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Sense of coherence and health-related quality of life in chronic patients: the mediating role of mental component

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Sense of coherence and health-related quality of life in chronic patients: the mediating role of mental component

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Contributorship statement

MG and PC performed study conception and design, data analysis, drafting the manuscript, and critical revision of the manuscript; MC drafted the manuscript; AC, GL, VM, MP, FT, GZ, and SD collected data and contributed to draft and edit the manuscript, EM, EC, and FB contributed to draft and edit the manuscript. All authors read and approved the final manuscript.

Abstract

Objective To examine the relationship between SOC and health-related quality of life in patients with chronic illness by focusing on mediating role of the mental component of quality of life.

Design Cross-sectional survey design.

Setting Secondary care; Three Departments of an Italian University hospital.

Methods Participants (N=209) in the study were adults (≥ 18 years) outpatients having a chronic pathology (e.g., diabetes, thyroid, and cancer diseases) at any phase of the care trajectory (e.g., pre-treatment, undergoing treatment, follow-up care). They agreeing to participate in the study after informed consent. Data were collected through a structured self-reported questionnaire. Data analysis was carried out using SPSS, and mediation analysis was performed via PROCESS macro.

Results SOC score of the study sample was equivalent to that of general population (mean difference = -2.7, 95% CI = -4.8–.00). Correlation analysis showed that SOC was mainly correlated to the mental component (MCS) ($r = .52, p < .01$) of quality of life and then to the physical component (PCS) ($r = .35, p < .01$). Mediation analysis showed that SOC had a direct relationship with MCS ($p < .001, 95\%CI = .61-1.00$) but not with PCS ($p = .57, 95\%CI = -.28-.16$). In turn, MCS had a direct relationship with PCS ($p < .001, 95\%CI = .67-.96$). The indirect effect of SOC on PCS through MCS was significant ($.66, p < .001, Boot 95\%CI = .50-.86$), thus supporting the mediating role of mental quality of life.

Conclusion The indirect effect suggests that SOC is a marker of quality of life, especially of mental component. The findings emphasize that SOC is a psychological process impacting on patients' mental health status that in turn affects physical health. A better knowledge of persons' SOC and how it affects quality of life may help to plan tailoring interventions for strengthening SOC and improve health-related quality of life.

Keywords: Chronic patient, Health, Mediating role, Quality of life, Sense of Coherence.

Article summary

Strengths and limitations of this study

- The sample is not representative of all chronic pathologies and future studies should expand data collection to obtain more data from other different diseases and look at the transferability of the results;
- The cross-sectional design does not allow us to draw conclusions regarding causal relationships between variables. Prospective designs are needed to examine the long-term connections between SOC and quality of life;
- Sense of coherence can represent a marker of mental health-related quality of life, which in turn influence that physical;
- A better knowledge of persons' sense of coherence and how it affects quality of life may help to better plan tailoring interventions;
- The efforts of health professionals in health promotion activities could be addressed to strengthen sense of coherence.

Sharing statement

Extra data is available by emailing contumail@gmail.com and maura.galletta@gmail.com.

Competing interests

The authors declare that they have no competing interests.

Funding

Not applicable.

Ethics approval

The study was conducted according to the Helsinki Declaration and approved by the AOUCA Independent Ethic Committee of Southern Sardinia, Italy (Prot. NP/2018/1635).

Introduction

Salutogenesis is a concept focusing on factors promoting health and wellbeing instead of focusing on those that cause disease.¹ Salutogenic approach involves the interaction between individual, community and environment, in which the resources of individuals and communities are committed to strengthening health and well-being.² The concept relies not only on the availability of resources (e.g., economic, social, healthy lifestyles, self-esteem, experience, knowledge resources...), but also on the ability of individuals and communities to use them.

According to Antonovsky, life is a chaos in which an individual have constantly to cope to change. People are exposed to different stress sources (e.g., diseases of family members, changes in the family such as divorce, changes in workplace such as organizational changes or unemployment, etc.) that may wander them from positive healthy conditions to negative ill conditions, and vice versa. This approach overcomes the traditional dichotomy between health and disease, but considers them as a continuum in people life.³ Some individuals achieve salutary outcomes despite their exposure to stressors. It depends on how they are able to manage stress by using the available resources.⁴ The way in which people perceive their life would have positive or negative outcomes on stressful events that may occur. An individual's positive perception would result in a positive influence on his/her health condition.¹ The ability to use resources to efficaciously cope to stressful events and promote health can be explained by the sense of coherence concept,^{5 6} which is at the base of the salutogenic model.

Sense of Coherence Concept

Sense of coherence (SOC) is a dispositional orientation that allows the individuals to be more resilient to daily life stressors, stay well and improve their health. It includes three components: comprehensibility, manageability and meaningfulness.^{6 7} The sense of comprehensibility refers to the degree to which life events make sense and are understandable for people. An individual who understands what is happening is more able to face difficult situations.

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The sense of manageability is the extent to which people perceive that they have sufficient available (internal and external) resources to satisfy their needs. To have control helps people to living better and in a healthy way. Finally, the sense of meaningfulness represents the motivational dimension, namely the extent to which people feel that the life has an emotional meaning and the faced problems are seen as challenges rather than as hindrances. Attributing a meaning to the events increases motivation to make efforts for facing life.

Therefore, SOC is a global orientation that convey a feel of trust due to the fact that stressors are predictable, resources to face challenges are available, and challenges are worthy of the individual's efforts because they have a meaning for him/her.^{4 8} However, despite the importance to considering the different coponents of SOC, Antonovsky^{4 9} strongly highlighted the indivisibility of the construct. Literature indicated that SOC is related to an individual's ability to use cognitive, emotional, and instrumental strategies to cope difficulties and maintain good health.^{10 11}

According to Antonovsky,^{4 6} individuals with high SOC perceive stressors as challenges, thus activating their own resilience resources to modify their life perception and move from an illness condition to a healthy one.

Salutogenic Approach and Helath-Related Quality of Life

Literature suggests that the salutogenic model promotes health, improves resilience and fosters positive physical and mental health conditions.^{12 13} Langeland et al.¹⁴ showed that SOC predicted life satisfaction in patients with mental health problems. Lindström and Eriksson,⁷ in their systematic review, indicated that SOC was associated with quality of life in different patient populations.

Health-related quality of life is a multidimensional concept encompassing physical and mental, and social aspects of an individual's health and his/her relationship with the environment.¹⁵

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It focuses on the impact of illness and treatment on quality of life and reflects the way in which people respond to the physical and psychological effects of illness, which can influence life satisfaction.¹⁸

Health-related quality of life can be measured by two main components: physical (e.g., physical functioning, role limitations due to physical problems, bodily pain, and general health) and mental (e.g., vitality, social functioning, role limitations due to emotional problems, and mental health). As coping strategies to overcome difficulties and maintain good health involve psychological processes focused on cognitive and behavioral efforts¹⁹ that require willing and motivation, it is likely that SOC is more linked to the mental than physical component of quality of life. Recent studies showed a strong relationship between SOC and the mental component of health-related quality of life in patients with different chronic illness.^{11 20} Nevertheless, it is not clear how SOC has an effect on the physical component. It is likely that resilience entails an emotional effort and has a direct relationship with the mental quality of life that, in turn, is related to the physical quality of life.

