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Causal relationships between sense of coherence and life skills: Examining the short-term longitudinal data of Japanese youths

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ABSTRACT

This study investigated the causal relationships between sense of coherence (SOC) and life skills. Participants (248 university students; 147 men, 101 women; mean age = 20.4 years, SD = 0.9 years) completed the Japanese version of the SOC-29 scale and the Life Skills Scale for Adolescents and Adults. Structural equation modeling (a synchronous effects model and a cross-lagged effects model) indicated that life skills had a certain effect (β = .55 to .75, $p < .01$) on SOC. This result suggests that improving life skills was effective in strengthening SOC. The findings of this study provide key information concerning the dimensions and stages of SOC and life skills. This can be used to construct a theoretical model and framework for future practical studies on strengthening SOC and conducting life skills training.

1. Introduction

Sense of coherence (SOC) is the perception and sense of one's experiences in the world, including not only coherence but also consistency, reasonability, and comprehensibility (Antonovsky, 1987b; Yamazaki, 2008). Antonovsky (1987b) indicated that individuals with a strong SOC can effectively cope with stress. SOC is usually driven by an individual's desire to overcome challenges, and the individual tends to employ the coping strategy that is the most suitable response to the current stressor (Monksnes, Espnes, & Haugan, 2013). SOC consists of three components: comprehensibility, manageability, and meaningfulness (Antonovsky, 1987a; Togari, 2008a). Comprehensibility means that the stimuli they encounter in the future will be predictable (Antonovsky, 1987b). Manageability is the extent to which a person perceives that his or her resources are adequate to meet the demands (Antonovsky, 1987b). Meaningfulness refers to the extent that stimuli are worth investing energy in, are worthy of commitment, and are seen as challenges rather than burdens (Antonovsky, 1987b).

SOC is a central concept of the salutogenic theory, which focuses on the process and factors associated with maintaining and promoting psychological health in humans (Antonovsky, 1987b; Kichbusch, 1996). According to the salutogenic theory, health is a "health ease/dis-ease continuum," and categorized as "pathological," "neutral," or "salutary" depending on how a person copes with stressors (Eriksson & Lindström, 2011; Lindström & Eriksson, 2005). Antonovsky (1987b) proposed general resistance resources (GRRs) as factors that relate to the ability to cope with stressors and the consequent health ease/dis-ease continuum. GRRs refer to personal and social resources (e.g., material wealth, money, knowledge, ego strength, social support, and cultural stability) used to cope with a wide variety of stressors. SOC mobilizes these GRRs allowing a person to cope with stressors more effectively.

SOC is also assumed to be affected by three kinds of experiences: "participation in shaping of outcomes (achieving valuable results)," "underload–overload balance (moderate burdensome experiences)," and "consistency (experiences based on shared values and rules)" (Antonovsky, 1987b; Togari, 2008b). Individuals with a high SOC maintain the sense that life has meaning even in stressful situations and can cope with stress flexibly using skills, abilities, materials, and social resources effectively. Consequently, individuals with a high SOC can cope with stressors aggressively and effectively, thus maintaining and improving self-affirmative cognitions (e.g., self-efficacy, self-esteem) and mental health (Antonovsky, 1987b; Yamazaki, 2008).

Notably, SOC is highly relevant to mental health, which has been shown in many quantitative studies across various countries and regions (e.g., Davidson, Feldman, & Margalit, 2012; Greimel et al., 2016; Grevenstein & Bluemke, 2015). Recently, the high degree of influence

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and uniqueness of SOC on mental health has been linked with other psychological factors that relate to mental health. Grevenstein and Bluemke (2015) reported that SOC predicted several indices that relate to mental health, such as life satisfaction, even after controlling for the influences of the Big Five personality traits. Kase, Ueno, and Oishi (2017) also reported that SOC showed stronger relationships to mental health than all Big Five factors. In addition, Grevenstein, Aguilar-Raab, and Bluemke (2017) indicated that SOC was a more critical determinant of psychological distress, life satisfaction, and emotional exhaustion than was mindfulness. Therefore, since SOC is a noteworthy psychological factor related to the maintenance and promotion of mental health, establishing an intervention method aimed at strengthening SOC is essential (Super, Wagemakers, Picavet, Verkooijen, & Koelen, 2015; Togari, 2008b; Yamazaki & Togari, 2010). For example, recent studies have examined various approaches to strengthening SOC, including resistance training for older adults (Kekäläinen, Kokko, Sipilä, & Walker, 2018) and mindfulness cognitive behavioral therapy for nurses and patients with heart disease (Ando, Natsume, Kukihara, Shibata, & Ito, 2011; Malm et al., 2018).

