fluctuations in stress tolerance or orientation to life affect this association. Sense of Coherence (SOC) is a core construct in the Salutogenic Model of Health and is determined by generalized resistance resources and measures one's orientation to life by comprehensibility, manageability, and meaningfulness. We followed the mortality of a cohort of middle-aged Finnish men ($n = 854$) from the 1980s to the end of 2019. The cohort baseline was stratified into four age groups at baseline: 42, 48, 54, and 60. SOC was measured twice, at the baseline and at the 11-year follow-up visit. Between these SOC measurements, Finland confronted a deep financial recession, the effects of which were examined at the follow-up visit by questionnaires related to economic hardship (sum of nine items) and experience of the recession (one item). Using age group, marital status, employment status, and education as covariates, the change in SOC mediated both the economic hardship and the experience of recession relations to mortality: the indirect effects -19.57 (95% CI -43.23 to -0.92), and -26.82 (95% CI -59.52 to -0.61), respectively. Every one-point increase in economic hardship predicted about 2 and a half weeks shorter life expectancy, and those who experienced very strong disadvantages of economic recession had about 3 and a half months lower life expectancy by the end of 2019 than those who fully avoided the disadvantages. Furthermore, the younger age groups, 42 and 48, experienced the recession more severely than the older groups, 54 and 60. We conclude that following how orientation to life changes among middle-aged might be an informative approach after a recession.

1. Introduction

A financial recession can impact mortality in different ways. In the short term, a recession increases rates of suicide but decreases all-cause mortality (Ballester et al., 2019; Granados, 2005; Margerison-Zilko et al., 2016; Strumpf et al., 2017; Toffolutti and Suhrcke, 2014). This so-called pro-cyclical mortality, in which mortality declines during and after a recession, is a well-known phenomenon (Stevens et al., 2015) and could be explained by decreased levels of traffic and work-related accidents, declines in stress and consumption of tobacco, alcohol, and saturated fats, and an increase in social interaction, social support, and sleep time (Granados, 2005; Catalano et al., 2011). Instead of this short-term net effect, it could be more beneficial to study how a recession affects health and mortality in subgroups (Catalano and Bellows, 2005; Catalano et al., 2011) and in the long term (Doerr and Hofmann, 2022; Salinari and Benassi, 2022; Vågerö and Garcy, 2016). There is also an urgent need for studies, which use well-established measurement instruments to investigate the relationships between mental health and economic crisis and identify individuals, who are especially vulnerable during and after a recession (Marazziti et al., 2020).

One measurement questionnaire that can aid in targeting protective measures against the negative effects of a recession is the Sense of

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Coherence (SOC) scale.[IP1] [IP1]Corrected. SOC is a central concept in the Salutogenic Model of Health, developed by Aaron Antonovsky, which is a health-promoting orientation and focuses on the origins of health instead of the origins of disease (Mittelmark and Bauer, 2022). SOC reflects an individual's orientation to life and has three subcomponents: comprehensibility, manageability, and meaningfulness (Antonovsky, 1993). Salutogenic orientation perceives health as a continuum on a healthy/dis-ease scale and relates to all aspects of a person, social surroundings included (Antonovsky, 1993; Mittelmark and Bauer, 2022). The Salutogenic Model of Health sees stressors as not simplistic pathogenic but a dynamic part of life, and inherent to human existence (Antonovsky, 1987).

Originally Antonovsky assumed that those who develop a strong SOC by the end of early adulthood have relatively stable SOC during the rest of their life (Meier Magistretti, 2022). Later evidence has shown that although SOC tends to increase during aging, SOC development is a lifelong learning process, and significant life events can fluctuate it (Meier Magistretti, 2022). A large five-year follow-up of Finnish adults found that the development of SOC is a complex phenomenon (Feldt et al., 2011), and a strong SOC did not protect it from declining, as negative life events decreased SOC in among both genders (Volanen et al., 2007). Many recession-related incidences, like job loss, have a significant impact on life and may affect the level of SOC. For example, an employment trajectory from fixed-term employment to unemployment has been shown to be associated with the least favorable SOC change (Liukkonen et al., 2010).

According to theory, SOC is developed by Generalized Resistance Resources (GRRs), which facilitate a person, a group, or a community to cope with stressors (Idan et al., 2016). The GRRs evolve through life experiences, and various internal and external factors, such as age, the growing environment, genes, gender, marital status, culture, and social support can influence GRRs and the development of SOC (Idan et al., 2016). Similarly, the association of a recession with morbidity and mortality may differ by age, living area, and gender (Margerison-Zilko et al., 2016). For example, in the US individuals aged 45–66 who experienced job loss due to the recession showed increased mortality risk (Noelke and Beckfield, 2014), but the mortality was decreased among unemployed people aged 25–64 and living in metropolitan areas (Strumpf et al., 2017). In the EU rising unemployment rates among individuals aged less than 65 years were associated with declining mortality (Toffolutti and Suhrcke, 2014). Moreover, global trends show that mortality is higher in developing economies and emerging markets than in more advanced countries still 10 years after the downfall of gross domestic product (Doerr and Hofmann, 2022), which could be related to the country's capability and willingness to reject austerity policies (Backhaus et al., 2022; Karanikolos et al., 2013).

Many of the recession-related responses may be gender specific and dependent on sociocultural gender roles, and the male gender may emphasize the negative effects of a recession. In Sweden, long-term observations show an association between increased mortality risk and unemployment across the population, but only men increase the risk by being unmarried and having low education and income (Vågerö and Garcy, 2016). Furthermore, job loss has been shown to increase alcohol-related hospitalization among both genders, but self-harm and traffic accidents among men only (Eliason and Storrie, 2009). In Finland, highly educated unemployed men have shown the highest risk for mortality from cardiovascular disease and suicide during a recession (Avendano et al., 2017). Moreover, in a Finnish cohort of over 1600 participants, the experience of economic hardship due to a recession was associated with increased cancer risk among men but not women (Jarroch et al., 2022a), and the covariate-adjusted risk of psychiatric disorders was clearly elevated among middle-aged and older men, but not among women (Jarroch et al., 2022b). Overall, a recession seems to have more negative health impacts on men than women (Margerison-Zilko et al., 2016).