As there is still uncertainty about the relationship mechanisms between SOC and health,²¹ this study aims to examine the relationship between SOC and quality of life in patients with chronic illness by focusing on mediating role of the mental component of quality of life.

Methods

Patient involvement

The research was carried out in three departments (e.g., Endocrinology, Diabetology, and Oncology) of a Southern Sardinia University hospital in Italy, after approval by health director of the hospital. Participants were recruited during the check-up consultation and approached in the waiting room of the services. Inclusion criteria for recruitment were (1) having a chronic pathology such as diabetes, thyroidopathies, cancer, etc. at any phase of the care trajectory (e.g., pre-treatment,

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undergoing treatment, follow-up care); (2) being adults (≥ 18 years); (3) agreeing to participate in the study after informed consent.

Written and oral information about the purpose of the study was provided to each participant. Participation was voluntary and subject to informed consent for all outpatients agreeing to the study. Participants were also informed that they could interrupt their participation at any time without any prejudice.

Data collection

Patient data were collected between May and September 2018 through a structured self-reported questionnaire. The completed questionnaires were directly returned to the researchers.

Instrument

The self-administered questionnaire consisted of two sections. The first included a demographic part with information such as gender, age, education, employment, type of pathology, time of onset of illness, drugs, and medical history (including surgery and possible complications related to the disease). The second part of the questionnaire concerned measure scales regarding the study variables (e.g., SOC and health-related quality of life).

To measure SOC, we used the Italian version of Antonovsky's SOC-13 original scale,⁶ validated by Sardu et al.²² The scale includes 13 items with a 7-point Likert- scale.

To measure health-related quality of life, the Short Form-36 Health Survey (SF-36) of Apolone et al.²³ was used, based on the original version of Ware and Sherbourne.²⁴ The scale includes a total of 36 items to assess eight health domains: physical functioning (PF; 10 items), role physical (RP; 4 items), bodily pain (BP; 2 items), general health (GH; 5 items), vitality (VT; 4 items), social functioning (SF; 2 items), role emotional (RE; 3 items), and mental health (MH; 5 items). Finally, one single item measures change of general health status over the past year.

As shown by Schroder et al.²⁵ the eight domains can be combined into two main components: Physical Component Summary (PCS), which includes the PF, RP, BP, and GH domains, and

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Mental Component Summary (MCS), which includes the VT, SF, RE, and MH domains. In our study we used such a combined measure to assess health-related quality of life and its association with SOC.

Statistical analysis

Data analysis was carried out by using SPSS (SPSS Inc., Chicago, IL, USA) 20.0 program. Descriptive analysis and correlations were performed for the study variables. Levene's test was computed to examine homogeneity of variances in the sample subgroups (e.g., for both gender and pathology) for the independent variable (e.g., SOC). To examine indirect effect of X (e.g., SOC) on Y (e.g., PCS) through M (e.g., MCS), mediation analysis was performed via PROCESS macro¹⁵ with Model 4. Bootstrapping procedure for indirect effect was carried out²⁶ and confidence intervals (95%) were calculated with a bias-corrected bootstrapped 5000 random resamples of the data with replacement. Control variables such as age and gender were introduced in the model as covariates.

Results

A total of 209 (71 males and 138 females) outpatients with three different pathologies was recruited. Patients were affected from diabetes (n = 71 patients, 37 males and 34 females), thyroidopathies (n = 77 patients, 9 males and 68 females), and cancer (n = 61 patients, 25 males and 36 females).

Table 1 displays mean scores and standard deviations for the SOC measure.

Table 1: *SOC scores in the general population and in the study sample.*

Variable	N	SOC score	SD
General population*	913	60.3	13.6
Study sample	209	63.0	15.2
Males	71	65.2	14.7
Females	138	61.8	14.8
diabetics patients	71	61.7	15.2

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thyroidopathic patients	77	62.4	15.1
cancer patients	61	65.1	13.9

Note. *From Sardu et al.'s study.

Comparing SOC scores, we can say that the SOC value of the study sample is equivalent to that of general population²² (mean difference = -2.7, 95% CI = -4.8–.00). Regarding the study sample, the Levene's test for equality of variances has showed that the SOC scores are equal between males and females ($F = .08$, $p = .78$; mean difference = -3.46, 95% CI = -7.81–.88), as well as between the different subgroups of pathologies ($F = .05$, $p = .60$; mean difference between diabetes and cancer patients = -3.35, 95% CI = -9.62–2.92; mean difference between diabetes and thyroidopathic patients = -.70, 95% CI = -6.83–5.44; mean difference between thyroidopathic and cancer patients = -2.65, 95% CI = -9.05–3.75). As there is no significant difference in the average SOC scores of the sample subgroups, we considered the sample as a whole.

Table 2 displays mean values, standard deviations, and correlations for all the used variables. The results are in line with theoretical purpose by showing that SOC is mainly correlated to MCS ($r = .52$) and then to PCS ($r = .35$).

Table 2: Means, Standard deviations and correlations for the study variables.

Variable	M	SD	SOC	PCS	MCS
SOC	63.0	14.8	1		
PCS	62.9	26.8	.35**	1	
MCS	58.9	23.1	.52**	.73**	1

Note. N = 209. ** $p < .01$

Table 3 shows the mediation analysis. As expected, the results indicate that SOC has a direct and positive relationship with MCS but not with PCS. In turn, MCS has a positive and direct relationship with PCS. The direct effect of SOC on PCS is not significant: = -.06, $p = .57$, 95%CI = -.28–.16. The indirect effect of SOC on PCS through MCS is significant: = .66, $p < .001$, Boot 95%CI

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= .50–.86. Among the control variables, gender is not significantly related neither MCS, nor PCS.

Age is significantly and negatively related to both MCS and PCS. Final model explains 55% of variance in the outcome variable.

Table 3: *Mediation analysis of MCS on SOC-PCS relationship.*

Outcome variable: MCS	coeff	SE	t	p	95%LLCI	95%ULCI
constant	13.78	6.65	2.07	.04	.65	26.91
SOC	26.91	.10	8.09	<.001	.61	1.00
Age	-10.50	3.03	-3.46	<.01	-16.48	-4.51
Gender	-.09	3.15	-.03	.98	-6.31	6.13
Model summary: $R^2 = .33$, $F = 28.25$, $p < .001$						
Outcome variable: PCS						
constant	21.15	6.40	3.30	<.01	8.52	33.78
MCS	.82	.07	11.20	<.001	.67	.96
SOC	-.06	.11	-.57	.57	-.28	.16
Age	-7.12	2.98	-2.39	.02	-13.01	-1.24
Gender	2.07	2.99	.69	.49	-3.84	7.98
Model summary: $R^2 = .55$, $F = 50.92$, $p < .001$						

Note. MCS = Mental component summary, SOC = Sense of coherence, PCS = Physical component summary

Discussion

The aim of the study was to examine the relationship between SOC and quality of life in patients with chronic illness and analyze the mediating role of the mental component of quality of life. The sample's descriptive characteristics confirmed that SOC is a stable factor regardless of health status of a person. In fact, the recruited patients with different pathologies had an average SOC score comparable to that of the general population. Furthermore, the results showed that SOC

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scores were equal between the different pathologies and did not appear gender differences.