Life skills may be one of the psychological factors that relates to SOC. Life skills are adaptive and enable individuals to deal effectively with the demands and challenges of everyday life (World Health Organization [WHO], 1994). According to the WHO (1994) framework for life skills, which is the basis for many studies of life skills (e.g., Botvin, 1990; Savoji & Ganji, 2013; Shimamoto & Ishii, 2006), life skills consist of 10 skills: decision making, problem solving, creative thinking, critical thinking, effective communication, interpersonal relationship skills, self-awareness, empathy, coping with stress, and coping with emotions. Further, improving life skills leads to promoting positive health behaviors and mental health through the primary prevention of individual negative emotions and problem behaviors by supporting both individual aspects (e.g., coping with stress or emotions) and interpersonal aspects (e.g., formation and maintenance of positive human relationships) (e.g., Botvin, 2000; Fagan & Mihalic, 2003; Yokoyama, 2010).

Kase, Iimura, Bannai, and Oishi (2016) extracted “decision making skills (make decisions to solve problems effectively by logical thinking or planning),” “interpersonal relationship skills (imagine others’ emotions from their behaviors and express empathy with appropriate words),” “effective communication skills (tell your own thoughts and feelings to others actively and effectively),” and “coping with emotion skills (controlling one's own emotions effectively)” as life skills for adolescents and adults based on the framework of life skills by the WHO (1994)[1]. With reference to the taxonomy of life skills by Shimamoto and Ishii (2006), decision making and coping with emotion were divided into personal skills, whereas interpersonal and effective communication skills were divided into interpersonal skills.

These life skills are often improved by a psychological education program called “life skills training” (LST) (Botvin, 1998; WHO, 1994). LST was originally developed to promote adaptation to society by preventing problem behaviors such as consuming drugs and alcohol by improving psychological factors related to positive self-evaluation of one's own abilities and existence (e.g., Botvin, 1998; Japan Know Your Body, 2005). LST has been implemented for various purposes, such as increasing physical activities among elementary school students (Anand, Ingle, Meena, Kishore, & Yadav, 2014) and improving the mental health of hospitalized patients (Shabani et al., 2014).

The effects of LST on health behavior and mental health have been revealed by many quantitative studies, including the suppression of problem behaviors such as excessive alcohol drinking or drug abuse (Giannotta & Weichold, 2016) and the formation of positive self–other recognition (Botvin & Griffin, 2014). In sum, daily problem-solving skills are fostered by an improvement in self-esteem and mental health, which is promoted by LST, which, in turn, leads to acquired prosocial behavior and thinking (e.g., Japan Know Your Body, 2005; Mohammadzadeh, Awang, Hayati, & Ismail, 2017; Savoji & Ganji, 2013).

Concerning the relationships between SOC and life skills, it has been noted that life skills contain the function of coping with stress in SOC (Yamazaki, 2008). Furthermore, Antonovsky (1987a) conjectured that SOC contains abilities such as objective and logical thinking, optimism, and agreeableness. Endo, Kano, and Oishi (2013) indicated that individuals with a high SOC tend to employ self-reflection, positive and multifaceted thinking, and assertiveness when communicating with others. These abilities and features shown by Antonovsky (1987b) and Endo et al. (2013) are similar to the content of life skills indicated by the WHO (1994) as well as Kase, Endo, and Oishi (2016), such as decision-making skills, interpersonal relationship skills, and coping with emotion skills. Therefore, individuals with a high SOC are considered to have high levels of life skills. Quantitatively, Kase, Ueno, and Oishi (2016) revealed that individuals with a high SOC have higher levels of life skills, and a more effective structure of life skills, compared with those low in SOC. In another study, it was suggested that SOC was related to leadership skills such as self-awareness, goal setting, and critical thinking (like life skills), and individuals with a high SOC had high levels of confidence in interpersonal communication (Lee & Ka, 2017). Further, in a study revealing that people diagnosed with major depression had low SOC levels, it was speculated that implementing LST focusing on strengthening SOC might be effective for preventing and reducing major depression symptoms (Carstens & Spangenberg, 1997). Taking into account the function of SOC in the salutogenic theory, life skills can be considered GRRs that are mobilized by SOC. If this assumption is correct, the results of the previous studies that mentioned the relationship between SOC and life skills (Caestens & Spangenberg, 1997; Kase et al., 2016; Lee & Ka, 2017) might suggest that life skills demonstrated effectively by SOC promote problem-solving in daily life, that is, they promote effective coping.

