Association of low sense of coherence with poor subjective well-being: a three-month cohort study of new medical students in Japan

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The aim of this 3-month cohort study was to examine the association between low sense of coherence (SOC) and poor subjective well-being of new medical students at a university. Participants were first-year students at Dokkyo Medical University (111 students in 2011, 107 in 2012, and 118 in 2013) who completed self-report questionnaires comprising 29 SOC items and 12 lifestyle items upon entry in April and again in July. Total SOC scores for April (131.8) and July (130.8) were almost unchanged, although meaningfulness and manageability scores decreased significantly and comprehensibility scores increased significantly. Mean scores of total SOC, manageability, and comprehensibility of students whose subjective well-being was good in April but poor in July were significantly lower than those of students whose subjective well-being was good in both months, whereas the mean score of meaningfulness of students with poor subjective well-being in both months was significantly lower than that of students whose subjective well-being was poor in April but good in July. Odds ratios for poor subjective well-being adjusted for age, sex, and year of admission were significantly high for low comprehensibility (4.33: 1.35–13.9) and low manageability (8.51: 1.90–38.1). Thus, our study suggested that the SOC of new medical students can be used to identify those students at risk of poor QOL.

Key words: new medical students, sense of coherence, subjective well-being, comprehensibility, manageability

Background

Japanese medical education takes at least 6 years after graduation from high school. Many medical students worldwide have experienced some degree of perceived mental stress while studying medicine1, and sense of coherence (SOC) related to health and quality of life (QOL) among students is an important consideration in medical education2. Antonovskysought to explain the relationship be-
between life stressors and health by what he called “sense of coherence” (SOC), where the concept explains maintenance or improvement of location on Antonovsky’s health–ease/dis–ease continuum. Salutogenesis (i.e., the origin of health) is a concept based on stress resources and context of living conditions. A number of studies have examined the connection between SOC and lower levels of stress. SOC was reported to be negatively related to state anxiety responses, and recently the association between SOC and depression was reported for adolescents and adults. The SOC concept was also reported as a health resource that influences QOL. A survey of North Indian students revealed that SOC was associated with health–promoting behaviors, and a Japanese study examining SOC and its related factors among university students found that strong SOC was related to a strong sense of responsibility, a greater amount of perceived social support, a supportive family environment during childhood, and positive experiences in junior and senior high school. In relation to students, Biro et al. reported that those who received social support had higher SOC. Medical school in particular has been described as a stressful social environment. This stressful environment might lead to unhealthier lifestyle habits among many medical students such as SOC-related breakfast skipping.

Due to these unhealthy behaviors, many medical students might develop poor health. For medical education, it is important to predict which students are likely to develop poor subjective well-being at an early stage. Therefore, the present study examined changes in subjective well-being and whether poor subjective well-being is related to lower SOC at an early stage. Also, the aim of present study was to examine whether low SOC at entry to a medical university is a predictor for developing poor subjective well-being 3 months later.

Methods

Study design

This study is a 3-month prospective cohort study.

Participants

Participants were 111 (69 men, 42 women; mean age, 19.4 ± 1.6 years) first-year students in 2011, 107 (65 men, 42 women; mean age, 19.4 ± 1.5 years) in 2012, and 118 (79 men, 39 women, 19.5 ± 1.8) in 2013 at Dokkyo Medical University School of Medicine. On April 11 in 2011 and 2012 and on April 12, 2013, the day after the entrance ceremony, participants received information about the study and provided written informed consent to participate.