Literature highlighted that SOC tends to be lower in females than males, but usually these differences were very small, probably due to social factors.^{10 22}

The correlation analysis showed that SOC was more strongly correlated to MCS than PCS and the indirect effect analysis highlighted a mediating role of MCS. In other words, SOC is not directly related to PCS but indirectly through mediation of MCS. In line with previous studies, these findings support that SOC is a psychological process that affects patients' mental health status,^{11 20} which in turn affects their physical health. This indirect effect is the additional value of this study.

As expected, gender was not significantly related to the model outcomes. This means that to be male or female does not contribute to explain the relationship with both MCS and PCS. Age had a negative relationship with both MCS and PCS. This result indicates that both mental and physical health-related quality of life decreases with progressing of age.

Implications for public health and communities

The results of this study can help to address efforts of health professionals in health promotion activities for people with chronic pathologies. A better knowledge of persons' SOC and how it affects quality of life may help to better plan tailoring interventions. The found indirect effect suggests that SOC is a marker of quality of life, especially of the mental component which, in turn influence that physical. In this sense, high SOC may empower patients' mental health status on the one hand, but on the other hand, low SOC may result in poor outcomes in terms of quality of life.

Even if previous studies confirmed that SOC is a stable entity in adulthood,^{27 28} recent research suggested that SOC could be strengthened in health promotion activities^{29 30} through an approach that includes reflection and mindfulness (for additional information regarding the interventions see Kabat-Zinn).³¹ Sometimes can happen that people possess sufficient resources to move to a more healthy state³² but are unable to identify and use them, thereby perceiving their

health condition as incomprehensible, unmanageable, and not meaningful. Health professionals can contribute to empower people to reflect on the available resources and on how mobilize them to use them successfully.²¹ They can facilitate people to reflect on difficult situations by looking at present time in a non-critical way, rather than thinking about possible future problems.^{29 21} These interventions could contribute to increase levels of SOC and improve quality of life.

Limitations

This study has a few limitations that should be addressed in future research. A first weakness is the small sample size. We are aware that our sample is not representative of all chronic pathologies and a future aim of this study is therefore to continue the data collection to obtain more data from other different diseases and look at the transferability of the results.

Second, data were collected via a quantitative approach. Future studies could supplement this method by a qualitative approach including interviews or focus groups to obtain a better understanding of the way in which people experience health-ill continuum in their daily life context.

Another limitation is the used cross-sectional design that did not allow us to draw conclusions regarding causal relationships between variables. Future studies should use prospective designs to examine the long-term connections between SOC and quality of life and between possible tailoring interventions and SOC levels.

Finally, further studies would need to examine other possible covariates as social/family support to analyze if and how it contributes to improve both SOC and quality of life.³³

However, despite these limitations, our findings offer a base on which develop future research on the area, and suggest that salutogenic approach may support mental health-related quality of life among chronic patients.

Conclusion

SOC was more strongly correlated to MCS than PCS and indirectly affected PCS through mediation of MCS. The findings emphasize that SOC is a psychological process impacting on

patients' mental health status which in turn affects physical health. Our study would boost the importance of additional evidence on the mediating role of the mental component of quality of life.

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Sense of Coherence and Quality of Life in chronic patients

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Short title: SENSE OF COHERENCE AND QUALITY OF LIFE IN CHRONIC PATIENTS

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Sense of coherence and health-related quality of life in chronic patients: The mediating role of the mental component

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Contributorship statement

MG and PC conceived and designed the study, conducted the data analysis, drafted the manuscript, and performed a critical revision of the manuscript; MC drafted the manuscript; AC, GL, VM, MP, FT, GZ, and SD collected data and contributed to drafting and editing the manuscript; PO, EM, EC, and FB contributed to drafting and editing the manuscript. All the authors read and approved the final manuscript.

Abstract

Objective To examine the relationship between sense of coherence (SOC) and health-related quality of life in patients with chronic illnesses by focusing on the mediating role of the mental component of quality of life.

Design Cross-sectional survey design.

Setting Secondary care; Three departments of an Italian university hospital.

Methods The participants (N=209) in the study were adult (≥ 18 years) outpatients with a chronic pathology (e.g., diabetes, thyroid disorders, or cancer) at any phase in the care trajectory (e.g., pre-treatment, undergoing treatment, follow-up care). They agreed to participate in the study after providing their informed consent. Data were collected using a structured self-reporting questionnaire. Data analysis was carried out using SPSS, and mediation analysis was performed via PROCESS macro.

Results The SOC score of the study sample was equivalent to that of the general population (mean difference = -2.7, 95% CI = -4.8–.00). Correlation analysis showed that SOC was mainly correlated to the mental component (MCS) ($r = .52, p < .01$) of quality of life and then to the physical component (PCS) ($r = .35, p < .01$). Mediation analysis showed that SOC was directly related to MCS ($p < .001, 95\%CI = .61–1.00$) but not to PCS ($p = .57, 95\%CI = -.28–.16$). In turn, MCS was directly related to PCS ($p < .001, 95\%CI = .67–.96$). The indirect effect of SOC on PCS through MCS was significant ($.66, p < .001, Boot 95\%CI = .50–.86$), thus supporting the mediating role of the mental component of quality of life.

Conclusion The indirect effect suggests that SOC is a marker of quality of life, especially of the mental component. The findings show that SOC is a psychological process that impacts patients' mental health status, which in turn affects physical health. Better knowledge of a person's SOC and how it affects his/her quality of life may help to plan tailoring interventions to strengthen SOC and improve health-related quality of life.

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4 **Keywords:** Chronic patient, Health, Mediating role, Quality of life, Sense of Coherence.

7 **Article summary**

9 **Strengths and limitations of this study**

- 11 • The sample is not representative of all chronic pathologies and future studies should expand
12 data collection to obtain more data from patients' with different diseases and look at the
13 transferability of the results;
- 14 • The study's cross-sectional design does not allow us to draw conclusions regarding the
15 causal relationships between variables. Prospective designs are needed to examine the long-
16 term connections between SOC and quality of life;
- 17 • Sense of coherence may be a marker of mental health-related quality of life, which in turn
18 influences physical quality of life;
- 19 • Better knowledge of a person's sense of coherence and how it affects his/her quality of life
20 may help to better plan tailoring interventions;
- 21 • The efforts of health professionals in health promotion activities could be addressed to
22 strengthen SOC.

41 **Sharing statement**

42 Extra data is available by emailing contumail@gmail.com and maura.galletta@gmail.com.

43 **Competing interests**

44 The authors declare that they have no competing interests.

45 **Funding**

46 Not applicable.

47 **Ethics approval**

48 The study was conducted according to the Helsinki Declaration and approved by the AOUCA
49 Independent Ethics Committee of Southern Sardinia, Italy (Prot. NP/2018/1635).

Introduction

Salutogenesis is a concept focusing on factors that promote health and wellbeing instead of focusing on those that cause disease.¹ The salutogenic approach involves the interaction between the individual, community and environment, in which the resources of individuals and communities are committed to strengthening health and well-being.² The concept relies not only on using resources (e.g., economic, social, healthy lifestyles, self-esteem, experience, knowledge resources, etc.), but also on the ability to identify and (re)use resources in a health-promoting way.