In sum, it is inferred that there are causal relationships between SOC and life skills, and improvement of life skills by LST may contribute to strengthening SOC. However, the causal relationships between SOC and life skills have not been verified empirically, as noted by Kase et al. (2016). For health promotion, it is critical to clarify the causal relationships between SOC and life skills and to accumulate empirical knowledge concerning both factors; therefore, we examined said relationships by conducting a quantitative survey and employing a short-term longitudinal design.

2. Methods

2.1. Participants

The first web survey was conducted for Japanese youths living all over Japan in December 2017 (Time 1), and the second web survey using the same methods was conducted in April 2018 (Time 2). Based on study purposes and statistical analysis methods, the surveys were conducted to obtain data from about 250 people[2]. Overall, 266 people participated at both Time 1 and Time 2, and data from 248 participants

[1] The life skills content extracted from Kase, Bannai, and Oishi (2016) and the LSSAA correspond not only to the WHO's (1994) framework but also to the framework by Brooks (1984), which is the basis of the Life-skills Development Scale–Adolescent Form (Darden & Ginter, 1996) and the Life-skills Development Inventory–College Form (Picklesimer & Miller, 1998). Therefore, it was considered that the LSSAA corresponded to the international definition of “life skills.”

[2] Referencing McQuitty (2004), a sample size with about .90 statistical power was devised based on degrees of freedom (synchronous effects model: $df = 65$; cross-lagged effects model: $df = 64$) and the standard of model fitness (RMSEA = 0.08) in the SEM.

(147 men, 101 women; mean age = 20.4 years, SD = 0.9 years) were analyzed. These web surveys were conducted through INTAGE Inc[3]. The season and intervals of the surveys were set based on previous studies (Shimamoto & Ishii, 2010; St. Pierre, Kaltreider, Mark, & Aikin, 1992) that had verified causal relationships between life skills and other variables (e.g., alcohol attitudes, drug knowledge, and sports experience).

2.2. Ethical considerations

The surveys were approved by the ethics committee of the first author's university (no. 17-64). Additionally, the surveys were conducted anonymously with the agreement of participants according to the privacy policy of INTAGE Inc. Before the survey, participants confirmed their consent to participate on the screen.

2.3. Measurements

2.3.1. SOC

SOC was assessed using the Japanese version of the 29-item SOC Scale (SOC-29; Yamazaki, 1999), which is a revised version of the 29-item Orientation to Life Questionnaire (Antonovsky, 1987) for Japanese individuals. The SOC-29 comprises 3 subscales: comprehensibility (11 items; e.g., Are you surprised by the behavior of people whom you thought you knew well?), manageability (10 items; e.g., Has it happened that people whom you counted on have disappointed you?), and meaningfulness (8 items; e.g., Do you have the feeling that you do not really care about what goes on around you?). Each item is assessed on a 7-point scale, with higher total sum scores indicating higher levels of SOC. The score ranges were 29 to 203 for the full SOC-29 assessment, 11 to 77 for comprehensibility, 10 to 70 for manageability, and 8 to 56 for meaningfulness.

2.3.2. Life skills

Life skills were assessed using the Life Skills Scale for Adolescents and Adults[1] (LSSAA; Kase et al., 2016). The LSSAA comprises 21 items across 4 subscales: decision making skills (8 items; e.g., I can think carefully about the loss and gain of things), interpersonal relationship skills (5 items; e.g., I can take actions that consider others' feelings), effective communication skills (5 items; I can effectually express my thoughts to others) and coping with emotion skills (3 items; I can control my emotions effectively). Each item is assessed on a 5-point scale, with higher total sum scores indicating higher levels of life skills. The score ranges were 8 to 40 for decision making skills, 5 to 25 for interpersonal relationship skills and effective communication skills, and 3 to 15 for coping with emotion skills. The LSSAA items were developed based on free-description type questionnaires and text mining among adolescents and adults living in Japan (Kase, Bannai, & Oishi, 2016), as well as the framework of life skills proposed by the WHO (1994). Furthermore, the validity and reliability of the LSSAA were confirmed through statistical analyses such as exploratory factor analysis, confirmatory factor analysis, calculation of reliability coefficients, and correlation analysis with external criteria in two surveys (Kase et al., 2016).