Self-report questionnaire

Participants completed a self-evaluation questionnaire comprising 26 items regarding fitness to practice as medical students, 29 SOC items, each rated on a 7-point scale, and 12 items on lifestyle and subjective well-being that were based on a Japanese national health and nutrition survey. Only 29 SOC items and items of subjective well-being were used in the present study. The maximum total SOC score was 203. The 29 SOC items reflect components of meaningfulness (maximum score 56), comprehensibility (maximum score 77), and manageability (maximum score 70) with high internal consistency and evidence of validity. The internal consistency measured by Cronbach’s alpha ranged from 0.70 to 0.95 using SOC–29 from 124 studies. The Japanese version of the 29 SOC items was developed by Yamazaki. The question for subjective well-being was as follows: How was your health over the past month? Subjective well-being was rated as fairly good, good, poor, or very poor. All questionnaires with this question
were completed on April 11, 2011 and 2012 and on April 12, 2013 and again on July 15, 2011, July 13, 2012, and July 19, 2013. July dates in each year represented the week after the first examination period.

**Statistical analysis**

First, both the mean scores of SOC subscales of meaningfulness, comprehensibility, and manageability, and total SOC were compared by year of admission using ANOVA. Similarly, responses to subjective well-being were compared by admission year in each conducted month using Pearson’s chi-squared test. Next, mean scores of SOC subscales of meaningfulness, comprehensibility, and manageability, and total SOC among all summed participants were compared by month (i.e., April or July) using Wilcoxon’s matched-pairs signed rank test.

Students were divided into four groups as follows: (1) The good/good group included students who reported their subjective well-being as fairly good or good in both months; (2) the good/poor group included students who reported their subjective well-being as fairly good or good in April but poor or very poor in July; (3) the poor/poor group included students who reported their subjective well-being as poor or very poor in both months; and (4) the poor/good group included students who reported their subjective well-being as poor or very poor in April but good or fairly good in July. Mean scores of meaningfulness, comprehensibility, and total SOC were compared between these four groups by ANOVAs.

Moreover, we divided all the participants into two further groups according to their mean (low and high) total SOC scores and each SOC subscale (meaningfulness, comprehensibility, and manageability) in April. The high SOC group was defined by scores of 132 or higher and the low SOC group by scores lower than 132 in April. The high meaningfulness group was defined by scores of 42 or higher, the high-comprehensibility group by scores of 43 or higher, and the high-manageability group by scores of 47 or higher in April. For participants with subjective well-being reported as fairly good or good in April, we calculated unadjusted odds ratios for total SOC and subscales using high and low groups for developing poor subjective well-being in July using 2 x 2 table with the chi-squared test, as well as sex, age, and year of admission–adjusted odds ratios for total SOC and subscales for poor subjective well-being using binary logistic regression. Next, for participants with subjective well-being reported as poor or very poor in April, we calculated unadjusted odds ratios for total SOC and subscales using high and low groups for continuing poor subjective well-being in July using 2 x 2 table with the chi-squared test, as well as sex, age, and year of admission–adjusted odds ratios for total SOC and subscales.

The Statistical Package for Social Sciences (SPSS) Version 21.0 for Windows (SPSS Japan Inc./IBM, Tokyo, Japan) was used for all statistical analyses. Level of significance was set as $p < 0.05$.

**Approval**

Approval from the Ethics Committee at Dokkyo Medical University was obtained for this study.

**Results**

Although the comprehensibility score in April was a little lower among new students who entered in 2011, SOC scores were almost the same by year of admission as shown in Table 1.

There were significant differences in reports of subjective well-being between groups by year of admission as shown in Table 2.

Table 3 shows that total SOC scores among first-year medical students were 131.8 in April and
130.8 in July. Although total SOC scores in April and July were not significantly different, scores of meaningfulness and manageability decreased significantly and the score of comprehensibility increased significantly.

Next, we examined differences in mean scores of total SOC and SOC subscales between groups based on changes in subjective well-being from April to July as shown in Table 4. The mean score of meaningfulness of the good/good group was
significantly higher than that of the poor/poor group, and the mean score of meaningfulness of the poor/good group was significantly higher than that of the poor/poor group. The mean score of comprehensibility of the good/good group was significantly higher than that of the poor/poor group. The mean score of manageability of the good/good group was significantly higher than that of the good/poor group or poor/poor group. The mean total SOC score of the good/good group was significantly higher than that of the good/poor group or poor/poor group, and that of the poor/good group was significantly higher than that of the poor/poor group.