According to Antonovsky, life is a chaos in which individuals constantly have to cope with change. People are exposed to different sources of stress (e.g., family illness, family changes such as divorce, changes in the workplace such as organizational changes or unemployment, etc.) that may lead them away from positive healthy conditions toward negative conditions of illness, and vice versa. This approach goes beyond the traditional dichotomy of health and disease and instead considers them a continuum in people's lives.³ Some individuals manage to achieve good health despite their exposure to stressors. This depends on whether they are able to deal with, overcome, or avoid the tension generated by stressors (e.g., stressful events) effectively by identifying and (re)using resources.⁴ The ability to identify and (re)use resources to effectively cope with stressful events and promote health would positively influence one's own health condition.¹ It can be explained by the sense of coherence concept,^{5,6} which is an underlying resource enabling effective coping strategies that forms the basis of the salutogenic model.

Sense of Coherence Concept

Sense of coherence (SOC) is a dispositional orientation that allows individuals to be more resilient to stressors in daily life, stay well and improve their health. It includes three components: comprehensibility, manageability, and meaningfulness.^{6,7} The sense of comprehensibility refers to the degree to which life events make sense and are understandable for people. An individual who understands what is happening is more able to face difficult situations. The sense of manageability

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is the extent to which people perceive that they have sufficient available (internal and external) resources to satisfy their needs. Having control helps people to live better and healthier. Finally, the sense of meaningfulness represents the source of motivation, namely the extent to which people feel that life has emotional meaning and the problems faced are seen as challenges rather than hindrances. Attributing meaning to events increases people's motivation to make an effort to face life.

Therefore, SOC is an overall orientation that conveys a feeling of trust because stressors are predictable, that resources to face challenges are available, and that the challenges are worth the individual's effort because they have meaning for him/her.^{4 8} However, despite the importance of considering the different components of SOC, Antonovsky^{4 9} strongly highlights the indivisibility of the construct. The literature indicates that SOC is related to an individual's ability to identify and (re)use resources from his/her internal (e.g., cognitive, emotional, and behavioral strategies) or external (e.g., social support, social fairness, relationships, outdoor life, culture) environment to cope with difficulties and maintain good health.^{10 11 12 13} According to Antonovsky,^{4 6} individuals with high SOC perceive stressors as challenges, and thus anticipate events and the resources available to modify their perception of life and move from a condition of illness to one of health. High SOC strengthens resilience and promotes an individual state of well-being.^{1 4}

Salutogenic Approach and Health-related Quality of Life

The literature suggests that the salutogenic model promotes health, improves resilience and fosters positive physical and mental health conditions.^{14 15} Langeland et al.¹⁶ show that SOC predicted life satisfaction in patients with mental health problems. Lindström and Eriksson,⁷ in their systematic review, indicate that SOC is associated with quality of life in different patient populations.

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Health-related quality of life is a multidimensional concept encompassing the physical, mental, and social aspects of an individual's health and his/her relationship to the environment.^{17 18 19}

It focuses on the impact of illness and treatment on quality of life and reflects how people respond to the physical and psychological effects of illness, which can influence life satisfaction.²⁰

Health-related quality of life can be measured by two main components: physical (e.g., physical functioning, role limitations due to physical problems, bodily pain, and general health) and mental (e.g., vitality, social functioning, role limitations due to emotional problems, and mental health). As coping strategies to overcome difficulties and maintain good health involve psychological processes focused on cognitive and behavioral efforts²¹ that require willingness and motivation, it is likely that SOC is more closely linked to the mental than the physical component of quality of life. A recent study has shown that mental health plays a mediating role in the association between physical disease and self-reported health.²² Moreover, other studies show a strong relationship between SOC and the mental component of health-related quality of life in patients with different chronic illness.^{11 23} Nevertheless, it is not clear how SOC affects the physical component. It is likely that resilience entails emotional effort and is directly related to mental quality of life that, in turn, is related to physical quality of life.

As there is still uncertainty regarding the relationship mechanisms between SOC and health,²⁴ this study aims to examine the relationship between SOC and physical health-related quality of life in patients with chronic illness by focusing on the mediating role of the mental component of quality of life.

Methods

Patient involvement

Research was carried out in three departments (e.g., Endocrinology, Diabetology, and Oncology) of a southern Sardinia university hospital in Italy, after being approved by the health

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director of the hospital. Participants were recruited during the check-up consultation and approached in the waiting room. The inclusion criteria used in recruitment were: (1) patients had a chronic pathology such as diabetes, a thyroid disorder, cancer, etc. at any phase in the care trajectory (e.g., pre-treatment, undergoing treatment, follow-up care); (2) patients were adults (≥ 18 years); (3) patients agreed to participate in the study after providing informed consent.

Written and oral information on the purpose of the study was provided to each participant. Participation was voluntary and subject to informed consent for all outpatients agreeing to the study. Participants were also informed that they could interrupt their participation at any time without any prejudice.

Data collection

Patient data were collected between May and September 2018 using a structured self-reporting questionnaire. All the patients completed the questionnaire independently, then returned it directly to the researchers.

Instruments

The questionnaire consisted of two sections. The first regarded patient demographics, including information such as gender, age, education, employment, type of pathology, time of onset of illness, medications, and medical history (including surgery and possible complications related to the disease). The physician completed this part of the questionnaire via patient interviews. The second part of the questionnaire was self-administered and concerned validated scales regarding the study variables (e.g., SOC and health-related quality of life). The first and second parts of the questionnaire were then matched via a coding scheme to guarantee the patients' privacy.

To measure SOC, we used the Italian version of Antonovsky's SOC-13 original scale,⁶ validated by Sardu et al.²⁵ The scale includes 13 items with a 7-point Likert scale.

To measure health-related quality of life, the Short Form-36 Health Survey (SF-36) of Apolone et al.²⁶ was used, based on the original version by Ware and Sherbourne.²⁷ The scale

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includes a total of 36 items that assess eight health domains: physical functioning (PF; 10 items), role physical (RP; 4 items), bodily pain (BP; 2 items), general health (GH; 5 items), vitality (VT; 4 items), social functioning (SF; 2 items), role emotional (RE; 3 items), and mental health (MH; 5 items). Finally, one single item measures the change in patients' general health status over the past year.

As shown by Schroder et al.²⁸, the eight domains can be combined into two main components: Physical Component Summary (PCS), which includes the PF, RP, BP, and GH domains, and Mental Component Summary (MCS), which includes the VT, SF, RE, and MH domains. In our study, we used this combined measure to assess health-related quality of life and its association with SOC.

Statistical analysis

Data analysis was carried out by using the SPSS (SPSS Inc., Chicago, IL, USA) 20.0 program. The significance of the sample size was calculated using statistical power analysis. SOC of the study sample was compared to that of the general population to examine if SOC is a stable factor. Descriptive analyses were performed for the study variables and bivariate analysis was conducted using Pearson's correlation. SOC was identified as the independent variable (X), PCS was the outcome variable (Y), and MCS was the mediator variable (M). Demographic variables such as gender and age were considered as control variables. Levene's test was computed to examine the homogeneity of variances in the sample subgroups (e.g., for both gender and pathology) for the independent variable. To examine the indirect effect of X on Y through M, mediation analysis was performed via PROCESS macro²⁹ using Model 4 (simple mediation). Mediation analysis allows the relationship between independent (SOC) and the dependent (PCS) variables through a mediating variable (MCS) to be examined. A mediator (or intervening variable) transfers the effect of an independent variable to a dependent variable. The mediator produces variation in the predicted variable and itself is caused by the predictor variable³⁰. In our research,

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we assume that MCS intervenes in the relationship between SOC and PCS. Simple mediation is a conventional model used to explore mediating effect and allows one mediator to be added to the regression model at a time²⁹ (Figure 1). The bootstrapping procedure to measure indirect effect was carried out and confidence intervals (95%) were calculated with 5000 bias-corrected bootstrapped random resamples of the data with replacement.³¹ Control variables such as age and gender were introduced in the model as covariates.