2.4. Statistical analyses

First, descriptive statistics and reliability were calculated. Second, Pearson's product-moment correlation coefficients were calculated. Finally, a synchronous effects model and cross-lagged effects model with structural equation analysis (SEM) using the maximum likelihood estimation were employed. The significance level was set at 5%. Comparative fit index (CFI), standardized root mean square residual (SRMR), and root mean square error of approximation (RMSEA) were used to evaluate the model's goodness-of-fit. Hu and Bentler (1999) and Kano and Miura (2002) proposed the conditions for good model fit: CFI > .90, SRMR < .08, and RMSEA < .10.

Statistical analyses were conducted using the Japanese versions of SPSS and Amos (Version 25; IBM, Armonk, NY) and semTools package in R version 3.5.0 (R Development Core Team, 2018).

3. Results

3.1. Descriptive statistics

The descriptive statistics are shown in Table 1. There were no ceiling or floor effects in each variable according to the mean and standard deviations. There were no significant differences in the score changes between Time 1 and Time 2 (Cohen's d = .00 to .07). Cronbach's α coefficients for each scale were calculated to verify the internal consistency of the scales (Table 1). The reliability of the SOC-29 subscales were somewhat low; however, these were judged to be acceptable in view of the values obtained in a previous study (Eriksson & Lindström, 2005).

3.2. Correlations among all variables

The results of the correlation analysis are shown in Table 2. There were significant positive correlations between all variables except between comprehensibility at Time 1 and decision-making skills at Time 2. Z tests showed that there were no significant differences between the correlations at Time 1 and Time 2 (Z = 0.08 to 1.37, *ns*).

3.3. Causal relationships between SOC and life skills

First, the synchronous effects model, with the SOC and LSSAA subscale scores at Time 1 and Time 2 as observed variables and SOC and life skills as latent variables, was analyzed using SEM (Fig. 1). Second, the cross-lagged effects model, with the SOC-29 and LSSAA subscale scores at Time 1 and Time 2 as observed variables and SOC and life skills as latent variables, was analyzed (Fig. 2). In the goodness-of-fit of these models, CFI and SRMR were acceptable based on Hu and Bentler (1999) and Kano and Miura (2002) (see Figs. 1 and 2). RMSEA was judged to be a moderate fit according to the evaluation criteria indicated by Brawne and Cudeck (1993) and Hoshino, Okada, and Maeda (2005). In addition, statistical power was calculated for both models based on the RMSEA values—.92 for the synchronous effects model (df = 65) and .93 for the cross-lagged effects model (df = 64), both of which were acceptable.

In both the synchronous effects and cross-lagged effects models, the paths from life skills at Time 1 and SOC at Time 1 to life skills at Time 2 and SOC at Time 2 were all significant (β = .55 to 0.75, p < .01), respectively. In the synchronous effects model, the path from life skills at Time 2 to SOC at Time 2 was significant (β = .37, 95% CI = [.14, .59], p < .01); however, the path from SOC at Time 2 to life skills at Time 2 was not significant (β = .01, 95% CI = [− .27, .27], *ns*). Furthermore, in the cross-lagged effects model, the path from life skills at Time 1 to SOC at Time 2 was significant (β = .28, 95% CI = [.08, .49], p < .01); however, the path from SOC at Time 1 to life skills at Time 2 was not significant (β = .02, 95% CI = [− .16, .19], *ns*). These results showed that life skills at Time 1 and Time 2 predicted SOC at Time 2, and SOC at Time 1 and Time 2 did not predict life skills.

[3] INTAGE Inc. is a company mainly engaged in marketing research with headquarters in Tokyo, Japan. As of April 2018, they had about 8.9 million web survey monitors all over Japan. Additionally, INTAGE Inc. has relationships with over 500 research institutes and has obtained high reliability in academic research.

Table 1
Descriptive statistics of each variable at Time 1 and Time 2.