Therefore, we chose 299 students whose reported subjective well-being as fairly good or good in April, and then divided them into two groups according to median (low and high) total SOC scores and each SOC subscale (meaningfulness, comprehensibility, and manageability) in April. We exam-
ined unadjusted odds ratios and odds ratios adjusted for age, sex, and year of admission for low total SOC scores and each score of meaningfulness, comprehensibility, and manageability in April for developing poor subjective well-being. Table 5 shows the results. Unadjusted odds ratios for poor subjective well-being were significantly higher in the low total SOC group (2.93: 1.01–8.53), low comprehensibility group (4.02: 1.28–12.6), and low manageability group (8.77: 1.97–39.1). Odds ratios for poor subjective well-being adjusted for age, sex, and year of admission were significantly higher in the low comprehensibility group (4.33: 1.35–13.9) and low manageability group (8.51: 1.90–38.1).

Next, we chose 28 students who reported their subjective well-being as poor or very poor in April. Similarly, we examined unadjusted odds ratios and age/sex-adjusted odds ratios for low total SOC scores and each score of meaningfulness, comprehensibility, and manageability for continuing poor or very poor subjective well-being in July. Table 6 shows the results. The unadjusted odds ratio was significantly higher in the low-meaningfulness group (18.0: 1.83–177). Odds ratios adjusted for age, sex, and year of admission were also significantly higher in the low-meaningfulness group (12.9: 1.17–141) for continuing poor subjective well-being.

### Discussion

In the present study, the mean scores of total SOC and SOC subscales of meaningfulness, comprehensibility, and manageability among new medical students remained almost unchanged for 3 years. Although the mean score of total SOC remained unchanged between April and July, the mean scores of meaningfulness and manageability were significantly lower, and the mean score of comprehensibility was significantly higher in July than in April.

According to Antonovsky, SOC gradually stabilizes in early adulthood when one begins to work

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**Table 5**  SOC odds ratio in April for change in subjective well-being from good in April to poor in July

<table>
<thead>
<tr>
<th>SOC in April</th>
<th>No. of students N=299</th>
<th>No. (%) of students whose subjective well-being became poor in July</th>
<th>Unadjusted odds ratio (95% CI)&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Odds ratio adjusted for age, sex, and year of admission (95% CI)&lt;sup&gt;e&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total SOC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>160</td>
<td>5 (3.1)</td>
<td>1.00 **</td>
<td>1.00 **</td>
</tr>
<tr>
<td>Low</td>
<td>139</td>
<td>12 (8.6)</td>
<td>2.93 (1.01–8.53)*</td>
<td>2.92 (0.99–8.62)</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>161</td>
<td>7 (4.3)</td>
<td>1.00 **</td>
<td>1.00 **</td>
</tr>
<tr>
<td>Low</td>
<td>138</td>
<td>10 (7.2)</td>
<td>1.72 (0.64–4.64)</td>
<td>1.59 (0.58–4.37)</td>
</tr>
<tr>
<td>Comprehensibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>160</td>
<td>4 (2.5)</td>
<td>1.00 **</td>
<td>1.00 **</td>
</tr>
<tr>
<td>Low</td>
<td>139</td>
<td>13 (9.4)</td>
<td>4.02 (1.28–12.6)*</td>
<td>4.33 (1.35–13.9)</td>
</tr>
<tr>
<td>Manageability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>154</td>
<td>2 (1.3)</td>
<td>1.00 **</td>
<td>1.00 **</td>
</tr>
<tr>
<td>Low</td>
<td>145</td>
<td>15 (10.3)</td>
<td>8.77 (1.97–39.1) **</td>
<td>8.51 (1.90–38.1) **</td>
</tr>
</tbody>
</table>