Results

A minimum total sample size of 209 individuals (general population N=913) was required for a statistical power of 90% at the $p < .05$ level of significance. Thus, a total of 209 (71 males and 138 females) outpatients with three different pathologies were recruited. Patients were affected by diabetes (n = 71 patients, 37 males and 34 females), thyroid disorders (n = 77 patients, 9 males and 68 females), and cancer (n = 61 patients, 25 males and 36 females).

Table 1 shows the mean scores and standard deviations for the SOC measure.

Table 1: *SOC scores for the general population and the study sample.*

Variable	N	SOC score	SD
General population*	913	60.3	13.6
Study sample	209	63.0	15.2
Males	71	65.2	14.7
Females	138	61.8	14.8
Diabetic patients	71	61.7	15.2
Patients with a thyroid disorder	77	62.4	15.1
Cancer patients	61	65.1	13.9

Note. *From the study by Sardu et al.²⁵

If we compare SOC scores, we can say that the SOC value in the study sample is equivalent to that of the general population²⁵ (mean difference = -2.7, 95% CI = -4.8–.00). Regarding the study

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sample, the Levene's test for equality of variances shows that the SOC scores are equal for both males and females ($F = .08, p = .78$; mean difference = $-3.46, 95\% \text{ CI} = -7.81-.88$), as well as for the different pathology subgroups ($F = .05, p = .60$; mean difference for diabetic and cancer patients = $-3.35, 95\% \text{ CI} = -9.62-2.92$; mean difference for patients with diabetes and a thyroid disorder = $-.70, 95\% \text{ CI} = -6.83-5.44$; mean difference for patients with a thyroid disorder and cancer = $-2.65, 95\% \text{ CI} = -9.05-3.75$). As there is no significant difference in the average SOC scores of the sample subgroups, we considered the sample as a whole.

Table 2 shows mean values, standard deviations, and correlations for all the variables. The results are in line with the theoretical purpose insofar as they show that SOC is mainly correlated to MCS ($r = .52$) and then to PCS ($r = .35$). Moreover, the correlation between MCS and PCS was $.73$.

Table 2: Means, Standard deviations and Pearson's correlations for the study variables.

Variable	M	SD	SOC	PCS	MCS
SOC	63.0	14.8	1		
PCS	62.9	26.8	.35**	1	
MCS	58.9	23.1	.52**	.73**	1

Note. $N = 209$. ** $p < .01$ (two-tailed).

As expected, the results from Model 4 indicate that SOC is directly and positively related to MCS ($\beta = .81, p < .001, 95\% \text{ CI} = .61-1.00$) but not to PCS ($\beta = -.06, p = .57, 95\% \text{ CI} = -.28-.16$). In turn, MCS is positively and directly related to PCS ($\beta = .82, p < .001, 95\% \text{ CI} = .67-.96$). Among the control variables, gender is not significantly related either to MCS ($\beta = -.09, p = .98, 95\% \text{ CI} = -6.31-6.13$) or to PCS ($\beta = 2.07, p = .49, 95\% \text{ CI} = -3.84-7.98$). Age is significantly and negatively related to both MCS ($\beta = -10.50, p < .01, 95\% \text{ CI} = -16.48--4.51$) and PCS ($\beta = -7.12, p = .02, 95\% \text{ CI} = -13.01--1.24$). The indirect effect of SOC on PCS through MCS is significant (Table 3 and Figure 2). The model explains 55% of the variance in the outcome variable.

Table 3: Mediation analysis of MCS on SOC-PCS relationship.

Model	Path coefficient	SE	Bias corrected bootstrap 95% CI	
			Lower limit	Upper limit
SOC on MCS (path a)	.81*	.10	.61	1.00
MCS on PCS (path b)	.82*	.07	.67	.96
Total effect of SOC on PCS (c path)	.60*	.12	.35	.84
Direct effect of SOC on PCS (c' path)	.06	.11	-.28	.16
Indirect effect of SOC on PCS (path ab)	.66*	.09	.50	.86

Note. MCS = Mental component summary, SOC = Sense of coherence, PCS = Physical component summary. * $p < .001$

Discussion

The aim of the study was to examine the relationship between SOC and quality of life in patients with a chronic illness and analyze the mediating role of the mental component of quality of life. The sample's descriptive characteristics confirmed that SOC is a stable factor regardless of the person's health status. In fact, the recruited patients with different pathologies had an average SOC score comparable to that of the general population. Furthermore, the results showed that SOC scores were equal for the different pathologies and there did not appear to be any differences in terms of gender. According to the literature, SOC tends to be lower in females than males, but usually these differences were very slight, probably due to social factors.^{10 25}

The correlation analysis showed that SOC was more strongly correlated to MCS than PCS and the indirect effect analysis highlighted the mediating role of MCS. In other words, SOC is not directly related to PCS but rather indirectly through the mediation of MCS. In line with the previous studies, these findings support the idea that SOC is a psychological process that is related to patients' mental health status,^{11 23} which is positively associated with their physical health. This indirect effect is the additional value of this study.

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As expected, gender was not significantly related to the model outcomes. This means that whether a person is male or female does not contribute to explaining the relationship to both MCS and PCS. Age was negatively related to both MCS and PCS. This result indicates that both mental and physical health-related quality of life decreases as people get older.

Implications for public health and communities

The results of this study can help to address the efforts of health professionals in health promotion activities for people with chronic pathologies. Better knowledge of a person's SOC and how it affects quality of life may help to better plan tailoring interventions. The indirect effect found suggests that SOC is a marker of quality of life, especially of the mental component, which in turn influences the physical component. In this sense, high SOC may strengthen patients' mental health status on the one hand, but on the other hand, low SOC may result in poor outcomes in terms of quality of life.

Previous studies found that SOC is a stable entity in adulthood.^{32 33} Nevertheless, research showed that SOC may increase with age, reaching its highest levels at older ages¹³. In addition, age proved to be a possible confounder in our study as it was negatively related to both the MCS and PCS components of quality of life. However, recent studies have suggested that SOC could be strengthened in health promotion activities^{34 35} by using an approach that includes reflection and mindfulness (for additional information regarding the interventions see Kabat-Zinn's work).³⁶ Sometimes people possess sufficient resources to move to a more healthy state³⁷ but are unable to identify and use them, and therefore perceive their health condition as incomprehensible, unmanageable, and unmeaningful. Health professionals can contribute to empowering people to reflect on the available resources and on how to mobilize them to use them successfully.²⁴ They can facilitate people's reflection on difficult situations by looking uncritically at the present, rather than thinking about possible future problems.^{24 34} These interventions could contribute to increasing levels of SOC and improving quality of life.

Limitations

This study has a few limitations that should be addressed in future research. Its first weakness is its small sample size. However, statistical power analysis shows that our sample is representative of the general population. While we are aware that our sample is not representative of all chronic pathologies, one future aim of this study is to continue collecting data to obtain more data on different diseases and look at the transferability of the results.