		Time 1 *Mean* (*SD*)	α	Time 2 *Mean* (*SD*)	α	*t*(247)
Sense of coherence	Sense of coherence	112.92 (16.38) [110.87, 114.96]	.85	113.46 (16.03) [111.45, 115.46]	.85	0.65, *ns*
	Comprehensibility	41.23 (6.75) [40.39, 42.08]	.65	41.25 (6.54) [40.43, 42.06]	.68	0.03, *ns*
	Manageability	39.92 (6.42) [39.12, 40.72]	.62	40.06 (6.30) [39.27, 40.84]	.65	0.39, *ns*
	Meaningfulness	31.76 (5.45) [31.08, 32.43]	.68	32.15 (5.57) [31.46, 32.85]	.68	1.24, *ns*
Life skills	Life skills	68.24 (11.92) [66.75, 69.73]	.91	68.05 (12.41) [66.50, 69.60]	.93	0.33, *ns*
	Decision making skills	26.70 (4.89) [26.09, 27.31]	.85	26.55 (5.23) [25.89, 27.20]	.90	0.56, *ns*
	Interpersonal relationship skills	17.03 (3.70) [16.57, 17.50]	88	16.81 (3.68) [16.35, 17.27]	.88	1.19, *ns*
	Effective communication skills	15.19 (3.53) [14.74, 15.63]	.73	15.21 (3.64) [14.75, 15.66]	.73	0.11, *ns*
	Coping with emotion skills	9.32 (2.37) [9.03, 9.62]	.71	9.49 (2.37) [9.19, 9.78]	.71	1.31, *ns*

Notes. $N = 248$. Values in square brackets are 95% confidence intervals. α: Cronbach's α coefficients; SD: standard deviation; ns: non-significant.

Table 2
Pearson's correlation coefficients between sense of coherence and life skills ($N = 248$).

		Time 1					Time 2				
		LS	DM	IR	EC	CE	LS	DM	IR	EC	CE
Time 1	SOC	.43**	.23**	.33**	.43**	.53**	.39**	.19**	.29**	.31**	.43**
	CO	.34**	.17**	.18**	.38**	.51**	.25**	.11	.18**	.26**	.40**
	MA	.40**	.21**	.40**	.34**	.46**	.30**	.19**	.29**	.23**	.36**
	ME	.40**	.25**	.32**	.41**	.41**	.35**	.20**	.31**	.35**	.36**
Time 2	SOC	.45**	.30**	.32**	.43**	.54**	.48**	.29**	.38**	.45**	.58**
	CO	.40**	.25**	.25**	.37**	.56**	.39**	.18**	.29**	.40**	.55**
	MA	.45**	.32**	.37**	.35**	.50**	.44**	.31**	.37**	.34**	.51**
	ME	.32**	.20**	.22**	.36**	.33**	.43**	.27**	.34**	.45**	.44**

Notes. SOC: sense of coherence; CO: comprehensibility; MA: manageability; ME: meaningfulness; LS: life skills; DM: decision making skills; IR: interpersonal relationship skills; EC: effective communication skills; CE: coping with emotion skills. $^{**}p < .01$.