Most earlier studies have concentrated on the association between

employment status and mortality, but unemployment is only one of the potential challenges associated with recession (Catalano et al., 2011). A financial depression may also increase stress and anxiety among those who keep their jobs, it may decrease social support available since many concentrates on securing their situation, and it may build up a collective climate of fear and panic (Giorgi et al., 2015). Systematic reviews have found that economic crisis is a stressing factor as such and is associated negatively with mental health (Frasquilho et al., 2016; Marazziti et al., 2020), especially in middle-aged men, although it is difficult to ascertain how this connection is developed (Marazziti et al., 2020). The change in SOC could be one of the explanatory factors.

While it is clear that SOC can change even in late adulthood, the relationship between this change and factors such as periods of financial decline, morbidity, mortality, and gender is still not well understood. A decrease in SOC, on a general level, has been linked to increased all-cause mortality hazard among middle-aged men, but the interrelation with recession remains only speculative (Piiroinen et al., 2022), and the potential explanations across health outcomes, SOC, and other psychometric measurements warrant more research (Piiroinen et al., 2020). It has been suggested that psychosocial resources could have a critical mediating or moderating role between socioeconomic status and health (Matthews et al., 2010) and that future research should focus on possible mediating, moderating, and confounding factors, such as stress management and age, between unemployment, recession, and mortality (Roelfs et al., 2011).

Although a strong SOC has been shown to moderate and buffer the negative effects of stressful life events on health (Richardson and Ratner, 2005), and a weak SOC to impact negatively on employees' financial health (Barnard et al., 2010), the best our knowledge, there are no previous studies of the possible mediating or moderating role of change in SOC between recession and mortality. Furthermore, none of the previous studies have investigated the possible underlying mechanism that might explain the findings that recession seems to have more negative health impacts on men than women. Based on previous research (Piiroinen et al., 2022) and the salutogenic theory (Antonovsky, 1993; Mittelmark and Bauer, 2022), we hypothesized that a change in SOC could explain, or at least moderate, the pathway from recession to mortality among middle-aged men.

As a possible explanation for our hypothesis, we posited that recession may have a negative impact on an individual's GRRs, for example, by decreasing material resources, increasing inconsistency in one's environment, sifting load balance towards under- or overload, and decreasing participation in shaping outcomes and belonging to social groups (see Idan et al., 2016). This, in turn, may limit the ability to mobilize more GRRs to manage recession-induced distress, thus disturbing one's SOC, leading toward the negative side of the health continuum, and eventually increasing mortality. Additionally, we hypothesized that age (Piiroinen et al., 2022), marital status, employment status, and education level (Vågerö and Garcy, 2016) would be important covariates for both the change in SOC and mortality. Therefore, the aim of this study was to examine whether the change in SOC mediates or moderates the long-term impact of economic hardship and the experience of a recession on all-cause mortality after the 1990s recession in Finland among middle-aged men.

2. Methods

2.1. Study participants

The participants came from Kuopio Ischaemic Heart Disease Risk Factor (KIHD) study, which is an ongoing prospective study, and has one of the most thoroughly characterized cohorts in the world (Brester et al., 2022). Originally the KIHD study included only middle-aged Eastern Finnish men because this specific population had one of the highest recorded coronary heart disease rates in Finland (Salonen, 1988; Voutilainen et al., 2007). The recruitment of men was carried out in two

sub-cohorts. The first was recruited between 1984 and 1986 and included 1166 men. The second was recruited between 1986 and 1989 and included 1516 men. All living participants of the second sub-cohort were invited for the KIHD 11-year follow-up examinations, of which 854 men participated and served as the present study population. The baseline age groups were 42 ($n = 218$), 48 ($n = 215$), 54 ($n = 223$), and 60 ($n = 198$). All study participants gave written informed consent both at the KIHD study baseline and at the follow-up. The ethical committee of Kuopio University Hospital and Kuopio University approved the KIHD study on December 1, 1983, and again on October 27, 1997 (Approval number 143/97). The KIHD study design has been described and its timeline illustrated in many publications, such as Mäkelä et al. (2022).

2.2. Measurements of recession effects, SOC, outcomes, and covariates

Economic hardship questions and an item of self-perceived experience of a recession were included in the KIHD study after Finland experienced a collapse of its economy in the early 1990s (Jarroch et al., 2022b) and were thus answered only at the 11-year follow-up. The Economic Hardship scale consisted of nine items covering financial burdens related to the economic recession. The participant's experience of the severity of recession disadvantages was measured by a single-item Experience of Recession scale. The details of the questions and coding for both scales are presented in Table 1.

SOC was measured by an applied 13-item scale, which has shown high temporal stability and relatively high structural validity (Feldt et al., 2007). The 10th question of the 13 items ("Many people, even those with a strong character, sometimes feel like losers in certain situations. How often have you felt this way in the past?") was not included due to difficulties in translating it from English to Finnish (Lynch et al., 1997). Therefore, the final SOC scale in KIHD consisted of 12 items. Each item was answered on a 7-point semantic scale so that the respective lowest and highest possible total scores were 12 and 84. Study participants answered the SOC questionnaire twice; at baseline between August 1986 and December 1989 and at the follow-up, approximately 11 years after the baseline, between October 1998 and February 2001. The mean follow-up time between the measurements was 11.1 (range = 9.7–14.4) years. Cronbach's alpha for the 12-item SOC scale was 0.82 at

the baseline and 0.85 at the 11-year follow-up.

Change in SOC was measured by the difference scores (Human et al., 2013). The difference scores were calculated by subtracting the baseline score from the 11-year follow-up score for each participant. Consequently, a positive difference score indicated a strengthened SOC over the follow-up time. Furthermore, we observed a clear negative correlation in the scatterplot of change, which plots the change in SOC (the difference score) against the baseline SOC (Barnett et al., 2005). This is called regression to the mean (RTM) phenomenon, which is an overall tendency of individuals to obtain values closer to the mean of the distribution when the same measurement is repeated over time and is often caused by random measurement error (Barnett et al., 2005) but can also occur without it (Johnson and George, 1991). Because the RTM phenomenon can make natural variations in repeated measurements look like a real change (Barnett et al., 2005), and ignoring RTM could lead to false conclusions (Halliday et al., 2018; Skinner et al., 2015), we adjusted the original baseline SOC scores for RTM using the formula $x_{adj} = \bar{x} + r(x - \bar{x})$, where $\bar{x}$ is the baseline mean, r is the correlation between baseline and follow-up, and x is the individual's baseline score (Linden, 2013).