Second, the data were collected using a quantitative approach. Future studies could supplement this method by using a qualitative approach including interviews or focus groups to better understand how people experience the health-illness continuum in their daily lives.

Another limitation is the cross-sectional design used, which did not allow us to draw conclusions regarding the causal relationships between variables. Future studies should use prospective designs to examine the long-term connections between SOC and quality of life and between possible tailoring interventions and SOC levels.

Finally, further studies would need to examine other possible covariates such as social/family support to analyze if and how it contributes to improving both SOC and quality of life.³⁸

However, despite these limitations, our findings offer a basis on which to develop future research in the area, and suggest that the salutogenic approach may support mental health-related quality of life among chronic patients.

Conclusion

SOC was more strongly correlated to MCS than PCS and indirectly affected PCS through the mediation of MCS. The findings underscore that SOC is a psychological process that impacts patients' mental health status, which in turn affects physical health. Our study would back the importance of gathering additional evidence on the mediating role of the mental component of quality of life.

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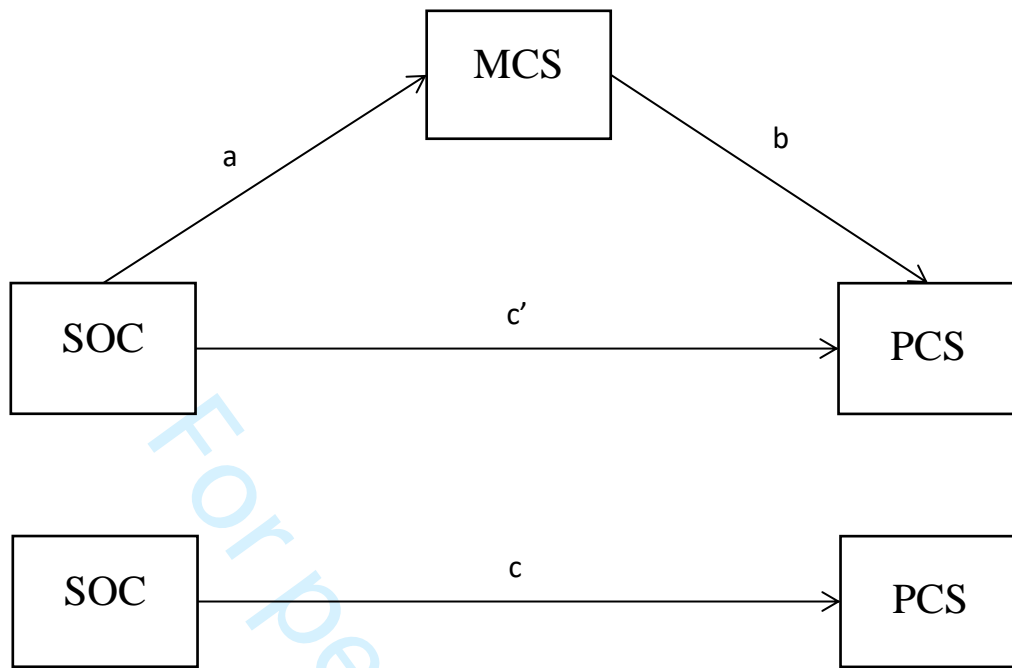
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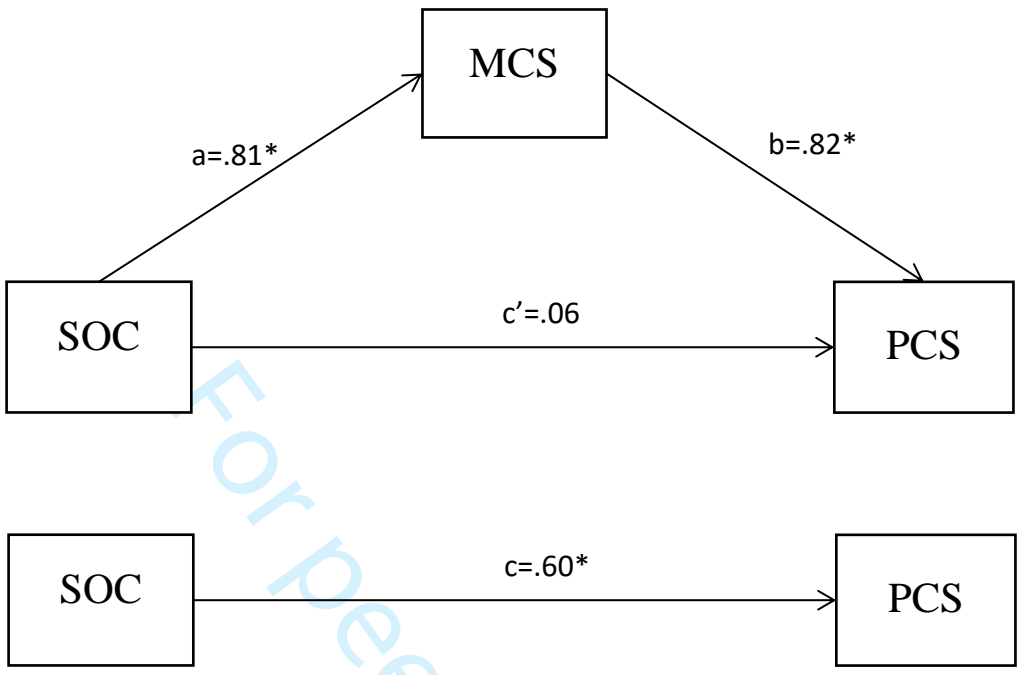
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5 *Figure 1.* Conceptual diagram for mediation analysis. Indirect effect of SOC on PCS through
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7 MCS = ab. Direct effect of SOC on PCS = c'. Total effect of SOC on PCS = c.
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11 *Figure 2.* Statistical diagram for mediation analysis. Indirect effect of SOC on PCS through
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13 MCS (ab) = .66, $p < .001$. * $p < .001$.
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Sense of coherence and health-related quality of life in chronic patients: the mediating role of the mental component

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Sense of Coherence and Quality of Life in chronic patients

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Sense of coherence and health-related quality of life in chronic patients: The mediating role of the mental component

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Contributorship statement

MG and PC conceived and designed the study, conducted the data analysis, drafted the manuscript, and performed a critical revision of the manuscript; MC drafted the manuscript; AC, GL, VM, MP, FT, GZ, and SD collected data and contributed to drafting and editing the manuscript; PO, EM, EC, and FB contributed to drafting and editing the manuscript. All the authors read and approved the final manuscript.

Abstract

Objective To examine the relationship between sense of coherence (SOC) and physical health-related quality of life in patients with chronic illnesses by focusing on the mediating role of the mental component of quality of life.

Design Cross-sectional survey design.

Setting Secondary care; Three departments of an Italian university hospital.

Methods The participants (N=209) in the study were adult (≥ 18 years) outpatients with a chronic pathology (e.g., diabetes, thyroid disorders, or cancer) at any phase in the care trajectory (e.g., pre-treatment, undergoing treatment, follow-up care). They agreed to participate in the study after providing their informed consent. Data were collected using a structured self-reporting questionnaire. Data analysis was carried out using SPSS, and mediation analysis was performed via PROCESS macro.