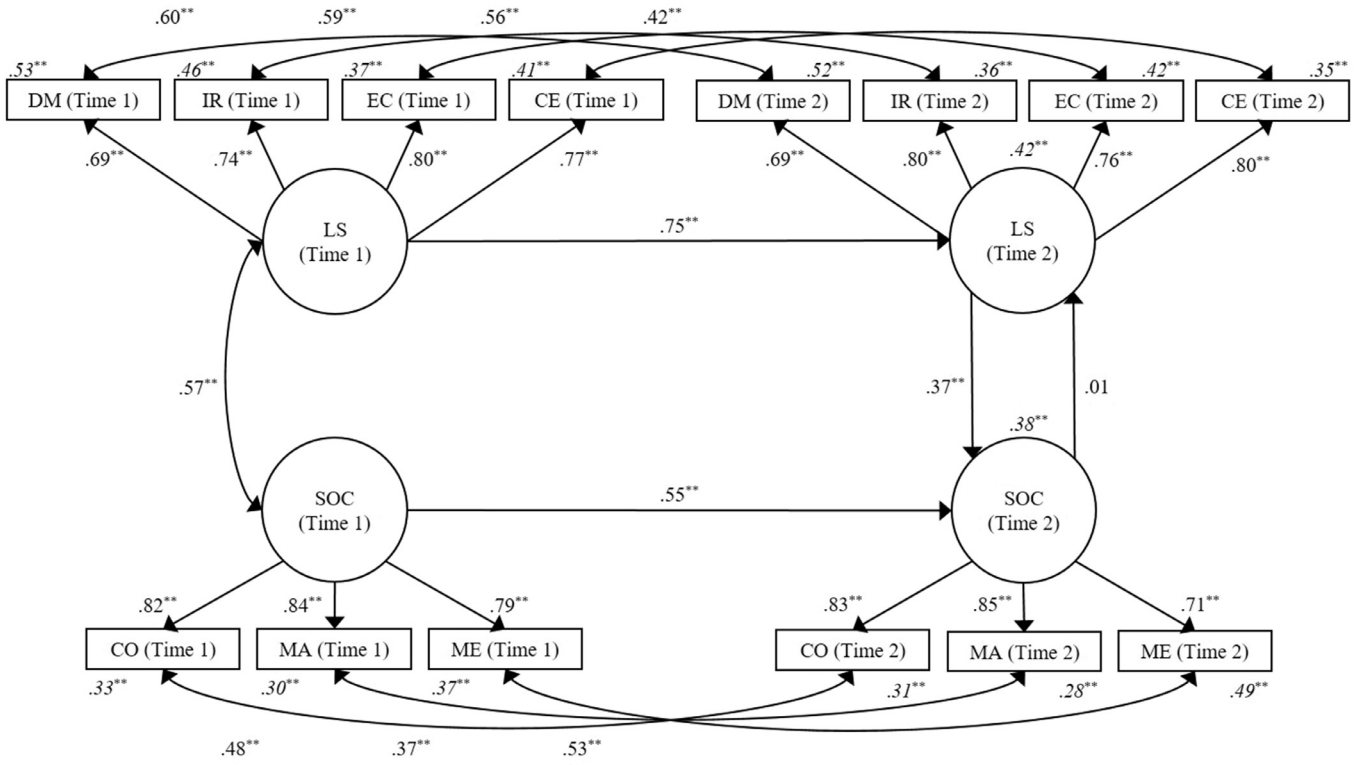

Fig. 1. Synchronous effects model (CFI = .947; SRMR = .065; RMSEA = .088). *Notes*. SOC: sense of coherence; CO: comprehensibility; MA: manageability; ME: meaningfulness; DM: decision making skills; IR: interpersonal relationship skills; EC: effective communication skills; CE: coping with emotion skills. Values in italic indicates R^2. Error variables are omitted for simplicity.