All-cause mortality was our outcome of interest. Statistics Finland provided the exact outcome dates of those who died during the follow-up (Data permission number TK-53-1770-16). The follow-up of this outcome started at the SOC remeasurement between October 1998 and February 2001 and lasted to death or to December 31, 2019, whichever came first.

Covariates. For mediation and moderation analyses of the relationship between recession and mortality, we used four covariates, which were chosen based on previous research (Piiroinen et al., 2022; Vågerö and Garcy, 2016), and were also assumed to be relevant GRRs (Idan et al., 2016): age, employment status, marital status, and education. Age was categorized into four groups following the baseline stratification: 42, 48, 54, and 60. Employment status and marital status were in two categories (employed/not-employed and married/not-married), and education was in years. For the survival analyses, we used previously determined somatic risk factors of mortality as covariates (Piiroinen et al., 2022). These covariates were measured at the baseline and included smoking status, alcohol consumption, physical activity, education in years, marital status, employment status, history of cancer, history of cardiovascular disease (CVD), diabetes at baseline, systolic blood pressure, Body Mass Index (BMI), and total cholesterol concentration. The specifics of these measurements are described in detail elsewhere (Piiroinen et al., 2022; Salonen et al., 1991; Voutilainen et al., 2007).

2.3. Data analysis

The treatment of missing data included two phases. First, we excluded 22 study participants because they had not answered the questions on the Economic Hardship scale. Consequently, the final n in the analyses was 832. Among those 832 men, one had not answered the question about the Experience of Recession, 78 had completely skipped the baseline SOC questionnaire (89 skipped at least one item), and 14 had completely skipped the follow-up SOC questionnaire (37 skipped at least 1 item). There were no incomplete data regarding other covariates used in the mediation, moderation, and survival analyses. Second, we used the item-specific median imputations to substitute missing SOC values. In general, using central tendency values for imputation is as efficient as multiple replacement techniques, especially when substituting baseline covariates (Sullivan et al., 2018) and survey-type scales (Bono et al., 2007; Shrive et al., 2006). We chose the item-specific median as the primary imputation for missing values because all the SOC items had skewed distributions, which also limited the use of regression-based imputation techniques. In addition, we report results for mean imputations and listwise deletion. According to Little's MCAR test, data were missing completely at random (Chi-square

Table 1
Details of the economic hardship scale and the experience of recession item.

Economic Hardship Scale[a]	Experience of Recession Item[b]
Which of the following recession-related events happened to you or your partner during the 1990s:	Have you personally experienced the influences of the economic recession in the 1990s?
1. Being heavily in debt or debt arrangement	- Fully avoided the disadvantages of economic recession
2. Guarantees reverting to you	- Experienced minor disadvantages of economic recession
3. Losing property as secure of debts	- Experienced quite strong disadvantages of economic recession
4. Business bankruptcy	- Experienced very strong disadvantages of economic recession
5. Threat of bankruptcy or unemployment	
6. The need for municipal support	
7. Didn't have money for repair, e.g., domestic appliances, car, etc.	
8. Difficulties paying ordinary bills, e.g., electricity and phone bills, rents, etc.	
9. Had to arrange money, food, or housing for a relative, who had economic difficulties	

Note. Economic Hardship and Experience of Recession items are on a scale No = 0, Yes = 1.

[a] Minimum = 0, Maximum = 9; Higher scores indicate higher levels of economic hardship; Cronbach's alpha .68.

[b] Minimum = 1, Maximum = 4; Higher points indicate higher levels of experience of recession.

= 600.18, *p* = .467).

The baseline differences by the vital status at the end of 2019 were analyzed with the Student's t-test for the normally distributed continuous variables, with the Chi-squared test for the categorical variables, and with the Mann-Whitney *U* test for the non-normally distributed continuous variables.

For the analyses of the differences between the four baseline age groups (42, 48, 52, and 60) and the two economic recession scales we used the Kruskal-Wallis test with mean ranks (*MR*). The differences between age groups and the Economic Hardship scale items were evaluated by Chi-squared test with z-tests. The differences between age groups and change in SOC were tested with an analysis of covariance (ANCOVA) with the baseline SOC as a covariate as well as with an analysis of variance (ANOVA) applying the Tukey's HSD post-hoc design (ANCOVA with covariates does not allow post-hoc tests). The correlations between age and the questionnaires were reported as Spearman's rank coefficients.

For the mediation analysis, we used the conditional modeling program PROCESS macro v4.1 Model 4 (simple mediation) for SPSS (Hayes, 2017) with 5000 bootstrap samples. We considered the indirect effect, through the change in SOC as a mediator, statistically significant if the 95% confidence intervals did not contain zero. Fig. 1 explains the coefficients of the simple mediation model with one covariate. For the moderation analysis, we calculated the coefficient for interaction with the same macro, as with the mediation, but used Model 1 (simple moderation). All mediation and moderation analyses were conducted using 1) no covariates, 2) age as a covariate, and 3) age, marital status, employment status, and years of education as covariates by the IBM® SPSS® Statistics Version 27. The statistical significance level was set at 0.05 in all analyses. The mediation analysis was reported in line with the AGReMA (A Guideline for Reporting Mediation Analyses of randomized trials and observational studies) guidelines (Lee et al., 2021).

We applied the Cox proportional-hazards model to compute hazards of all-cause mortality associated with the Economic Hardship and Experience of Recession scales and change in SOC. Model 1 was adjusted for age and Model 2 for age and the previously determined 12 covariates (Piiroinen et al., 2022).

3. Results

3.1. Study participants

The baseline characteristics of the 832 participants by vital status are shown in Table 2. By the end of 2019, 387 (47%) ceased. Per age group, 42, 48, 54, and 60, the number of deaths was 47 (22%), 67 (32%), 122 (56%), and 151 (79%), respectively. Compared to those who stayed alive, those who died were older, were more often smokers, had fewer years of education, were more often not working, had more often a history of cardiovascular diseases and diabetes, and had higher blood pressure. The baseline SOC was not statistically significantly different between those who stayed alive and those who deceased.