*Note. 95% CI=95% confidence interval

<sup>a</sup>Fisher’s chi-square test

<sup>b</sup>Binary logistic regression

* *p<0.05, ** *p<0.01
until the age of 30\(^4\). As the participants in the present study were new medical students just beginning their medical coursework, scores of total SOC and each SOC subscale showed reasonable changes. SOC is said to be formed by life experiences\(^3,4,8\). Our results revealed that mean scores of total SOC were 131.8 in April and 130.8 in July—nonsignificant difference. Similar to our results, the mean SOC score in 1998 was 131.1 in Japanese people according to Takayama et al\(^9\). Similarly, the mean score was 130.87 in a study of North Indian students\(^13\). However, a Japanese study of three nonmedical universities reported a mean score of 117.9 among male students and 117.5 among female students\(^14\). The authors of this previous study also found significant differences in mean SOC scores among different universities that were dependent upon entrance difficulty\(^14\). Considering the difficulty of entry into Japanese medical universities, the mean score in our study might be higher than that of the previous study on nonmedical universities.

In our study, the mean score in April among students whose reported subjective well-being was good or fairly good in April but changed to poor or very poor in July was 116.5, and that among students whose reported subjective well-being was poor or very poor in both months was 111.9. This result suggests an effect of low SOC score on poor subjective well-being. As QOL has been defined as personal well-being or satisfaction with life, subjective well-being has almost the same meaning as QOL. From a systematic review including 32 papers whose main objective was to investigate the relationship between SOC and QOL, SOC apparently had an impact on QOL\(^12\). It was reported that the stronger the SOC, the better the QOL\(^12\). In another systematic review by the same authors, SOC appeared to be a health-promoting resource that strengthens resilience and develops a positive subjective state of health\(^22\).

Table 6  SOC odds ratio in April for subjective well-being unchanged from poor in July

<table>
<thead>
<tr>
<th>SOC in April</th>
<th>No. of students (N=28)</th>
<th>No. (%) of students whose subjective well-being remained poor in July</th>
<th>Unadjusted odds ratio (95% CI)(^f)</th>
<th>Odds ratio adjusted for age, sex, and year of admission (95% CI)(^g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total SOC</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>8</td>
<td>2 (25.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low</td>
<td>20</td>
<td>11 (55.0)</td>
<td>1.67 (0.89-3.12)</td>
<td>2.92 (0.99-8.62)</td>
</tr>
<tr>
<td>Meaningfulness</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>1 (10.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low</td>
<td>18</td>
<td>12 (66.7)</td>
<td>18.0 (1.83-177) **</td>
<td>12.9 (1.17-141) *</td>
</tr>
<tr>
<td>Comprehensibility</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>10</td>
<td>5 (50.0)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low</td>
<td>18</td>
<td>8 (44.4)</td>
<td>0.80 (0.17-3.77)</td>
<td>0.49 (0.44-1.59)</td>
</tr>
<tr>
<td>Manageability</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>High</td>
<td>11</td>
<td>4 (36.4)</td>
<td>1.00</td>
<td>1.00</td>
</tr>
<tr>
<td>Low</td>
<td>17</td>
<td>9 (52.9)</td>
<td>1.97 (0.42-9.32)</td>
<td>1.29 (0.23-7.43)</td>
</tr>
</tbody>
</table>

Note. 95% CI=95% confidence interval
\(^f\) Fisher’s chi-square test
\(^g\) Binary logistic regression.
\(*p<0.05\), ** *p<0.01
comprehensibility, and manageability. Meaningfulness is the sense that events in life have significance and are worthy of investment. Comprehensibility is the sense that stimuli from one’s internal and external environments are predictable and structured in the course of living. Manageability is the sense that available resources are adequate to deal with demands from stimuli. In the present study, the mean score of meaningfulness and that of manageability decreased, whereas that of comprehensibility increased in July, 3 months after entry. According to Antonovsky, comprehensibility develops in groups that share a common sense of values and belonging and that are governed by definitive rules. Similarly, medical students share a common sense of values and belonging and each are motivated to become a doctor. On the other hand, meaningfulness develops by autonomy and participation in decision making in life, and manageability develops by experience of a good load balance.