Results The SOC score of the study sample was equivalent to that of the general population (mean difference = -2.7, 95% CI = -4.8–.00). Correlation analysis showed that SOC was mainly correlated to the mental component (MCS) ($r = .52$, $p < .01$) of quality of life and then to the physical component (PCS) ($r = .35$, $p < .01$). Mediation analysis showed that SOC was directly related to MCS ($p < .001$, 95%CI = .61–1.00) but not to PCS ($p = .57$, 95%CI = -.28–.16). In turn, MCS was directly related to PCS ($p < .001$, 95%CI = .67–.96). The indirect effect of SOC on PCS through MCS was significant (.66, $p < .001$, Boot 95%CI = .50–.86), thus supporting the mediating role of the mental component of quality of life.

Conclusion The indirect effect suggests that SOC is a marker of quality of life, especially of the mental component. The findings show that SOC is a psychological process that impacts patients' mental health status, which in turn affects physical health. Better knowledge of a person's SOC and how it affects his/her quality of life may help to plan tailoring interventions to strengthen SOC and improve health-related quality of life.

1 Sense of Coherence and Quality of Life in chronic patients

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5 **Keywords:** Chronic patient, Health, Mediating role, Quality of life, Sense of Coherence.

6 7 **Article summary**

8 9 **Strengths and limitations of this study**

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- 12 • The sample is not representative of all chronic pathologies and future studies should expand
13 data collection to obtain more data from patients' with different diseases and look at the
14 transferability of the results;
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 - 17 • The study's cross-sectional design does not allow us to draw conclusions regarding the
18 causal relationships between variables. Prospective designs are needed to examine the long-
19 term connections between SOC and quality of life;
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 - 22 • Sense of coherence may be a marker of mental health-related quality of life, which in turn
23 influences physical quality of life;
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 - 26 • Better knowledge of a person's sense of coherence and how it affects his/her quality of life
27 may help to better plan tailoring interventions;
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 - 30 • The efforts of health professionals in health promotion activities could be addressed to
31 strengthen SOC.
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39 **Sharing statement**

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42 Extra data is available by emailing contumail@gmail.com and maura.galletta@gmail.com.

43 **Competing interests**

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46 The authors declare that they have no competing interests.

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52 for-profit sectors.
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54 **Ethics approval**

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57 The study was conducted according to the Helsinki Declaration and approved by the AOUCA
58 Independent Ethics Committee of Southern Sardinia, Italy (Prot. NP/2018/1635).
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Introduction

Salutogenesis is a concept focusing on factors that promote health and wellbeing instead of focusing on those that cause disease.¹ The salutogenic approach involves the interaction between the individual, community and environment, in which the resources of individuals and communities are committed to strengthening health and well-being.² The concept relies not only on using resources (e.g., economic, social, healthy lifestyles, self-esteem, experience, knowledge resources, etc.), but also on the ability to identify and (re)use resources in a health-promoting way.

According to Antonovsky, life is a chaos in which individuals constantly have to cope with change. People are exposed to different sources of stress (e.g., family illness, family changes such as divorce, changes in the workplace such as organizational changes or unemployment, etc.) that may lead them away from positive healthy conditions toward negative conditions of illness, and vice versa. This approach goes beyond the traditional dichotomy of health and disease and instead considers them a continuum in people's lives.³ Some individuals manage to achieve good health despite their exposure to stressors. This depends on whether they are able to deal with, overcome, or avoid the tension generated by stressors (e.g., stressful events) effectively by identifying and (re)using resources.⁴ The ability to identify and (re)use resources to effectively cope with stressful events and promote health would positively influence one's own health condition.¹ It can be explained by the sense of coherence concept,^{5,6} which is an underlying resource enabling effective coping strategies that forms the basis of the salutogenic model.

Sense of Coherence Concept

Sense of coherence (SOC) is a dispositional orientation that allows individuals to be more resilient to stressors in daily life, stay well and improve their health. It includes three components: comprehensibility, manageability, and meaningfulness.^{6,7} The sense of comprehensibility refers to the degree to which life events make sense and are understandable for people. An individual who understands what is happening is more able to face difficult situations. The sense of manageability

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is the extent to which people perceive that they have sufficient available (internal and external) resources to satisfy their needs. Having control helps people to live better and healthier. Finally, the sense of meaningfulness represents the source of motivation, namely the extent to which people feel that life has emotional meaning and the problems faced are seen as challenges rather than hindrances. Attributing meaning to events increases people's motivation to make an effort to face life.

Therefore, SOC is an overall orientation that conveys a feeling of trust because stressors are predictable, that resources to face challenges are available, and that the challenges are worth the individual's effort because they have meaning for him/her.^{4 8} However, despite the importance of considering the different components of SOC, Antonovsky⁴⁹ strongly highlights the indivisibility of the construct. The literature indicates that SOC is related to an individual's ability to identify and (re)use resources from his/her internal (e.g., cognitive, emotional, and behavioral strategies) or external (e.g., social support, social fairness, relationships, outdoor life, culture) environment to cope with difficulties and maintain good health.^{10 11 12 13} According to Antonovsky,⁴⁶ individuals with high SOC perceive stressors as challenges, and thus anticipate events and the resources available to modify their perception of life and move from a condition of illness to one of health. High SOC strengthens resilience and promotes an individual state of well-being.¹⁴

Salutogenic Approach and Health-related Quality of Life

The literature suggests that the salutogenic model promotes health, improves resilience and fosters positive physical and mental health conditions.^{14 15} Langeland et al.¹⁶ show that SOC predicted life satisfaction in patients with mental health problems. Lindström and Eriksson,⁷ in their systematic review, indicate that SOC is associated with quality of life in different patient populations.

Health-related quality of life is a multidimensional concept encompassing the physical, mental, and social aspects of an individual's health and his/her relationship to the environment.^{17 18 19}

It focuses on the impact of illness and treatment on quality of life and reflects how people respond to the physical and psychological effects of illness, which can influence life satisfaction.²⁰

Health-related quality of life can be measured by two main components: physical (e.g., physical functioning, role limitations due to physical problems, bodily pain, and general health) and mental (e.g., vitality, social functioning, role limitations due to emotional problems, and mental health). As coping strategies to overcome difficulties and maintain good health involve psychological processes focused on cognitive and behavioral efforts²¹ that require willingness and motivation, it is likely that SOC is more closely linked to the mental than the physical component of quality of life. A recent study has shown that mental health plays a mediating role in the association between physical disease and self-reported health.²² Moreover, other studies show a strong relationship between SOC and the mental component of health-related quality of life in patients with different chronic illness.^{11 23} Nevertheless, it is not clear how SOC affects the physical component. It is likely that resilience entails emotional effort and is directly related to mental quality of life that, in turn, is related to physical quality of life.

As there is still uncertainty regarding the relationship mechanisms between SOC and health,²⁴ this study aims to examine the relationship between SOC and physical health-related quality of life in patients with chronic illness by focusing on the mediating role of the mental component of quality of life.

Methods

Patient involvement

Research was carried out in three departments (e.g., Endocrinology, Diabetology, and Oncology) of a southern Sardinia university hospital in Italy, after being approved by the health

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director of the hospital. Participants were recruited during the check-up consultation and approached in the waiting room. The inclusion criteria used in recruitment were: (1) patients had a chronic pathology such as diabetes, a thyroid disorder, cancer, etc. at any phase in the care trajectory (e.g., pre-treatment, undergoing treatment, follow-up care); (2) patients were adults (≥ 18 years); (3) patients agreed to participate in the study after providing informed consent.