3.2. Change in SOC as mediator and moderator between recession and mortality

Fig. 2 shows the total, direct, and indirect effects of Economic Hardship on all-cause mortality (days to death or the end of 2019) with the change in SOC as a mediator in a simple mediation model, missing values imputed with SOC scale item-specific medians. Both models adjusted for age group and additional for marital status, employment status and years of education indicated that the change in SOC mediated the economic hardship effect on all-cause mortality because the indirect effect 95% confidence interval did not contain zero, the direct effect was closer to zero than the total effect, and the direct effect was not statistically significant. The effect size was calculated as a partially standardized effect (Hayes, 2017) and was 0.10 for both models. The
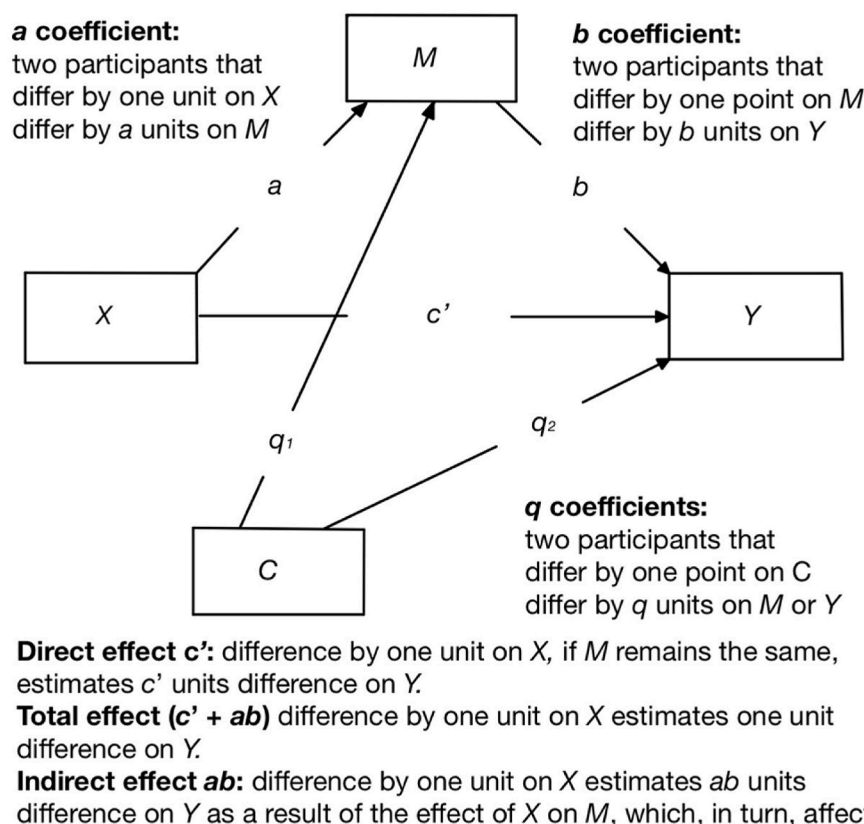

***a* coefficient:**
two participants that differ by one unit on *X* differ by *a* units on *M*

***b* coefficient:**
two participants that differ by one point on *M* differ by *b* units on *Y*

***q* coefficients:**
two participants that differ by one point on C differ by *q* units on *M* or *Y*

Direct effect *c'*: difference by one unit on *X*, if *M* remains the same, estimates *c'* units difference on *Y*.
Total effect (*c'* + *ab*) difference by one unit on *X* estimates one unit difference on *Y*.
Indirect effect *ab*: difference by one unit on *X* estimates *ab* units difference on *Y* as a result of the effect of *X* on *M*, which, in turn, affects *Y*.

Fig. 1. A statistical diagram of the simple mediation model with one covariate (adapted from Hayes, 2017).

Table 2

Baseline characteristics of the Kuopio Ischaemic Heart Disease Risk Factor Study sample (*n* = 832) by vital status at the end of the year 2019.

Variable	Alive	Deceased	*p*-value
n (%)	445 (53.5)	387 (46.5)	<0.001[a]
Age years, mean (*SD*)	48.8 (5.9)	54.5 (6.2)	<0.001[a]
SOC, mean (*SD*)	62.6 (9.1)	62.4 (9.5)	0.740[a]
Smoker, *n* (%)	97 (21.8)	129 (33.3)	<0.001[b]
Alcohol g/week, median (*IQR*)	31.8 (74.0)	32.0 (96.0)	0.463[c]
CLPA kcal/day, median (*IQR*)	96.3 (148.1)	87.3 (182.1)	0.902[c]
Education years, mean (*SD*)	10.0 (3.6)	8.8 (3.5)	<0.001[a]
Not married, *n* (%)	41 (9.2)	46 (11.9)	0.209[b]
Retired or no work, *n* (%)	72 (16.2)	157 (18.6)	<0.001[b]
History of cancer, *n* (%)	4 (0.9)	10 (2.6)	0.059[b]
History of CVD, *n* (%)	107 (24.0)	162 (41.9)	<0.001[b]
Diabetes, *n* (%)	9 (2.0)	20 (5.2)	0.014[b]
SBP mmHg, mean (*SD*)	129.6 (13.9)	132.6 (16.5)	0.005[b]
BMI kg/m^2, mean (*SD*)	26.4 (3.2)	26.9 (3.3)	0.052[a]
STC mmol/l,	5.7 (0.9)	5.7 (1.1)	0.397[a]
Economic Hardship, mean (*SD*)	0.8 (1.4)	0.6 (1.0)	0.001[a]
Experience of Recession, mean (*SD*)	2.0 (0.9)	1.9 (0.7)	0.003[a]

Note. SD = standard deviation; SOC = sense of coherence adjusted for regression to the mean; *IQR* = interquartile range; CLPA = conditioning leisure-time physical activity; CVD = cardiovascular disease; SBP = systolic blood pressure; BMI = body mass index; STC: serum total cholesterol.

[a] Student's *t*-test.

[b] Chi-squared test.

[c] Mann-Whitney *U* Test; Statistically significant *p*-values are bolded; Economic Hardship and Experience of Recession were measured circa 11 years after baseline.

mediation effect remained when missing values were imputed with item-specific means, but with listwise deletion or without covariates, the effect was non-significant.