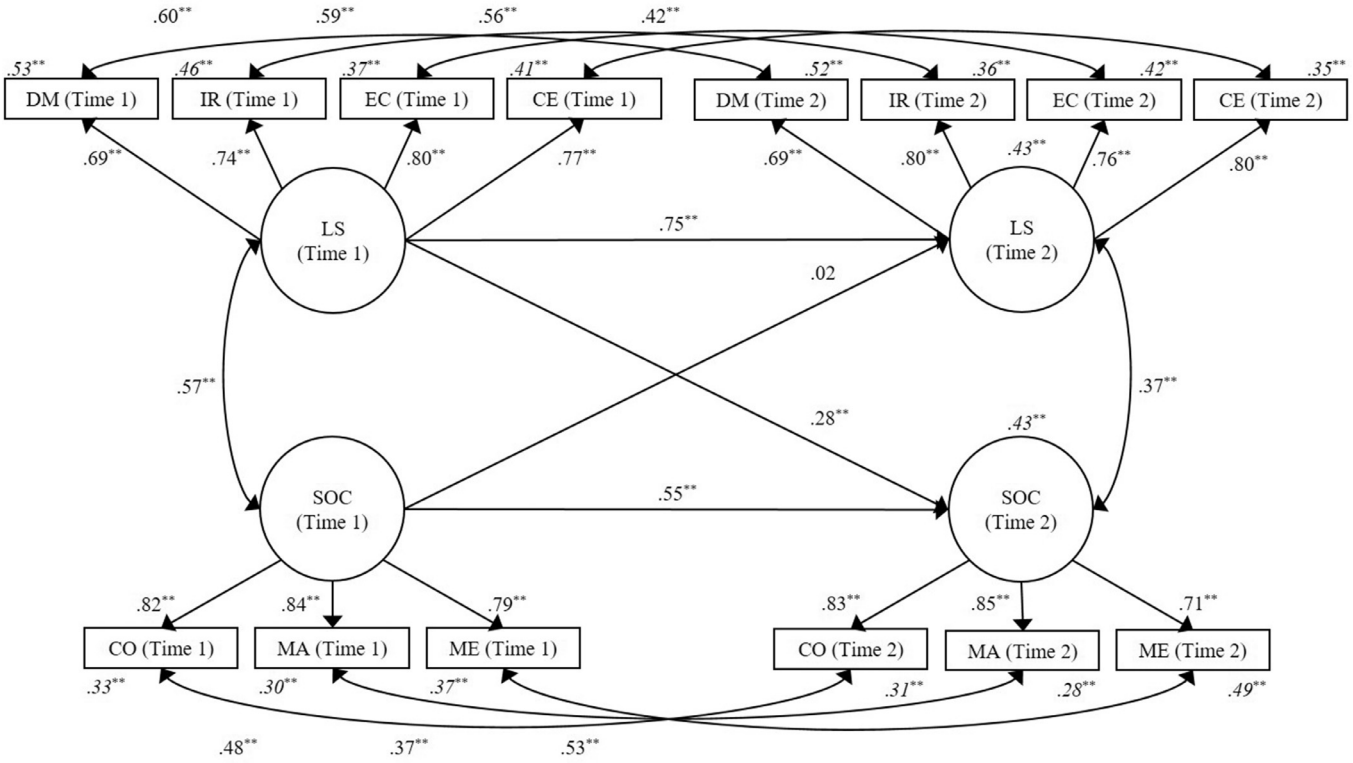

Fig. 2. Cross-lagged effects model (CFI = .947; SRMR = .065; RMSEA = .089). *Notes*. SOC: sense of coherence; CO: comprehensibility; MA: manageability; ME: meaningfulness; DM: decision making skills; IR: interpersonal relationship skills; EC: effective communication skills; CE: coping with emotion skills. Values in italic indicates R^2. Error variables are omitted for simplicity.

4. Discussion

4.1. Causal relationships between SOC and life skills

We investigated the causal relationships between SOC and life skills, and the correlation analysis showed that SOC was positively associated with life skills. These results are consistent with previous studies (e.g., Kase et al., 2016; Lee & Ka, 2017). Furthermore, the causal relationships from life skills toward SOC were estimated considering the factor structures of SOC and life skills using SEM. Namely, the hypotheses from former studies in which improving life skills led to strengthened SOC (e.g., Carstens & Spangenberg, 1997; Kase et al., 2016) were supported. Additionally, the causal relationships from SOC toward life skills were non-significant; in other words, there was no bidirectional relationship between SOC and life skills. These results provide key information concerning the dimensions and stages of SOC and life skills that can be used when constructing a theoretical model and implementing practical studies on strengthening SOC and conducting LST.

As mentioned above, the WHO (1994) suggested that solving everyday problems is related to improved mental health. Applying the findings of this study to this suggestion, we revealed several experiences that can strengthen SOC, as pointed out in previous research (Antonovsky, 1987b; Togari, 2008b). For example, solving problems systematically and positively using life skills such as decision-making skills may reflect "participation in shaping outcomes." This suggestion is reasonable because "participation in shaping outcomes" includes autonomy and decision making (Togari, 2008b). Moreover, it is vital to prevent feeling meaningless and helpless to experience an "underload–overload balance" (Antonovsky, 1987). According to definitions of "personal skills" such as decision making and coping with emotion skills by Kase et al. (2016), those who have high personal skills can set goals of appropriate difficulty levels for themselves and can find meaning and value when solving them. Therefore, they may be less likely to feel meaningless and helpless and will experience an "underload–overload balance." Furthermore, decision making skills allow one to determine rules and consistency and understand problems critically (Kase et al., 2016; Slicker, Picklesimer, Guzak, & Fuller, 2005). Additionally, it can be inferred that high interpersonal relationships and effective communication skills promote a sense of shared values and orientation with others. These experiences correspond to "consistency."

In summary, experiences of successfully solving demands and problems in everyday life using life skills lead to strengthened SOC, which may contribute to improved and maintained mental health (Fig. 3). Therefore, conducting LST to promote problem solving by comprehensively enhancing personal and interpersonal skills while considering experienced problems and successes to strengthen SOC may contribute to coping with stressors effectively and improving long-term mental health.