The present study also suggested that changes in subjective well-being from good to poor in July were associated with low scores of comprehensibility and manageability, whereas subjective well-being that remained poor in both months was associated with a low score of meaningfulness.

Our previous study reported that SOC scores for meaningfulness and manageability were associated with breakfast eating. In a study of Japanese university students, the rate of breakfast skipping among first-year students was significantly lower than that of higher-year students. As new students gradually begin to skip breakfast and as their perception of medical school stress rises, scores of meaningfulness and manageability might become lower.

In a study of young adults, chronic stress was a predictor of health risk behaviors such as daily smoking and heavy drinking. Wainwright et al. reported that individual differences in SOC were associated with healthy lifestyle choices independent of social class and education. Even in food selection, both men and women with high SOC scores reported more healthy food choices than those with lower scores. Unhealthy behaviors might lead to poorer subjective well-being. According to Richardson and Ratner, SOC moderates the effects of stressful life events on health. A Japanese 1-year follow-up study reported that SOC can predict movement towards health within a year. In a study of Japanese factory workers, SOC was associated with reduced psychological responses to stressors. As new medical students perceive many stressors such as the first period of examinations, having a higher SOC score might reduce these stressors. In a study of German medical students, psychiatric disorders such as burnout, depression, and anxiety disorders were common. Furthermore, although these German medical students who exhibited normal health status at the beginning of their university study period, deterioration of SOC and QOL steadily developed in later semesters. Therefore, strategies to avoid burnout and anxiety should be introduced in medical schools by targeting students with lower SOC scores in order to maintain their QOL. It is important to identify high-risk students who easily develop mental impairment by checking SOC at the beginning of their university life. Wild et al. has reported a new course on relaxation techniques for medical students showing good effects on reducing burnout and anxiety.

In this study, we also examined the association between SOC and subjective well-being as it relates to QOL. A significant difference in subjective well-being was seen between the low and high SOC groups and it is therefore suggested that SOC, especially comprehensibility and manageability, can also predict the future QOL of medical stu-
The present study has several limitations. First, the sample size was small and narrowly confined to first-year students from one medical university in Japan. Therefore, we cannot generalize these results to medical students in general. Second, the study’s questionnaires relied upon subject self-report, so some reporting errors might have occurred due to misunderstood questions. Third, our cohort study lasted only 3 months. We should follow up students for a longer period to learn more about the relationship between SOC and subjective well-being. Further studies are warranted to address these issues.

Conclusion

Our study suggested that low SOC scores at entry to medical school can predict adverse changes in subjective well-being 3 months after entry. Thus, the SOC of new medical students can be used to identify those students at risk of poor QOL and to provide early intervention before their lifestyle habits worsen.

Acknowledgements

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和文抄録

本研究は3ヶ月間のコホート研究であり、その目的は、医学部の新入生の首尾一貫感覚（SOC）と主観的健康感の変化との関係を検討するものである。対象者は関西医科大学の医学部新入生（2011年111名、2012年107名、2013年118名）である。本研究は4月と7月に自記式の29項目のSOCと12項目の生活習慣調査からなるアンケート調査に回答することを同意したもの対象とした。SOC総合点は、4月に131.8点、7月に130.8点でほとんど変化なかったが、有意差感と処理可能性感有意な低下し、把握可能性感有意に上昇した。4月の主観的健康感が良好であり7月には不良になったものの4月入学時のSOC総合点、処理可能性感、把握可能性感の平均点が、4月も7月も主観的健康感が良好であったものより有意に低い結果となった。一方、4月も7月も主観的健康感が不良であるものは、主観的健康感が4月は不良で7月には良好になったものに比較して、4月入学時の有用感の平均点有意に低いという結果となった。主観的健康感が不良になることの性、年齢および入学年で調整したオッズ比は、把握可能性が低いこと（4.33: 1.35-13.9）と処理可能性感が低いこと（8.51: 1.90-38.1）で有意に高かった。従って、本研究結果より、新入学生のSOCを測定することはQOL低下の危険性がある学生を早期に見出すことができる可能性が示唆された。