Fig. 3 shows two other simple mediation models, which were otherwise the same as the first models except the Economic Hardship was replaced by the Experience of Recession. Also in these models, there were statistically non-significant total and direct effects between the independent and dependent variables and the change in SOC mediated the experience of recession -effect on all-cause mortality. The partially standardized effect (Hayes, 2017) was 0.14 for both the age group-adjusted model and the model adjusted for the three additional covariates. The mediation effect of the experience of recession remained when missing values were imputed with item-specific means, but with listwise deletion or without covariates, the effect was non-significant.

In the moderation analyses, when the age group was a covariate and change in SOC was a moderator, the coefficient for the interaction was not statistically significant for either Economic Hardship or Experience of Recession when the missing SOC item values were imputed with median values. Also, with mean imputations or listwise deletion and without the covariates, the interaction coefficients were non-significant for both the Economic Hardship and the Experience of Recession.

Because the follow-up SOC and change in SOC correlated strongly, we also run the analyses presented in Fig. 2 ja 3 using the follow-up SOC as a mediator and a moderator. These analyses could not find statistically significant effects. The SPSS outputs for all models can be found in the Supplementary files.

3.3. Economic hardship, experience of recession, change in SOC, and mortality

On the Economic Hardship scale, 62% (*n* = 514) of the participants did not report any recession-related events. Twenty-four percent (*n* = 196) reported one event, seven percent (*n* = 60) two events, three percent (*n* = 26) three, and two percent (*n* = 17) four. The rest (*n* = 19) reported five to eight events (0.4–1.0%), and no one answered 'yes' to all nine items. The median for the Economic Hardship scale was 0.0 (*IQR* = 1.00) and the mean was 0.71 (95% *CI* 0.61 to 0.79). The mean was

higher among those who stayed alive (0.83 vs. 0.55, *p* = .001, Table 2). Kruskal-Wallis test revealed a statistically significant difference in the Economic Hardship scale across the age groups (*H*(3) = 26.12, *p* < .001). Age groups 42 (*MR* = 467.23) and 48 (*MR* = 434.32) had a higher Economic Hardship total score than the older age groups 54 (*MR* = 384.76), and 60 (*MR* = 377.13). The pairwise comparison of the Economic Hardship scale items is shown in Table 3. Those in the youngest age group (42) were more often heavily in debt, losing property as a debt security, in threat of bankruptcy or unemployment, in the need of municipal support, and having difficulties paying ordinary bills than the two oldest groups (54 and 60). The only item that statistically significantly differed across all age groups was the threat of bankruptcy or unemployment.

The median for the Experience of Recession single-item questionnaire was 2.00 (*IQR* = 3), and there was a statistically significant difference across the age groups, *H*(3) = 29.89, *p* < .001. The mean value was higher among those who stayed alive (2.03 vs. 1.87, *p* = .003, Table 2). Age group 42 (*MR* = 475.60) experienced the recession more severely than all the other age groups, 48 (*MR* = 433.18), 54 (*MR* = 380.14), and 60 (*MR* = 373.81). Moreover, the age group 48 experienced the recession more severely than older groups. In all, most participants experienced either minor disadvantages of the recession (52%, *n* = 427) or fully avoided them (29%, *n* = 244). Fourteen percent (*n* = 113) reported quite strong, and six percent (*n* = 47) had strong disadvantages.

The mean baseline SOC was 62.6 (*SD* = 9.2 for non-adjusted and *SD* = 4.7 for RTM-adjusted values), and the follow-up SOC was 65.0 (*SD* = 9.6). The mean change in SOC was 2.4 (*SD* = 8.3). ANCOVA showed a statistically significant difference across the age groups [*F*(3, 827) = 7.68, *p* < .001]. ANOVA applying the Tukey's HSD post-hoc design indicated that the SOC increase on average was lower in the age group 42 (*M* = 0.27) than in older age groups, 48 (*M* = 3.98, *p* < .001), 54 (*M* = 2.83, *p* = .007), and 60 (*M* = 2.71, *p* = .015).

The correlation matrix between the age groups and the questionnaire-based scales is in Table 4. The highest statistically significant correlation was between the follow-up SOC and change in SOC, followed by baseline SOC and follow-up SOC, and Economic Hardship and Experience of Recession. All other correlations (*r*$_s$) were <.20.

The *HR*s for death with respect to the questionnaires are in Table 5. In the model adjusted for age group, the change in SOC was associated with mortality (*HR* = 0.99, *p* = .023). All other associations were statistically non-significant.

4. Discussion

This study presents novel results concerning the mediating role of the change in SOC between recession-induced distress and mortality. Contrary to the well-known pro-cyclical relationship between financial recession and all-cause mortality (Ballester et al., 2019; Granados, 2005; Margerison-Zilko et al., 2016; Stevens et al., 2015; Toffolutti and Suhrcke, 2014) our findings are countercyclical and suggest that recession-related distress could increase mortality in the long term in some sub-groups. Our results indicated that the effect of experienced disadvantages due to recession on mortality is mediated by the change in SOC. With this mediation, those who experienced very strong disadvantages of economic recession had approximately 3 and a half months lower life expectancy in the over 20-year follow-up than those who fully avoided the disadvantages, and every one-point increase in economic hardship predicted about 2 and a half weeks shorter life expectancy. These differences and the effect sizes observed in our study were relatively small. However, it is important to exercise caution when interpreting the results of any single observational cohort study that examines multiple variables without prior power calculations (Ioannidis, 2008). Our findings are promising early discoveries that should stimulate further discussion and investigation.