Further, it has been suggested that obtaining social support from friends and family leads to strengthened SOC (Kase et al., 2016). In addition, those with high interpersonal skills such as interpersonal relationship and effective communication skills can obtain social support from friends and family effectively by communicating their own requests and feelings to others appropriately (Hishida et al., 2012). Therefore, it is expected that strengthening SOC will be achieved by implementing LST and enhancing interpersonal skills to obtain appropriate support from others.

4.2. Future directions and limitations

In this study, the causal relationships between SOC and life skills were examined using short-term, longitudinal, quantitative research. It is necessary to clarify more concretely the process of using life skills to solve problems and strengthen SOC. Endo et al. (2013) qualitatively examined coping during difficult situations (e.g., frustration in college athletes) among individuals with high vs. low SOC using a free-

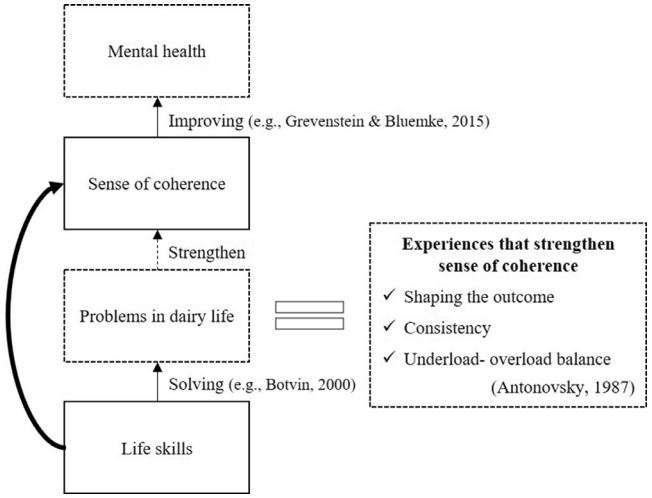

Fig. 3. Hypothesis about relationships among life skills, sense of coherence, and mental health. Note. This figure was created by the authors with reference to previous studies (Japan Know Your Body, 2005; World Health Organization, 1994). Solid arrow: The relevance that shown in the previous study. Thick arrow: The present results. Dashed arrow: Hypothetical association.

description survey. Such methods are effective for clarifying and understanding how to solve everyday life problems using life skills, which will lead to strengthened SOC. By applying such methods, it may also be possible to explain the qualitative process of SOC mobilizing life skills as GRRs to promote problem-solving, which is difficult to clarify in detail by quantitative research methods.

Additionally, it was pointed out that although SOC stabilizes to a certain extent in early adulthood, it continues to change in response to life experiences (Antonovsky, 1987b). This is an important argument in regard to the process of improving SOC by LST in the hypothesis model (Fig. 3) proposed from the results of this research. Smith, Breslin, and Beaton (2003) examined the stability of SOC from the viewpoint of measurement by questionnaire. The results of a 4-year longitudinal study on 18 to 64 year old persons, suggested that SOC had a large state component; consequently, we must be cautious about this apparent lack of stability when using the SOC to represent a stable orientation within a causal context. In addition, Schnyder, Büchi, Sensky, and Klaghofer (2000) found from a longitudinal study that SOC is a relatively stable trait in persons aged 30 to 60. However, they also suggested that when an impactful life event such as a life-threatening accident occurs, the SOC, as a life orientation, may be changed after the remission even if it occurs in adulthood. Based on the suggestions from these studies, it is unclear whether results similar to the present study can be generalized to adolescents in their early 20s as targeted in the present study, or to adults and seniors over 30 years old who may have relatively stable SOC. Therefore, it is necessary for future studies to verify the causal relationship between SOC and life skills for different age groups, such as adults, middle age, infants, and children under 20.

Moreover, we conducted a web survey that enabled us to collect data from individuals living all over Japan, which indicated enhanced generalization of the current results. However, it has been noted that web survey participants tend to have high information access (Takaizumi, Harada, & Nakamura, 2016). Such participant bias may relate to levels of life skills in information handling (e.g., decision making skills). Therefore, in future studies, it will be necessary to use fixed survey methods or conduct surveys by mail for those who are unable to complete web surveys, and to confirm the reproducibility of the current results. Furthermore, it is essential to implement the surveys in countries other than Japan for further generalization of the findings.

Conflict of interest

The authors declare no conflict of interest.

Declarations of interest

None.

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