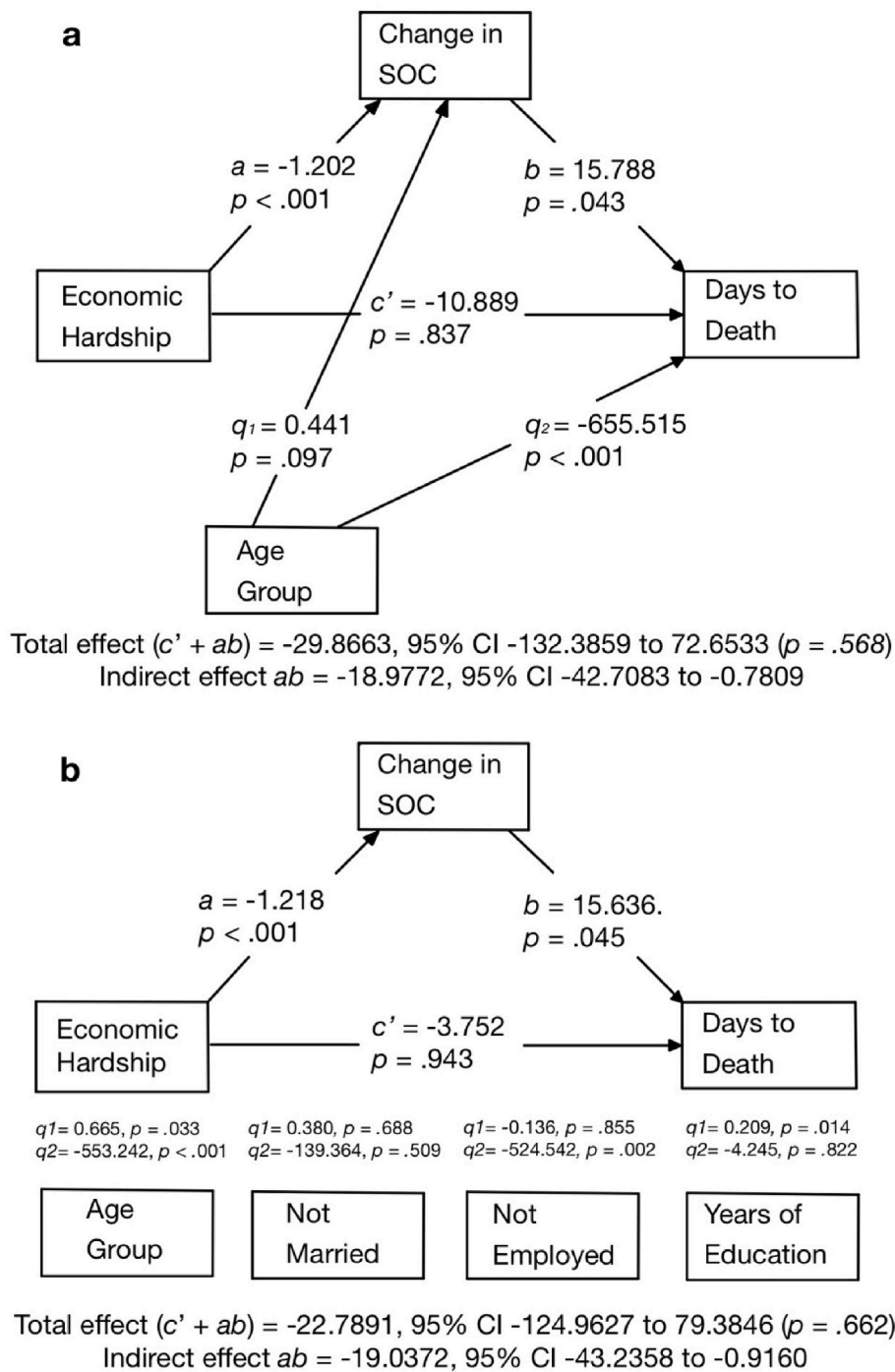As theory suggests (Idan et al., 2016), it might be, that the change in

Fig. 2. Simple mediation models of the association between the Economic Hardship scale and all-cause mortality (Days to Death) with change in sense of coherence (SOC) as a mediator. a) Age Group as a covariate. b) Age group, marital status, employment status, and years of education as covariates.

SOC reflected the changes in GRRs: recession could have increased the experience of chaos in life, shifted the load balance either towards underload or overload (through unemployment or over-employment) and decreased the feeling of control and belonging to social groups. Our results support the notion that besides the general net effects between recession and all-cause mortality, researchers should study subgroups (Catalano et al., 2011) as well as possible mediating, moderating, and confounding factors concerning[IP1] [IP1]Change unemployment, recession, and mortality (Roelfs et al., 2011). Especially, recession-related psychological distress' association with mortality has received too little attention in the scientific literature (Catalano et al.,

2011), although it has been assumed that psychosocial resources act as mediators between socioeconomic status and health or moderate the association (Matthews et al., 2010).

Having resources for coping with stress, reflected as a stable SOC, has been associated with an increased life expectancy during a long-term follow-up after a recession (Piiroinen et al., 2022), and a decline in SOC with negative life events (Volanen et al., 2007). Our present study suggests that a negative experience of a recession could be associated with decreasing SOC and decreasing SOC with shorter life expectancy. There is a plausible explanation for the previously observed associations and our current findings of the mediating role of the change in SOC
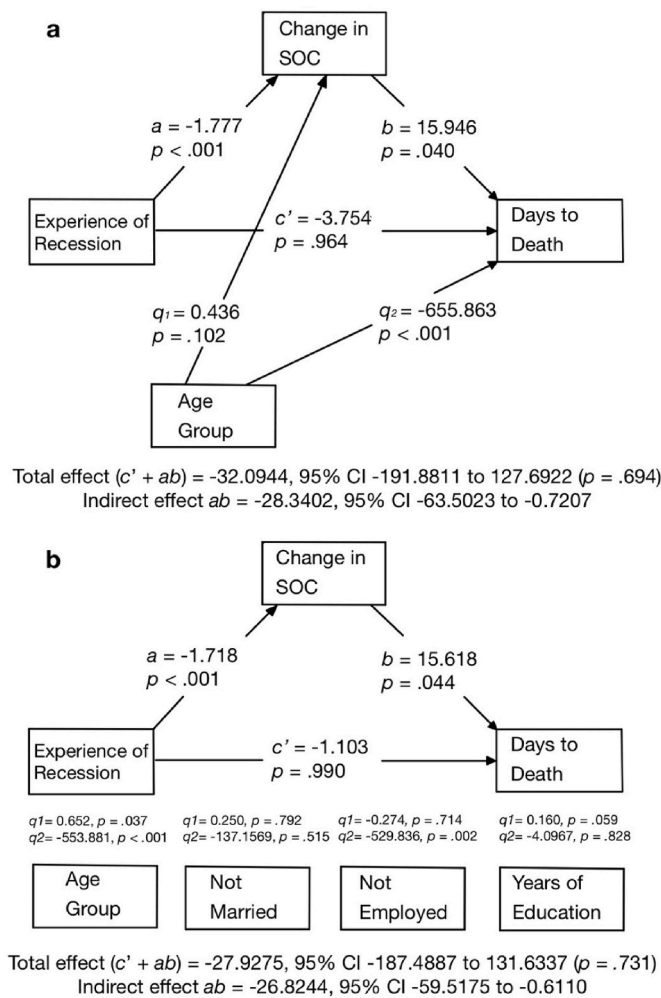
Fig. 3. Simple mediation models of the association between the Experience of Recession item and all-cause mortality (Days to Death) with change in sense of coherence (SOC) as a mediator. a) Age Group as a covariate. b) Age group, marital status, employment status, and years of education as covariates.

between recession and mortality. First, recession-induced stress experience, alone or in conjunction with other stressful events, could negatively affect one's psychosomatic and material GRRs and induce a feeling of helplessness as an overload of chaotic events bombards one's life especially if the amount of social support is threatened due to all recession challenges in the community (see Idan et al., 2016) and loss of support from co-workers (Britton et al., 2008). Second, these reactions to internal and external stressors could shape one's SOC and shift the health continuum towards either ease or dis-ease, as the Salutogenic Model of Health predicts (Antonovsky, 1993), which, in turn, could influence mortality. For example, the association of a weak SOC with unemployment has been shown to be indisputable, and an employment trajectory from fixed-term employment to unemployment has shown the least favorable SOC change in a large Finnish cohort of over 10,000 participants (Liukkonen et al., 2010).

Of the four covariates used in the mediation model, the baseline age group and employment status seemed to be the most relevant in the recession-mortality relationship among middle-aged Finnish men (see Figs. 2 and 3). Job loss as a mortality risk factor among men is a well-established phenomenon (Avendano et al., 2017; Eliason and Storrie, 2009; Vågerö and Garcy, 2016), but the association with age warrants more discussion. The mean increase in SOC was lowest in the youngest age group (42) and, based on the Experience of Recession scale, study participants belonging to this group experienced the recession more

Table 3
Pairwise comparison of the Economic Hardship scale items of the Kuopio Ischaemic Heart Disease Risk Factor Study sample ($n = 832$).

Economic Hardship Item	Age Group with the number and % of 'Yes' answers				
	42 n (%)	48 n (%)	54 n (%)	60 n (%)	p-value*
1. Being heavily in debt or debt arrangement	18[a] (8.4)	11[a,b] (5.3)	3[c] (1.4)	5[b,c] (2.6)	**0.002**
2. Guarantees reverting to you	17[a] (7.9)	12[a,b] (5.8)	7[b] (3.2)	15[a] (7.8)	0.139
3. Losing property as secure of debts	13[a] (6.1)	11[a,b] (5.3)	4[b] (1.8)	4[b] (2.1)	**0.044**
4. Business bankruptcy	7[a] (3.3)	5[a,b] (2.4)	3[a,b] (1.4)	1[b] (0.5)	0.197
5. Threat of bankruptcy or unemployment	58[a] (27.1)	37[b] (17.8)	14[c] (6.4)	2[d] (1.0)	**<0.001**
6. The need for municipal support	18[a] (8.4)	7[b] (3.4)	2[b,c] (0.9)	1[c] (0.5)	**<0.001**
7. Didn't have money for repair, e.g., domestic appliances, car, etc.	33[a] (15.4)	27[a] (13.0)	26[a] (11.9)	19[a] (9.9)	0.399
8. Difficulties paying ordinary bills, e.g., electricity and phone bills, rents, etc.	34[a] (15.9)	20[a,b] (9.6)	9[c] (4.1)	10[b,c] (5.2)	**<0.001**
9. Had to arrange money, food, or housing for a relative, who had economic difficulties	36[a] (16.9)	37[a] (17.8)	31[a] (14.2)	26[a] (13.5)	0.574

Note. *Chi-squared test; Pairwise comparison by z-test; Each superscript letter on the same row denotes a subset of Age Group categories whose column proportions do not differ significantly from each other at the .05 level; Statistically significant p-values are bolded.

Table 4
Correlation matrix between age group and questionnaire-based scales used in the Kuopio Ischaemic Heart Disease Risk Factor Study sample ($n = 832$) measured with Spearman's rank coefficient.

Variable	Economic Hardship	Experience of Recession	Baseline SOC	Follow-up SOC	Change in SOC
Age Group	−0.172**	−0.183**	−0.009	0.038	0.049
Economic Hardship	–	0.364**	−0.094**	−0.150**	−0.123**
Experience of Recession		–	−0.086*	−0.154**	−0.135**
Baseline SOC			–	0.518**	0.052
Follow-up SOC				–	0.853**

Note. Age Group: 42, 48, 54, and 60. SOC: Sense of Coherence scale. Baseline SOC was adjusted for the regression to the mean. **Correlation is significant at 0.01 level (2-tailed); * Correlation is significant at 0.05 level (2-tailed).

severely than older study participants (48, 54, and 60). There are different potential reasons for that finding. First, older adults might be more resilient against economic fluctuations because they have had more time to gather life savings and pay debts and have fewer financial obligations due to children living with them than younger adults. This difference between older and younger adults could have been highlighted during the deep recession in the 1990s in Finland, where the unemployment system was particularly generous in terms of replacement rates and duration of compensation compared to other EU countries (Avendano et al., 2017). Second, the relative willingness to take financial risks decreases with age, which can be explained by a general decline in risk-taking during aging or by investment plan adjustments for retirement in later middle age (Jianakoplos and Bernasek 2006). Our results support the decreasing risk-taking and increasing financial security through middle age because the younger age groups were more

Table 5
Hazard ratios (*HR*) for death with respect to questionnaire-based scales.

Variable	*HR*[a] (95% *CI*)	*p*-value	*HR*[b] (95% *CI*)	*p*-value
Economic Hardship (*n* = 832)	0.96 (0.87–1.06)	0.461	0.94 (0.85–1.04)	0.224
Experience of Recession (*n* = 831)	0.98 (0.86–1.12)	0.760	0.95 (0.83–1.09)	0.444
Change in SOC (*n* = 832)	0.99 (0.97–1.00)	**0.023**	0.99 (0.98–1.00)	0.121
Change in SOC[c] (*n* = 715)	.245 0.99 (0.98–1.01)		.589 1.00 (0.98–1.01)	

Notes. *CI* = confidence interval; SOC = sense of coherence.
[a] Model 1 adjusted for age groups.
[b] Model 2 adjusted for age group, smoking status, alcohol consumption, leisure-time physical activity, education years, marital status, employment status, history of cancer, history of cardiovascular disease, diabetes at baseline, systolic blood pressure, body mass index, and total cholesterol concentration.
[c] Only those who had answered all baseline and follow-up SOC questions; Statistically significant *p*-values are bolded.

often heavily in debt and had difficulties paying ordinary bills than the older ones. This also is in line with the previous findings based on which unemployment is more associated with increased mortality risk among persons in their early and middle careers than those in their late careers (Roelfs et al., 2011).

The present findings could also have been affected by the steepness of the recession, including only males, the length of the follow-up period, and the number of recessions confronted. Willingness to take financial risks was enhanced before the 1990s recession in Finland since the recession was preceded by a period of exceptional financial overheating and the deregulation of bank lending rates (Honkapohja and Koskela, 1999). A very sudden and steep downfall in socioeconomic status can be especially detrimental in the short term for certain populations since it has been shown that highly educated men, but not women, who experienced unemployment during the 1990s recession in Finland, had the highest mortality risk from cardiovascular disease and suicide during the recession period (Avendano et al., 2017). However, during a 3-year period after the 2008 recession, in European countries where the crisis was the most severe, both all-cause mortality and suicide rates decreased most (Granados, 2005), and the decreasing mortality trend persisted even 11 years after the recession (Salinari and Benassi, 2022). In comparison, the follow-up time in our study was exceptionally long, over 20 years, and it included two separate recessions, the 1990s and 2008, although the 2008 recession was relatively mild in Finland (Granados, 2005). Altogether, a combination of high risk-taking in early or middle career, male gender, a steep decline in socioeconomic status, and experiencing more than one recession, together with a decrease in SOC could be particularly harmful in the long term. To support this conclusion there is evidence that a stronger SOC relates positively to better financial health and more effective debt management and retirement planning (Barnard et al., 2010).

In our study, the threat of bankruptcy or unemployment reached the highest frequencies among the statistically significant item-specific results on the Economic Hardship scale. Moreover, the younger the age group the higher the self-perceived threat perhaps because of job or financial insecurity. Antonovsky suggested that job security is a fundamental part of the comprehensibility factor in SOC, and it consists of the belief in the continuation of work and the social system (Antonovsky, 1987). It has been shown that Governmental policies and rejecting fiscal austerity can reduce recession-related mortality in the short term (Karanikolos et al., 2013). Furthermore, it may be in order that the perceived availability of governmental and social support is more important than the actual use of support (Mittelmark and Bauer, 2022). Consequently, the threat of something negative happening to one's finance or career could be equally harmful as the actual event (Giorgi et al., 2015). Building up the inner belief that despite financial and career challenges

one can survive and even thrive could be a key explanation for why the change in SOC mediates the effect between recession distress and mortality.

To conclude, our findings challenge, to some extent, the general observation from European countries based on which experiencing the recession is associated with an increase in life expectancy even in the long term (Salinari and Benassi, 2022), and encourage the need to identify subgroups that suffer the most during and after a recession. Our findings suggest that what matters most may not be the amount of economic hardship or even the experience of recession, but rather the ability to maintain or increase one's GRRs and stress tolerance, as reflected in SOC.

4.1. Strengths and limitations

The strengths of this study include a representative age-stratified random sample of middle-aged Finnish men who all lived through a deep financial recession, a remeasurement of SOC 11 years after the baseline measurement, and a long follow-up time over 20 years. Furthermore, we were able to study how recession-related distress, not just unemployment itself, was associated with mortality in subgroups, and how the change in SOC, a widely used psychometric property, mediated the recession-mortality association. While the effect sizes were small, our results contribute to the early discovery literature and provide direction for further research (Ioannidis, 2008). Overall, our findings shed light on explanatory factors that may influence the relationship between economic adversity and mortality.

There are also limitations in our study. First, only middle-aged Finnish men representing one historical and cultural epoch were included in the study cohort, which reduces the generalizability of the results. Second, we acknowledge that this was an observational study by nature, and since there was no experimental manipulation or other forms of experimental control, we cannot state the causality between variables. We can only inform that there was or was not a covariation between the variables in a causal system (Hayes, 2017). Furthermore, since the mediation model did not control other covariates than age, marital and employment status, and education, the mediation could be affected by other confounding factors that also reduce respondents' ability to maintain or increase GRRs during recessionary times. Third, although our results could be interpreted so that SOC completely mediates the association between recession and mortality (Baron and Kenny, 1986), there could be other mediators with equal importance (Hayes, 2017). For these reasons, future studies should further explore how psychosocial factors affect the association between recession and mortality in different subgroups, across genders, and whether a causal relationship exists.

4.2. Implications

The present results suggest that a change in SOC mediates the potential negative effects of economic recession on mortality. Our results highlight the importance of considering that although a recession's overall effect on mortality is pro-cyclical, certain subgroups may face increased mortality hazards during and after these periods. To mitigate this potential harm, it may be important to maintain a stable capacity to cope with stressors, and SOC can be an essential reflection of this individual characteristic. From both clinical and research perspectives, it might be more informative to monitor alterations in SOC specifically in middle age than to measure it only once. Overall, these results underscore the importance of understanding the factors that can mitigate the impact of economic adversity on health outcomes.

Credit author statement

All authors contributed to the writing and revisions of the manuscript. IP and AV conducted the data analysis, and SLK contributed to the

conditional modeling. All authors reviewed the final version of the manuscript, agreed on submission to this journal, and take responsibility for the contents of this article.

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Declaration of interest statement

The authors report no conflicts of interest in conducting this work.

Data availability

The authors do not have permission to share data.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.socscimed.2023.116127.

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