Written and oral information on the purpose of the study was provided to each participant. Participation was voluntary and subject to informed consent for all outpatients agreeing to the study. Participants were also informed that they could interrupt their participation at any time without any prejudice.

Data collection

Patient data were collected between May and September 2018 using a structured self-reporting questionnaire. All the patients completed the questionnaire independently, then returned it directly to the researchers.

Instruments

The questionnaire consisted of two sections. The first regarded patient demographics, including information such as gender, age, education, employment, type of pathology, time of onset of illness, medications, and medical history (including surgery and possible complications related to the disease). The physician completed this part of the questionnaire via patient interviews. The second part of the questionnaire was self-administered and concerned validated scales regarding the study variables (e.g., SOC and health-related quality of life). The first and second parts of the questionnaire were then matched via a coding scheme to guarantee the patients' privacy.

To measure SOC, we used the Italian version of Antonovsky's SOC-13 original scale,⁶ validated by Sardu et al.²⁵ The scale includes 13 items with a 7-point Likert scale.

To measure health-related quality of life, the Short Form-36 Health Survey (SF-36) of Apolone et al.²⁶ was used, based on the original version by Ware and Sherbourne.²⁷ The scale

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includes a total of 36 items that assess eight health domains: physical functioning (PF; 10 items), role physical (RP; 4 items), bodily pain (BP; 2 items), general health (GH; 5 items), vitality (VT; 4 items), social functioning (SF; 2 items), role emotional (RE; 3 items), and mental health (MH; 5 items). Finally, one single item measures the change in patients' general health status over the past year.

As shown by Schroder et al.²⁸, the eight domains can be combined into two main components: Physical Component Summary (PCS), which includes the PF, RP, BP, and GH domains, and Mental Component Summary (MCS), which includes the VT, SF, RE, and MH domains. In our study, we used this combined measure to assess health-related quality of life and its association with SOC.

Statistical analysis

Data analysis was carried out by using the SPSS (SPSS Inc., Chicago, IL, USA) 20.0 program. The significance of the sample size was calculated using statistical power analysis. SOC of the study sample was compared to that of the general population to examine if SOC is a stable factor. Descriptive analyses were performed for the study variables and bivariate analysis was conducted using Pearson's correlation. SOC was identified as the independent variable (X), PCS was the outcome variable (Y), and MCS was the mediator variable (M). Demographic variables such as gender and age were considered as control variables. Levene's test was computed to examine the homogeneity of variances in the sample subgroups (e.g., for both gender and pathology) for the independent variable. To examine the indirect effect of X on Y through M, mediation analysis was performed via PROCESS macro²⁹ using Model 4 (simple mediation). Mediation analysis allows the relationship between independent (SOC) and the dependent (PCS) variables through a mediating variable (MCS) to be examined. A mediator (or intervening variable) transfers the effect of an independent variable to a dependent variable. The mediator produces variation in the predicted variable and itself is caused by the predictor variable³⁰. In our research,

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we assume that MCS intervenes in the relationship between SOC and PCS. Simple mediation is a conventional model used to explore mediating effect and allows one mediator to be added to the regression model at a time²⁹ (Figure 1). The bootstrapping procedure to measure indirect effect was carried out and confidence intervals (95%) were calculated with 5000 bias-corrected bootstrapped random resamples of the data with replacement.³¹ Control variables such as age and gender were introduced in the model as covariates.

Results

A minimum total sample size of 209 individuals (general population N=913) was required for a statistical power of 90% at the $p < .05$ level of significance. Thus, a total of 209 (71 males and 138 females) outpatients with three different pathologies were recruited. Patients were affected by diabetes ($n = 71$ patients, 37 males and 34 females), thyroid disorders ($n = 77$ patients, 9 males and 68 females), and cancer ($n = 61$ patients, 25 males and 36 females).

Table 1 shows the mean scores and standard deviations for the SOC measure.

Table 1: *SOC scores for the general population and the study sample.*

Variable	N	SOC score	SD
General population*	913	60.3	13.6
Study sample	209	63.0	15.2
Males	71	65.2	14.7
Females	138	61.8	14.8
Diabetic patients	71	61.7	15.2
Patients with a thyroid disorder	77	62.4	15.1
Cancer patients	61	65.1	13.9

Note. *From the study by Sardu et al.²⁵

If we compare SOC scores, we can say that the SOC value in the study sample is equivalent to that of the general population²⁵ (mean difference = -2.7, 95% CI = -4.8–.00). Regarding the study

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sample, the Levene's test for equality of variances shows that the SOC scores are equal for both males and females ($F = .08, p = .78$; mean difference = $-3.46, 95\% \text{ CI} = -7.81-.88$), as well as for the different pathology subgroups ($F = .05, p = .60$; mean difference for diabetic and cancer patients = $-3.35, 95\% \text{ CI} = -9.62-2.92$; mean difference for patients with diabetes and a thyroid disorder = $-.70, 95\% \text{ CI} = -6.83-5.44$; mean difference for patients with a thyroid disorder and cancer = $-2.65, 95\% \text{ CI} = -9.05-3.75$). As there is no significant difference in the average SOC scores of the sample subgroups, we considered the sample as a whole.

Table 2 shows mean values, standard deviations, and correlations for all the variables. The results are in line with the theoretical purpose insofar as they show that SOC is mainly correlated to MCS ($r = .52$) and then to PCS ($r = .35$). Moreover, the correlation between MCS and PCS was $.73$.

Table 2: Means, Standard deviations and Pearson's correlations for the study variables.

Variable	M	SD	SOC	PCS	MCS
SOC	63.0	14.8	1		
PCS	62.9	26.8	.35**	1	
MCS	58.9	23.1	.52**	.73**	1

Note. $N = 209$. ** $p < .01$ (two-tailed).

As expected, the results from Model 4 indicate that SOC is directly and positively related to MCS ($\beta = .81, p < .001, 95\% \text{ CI} = .61-1.00$) but not to PCS ($\beta = -.06, p = .57, 95\% \text{ CI} = -.28-.16$). In turn, MCS is positively and directly related to PCS ($\beta = .82, p < .001, 95\% \text{ CI} = .67-.96$). Among the control variables, gender is not significantly related either to MCS ($\beta = -.09, p = .98, 95\% \text{ CI} = -6.31-6.13$) or to PCS ($\beta = 2.07, p = .49, 95\% \text{ CI} = -3.84-7.98$). Age is significantly and negatively related to both MCS ($\beta = -10.50, p < .01, 95\% \text{ CI} = -16.48--4.51$) and PCS ($\beta = -7.12, p = .02, 95\% \text{ CI} = -13.01--1.24$). The indirect effect of SOC on PCS through MCS is significant (Table 3 and Figure 2). The model explains 55% of the variance in the outcome variable.

Table 3: Mediation analysis of MCS on SOC-PCS relationship.

Model	Path coefficient	SE	Bias corrected bootstrap 95% CI	
			Lower limit	Upper limit
SOC on MCS (path a)	.81*	.10	.61	1.00
MCS on PCS (path b)	.82*	.07	.67	.96
Total effect of SOC on PCS (c path)	.60*	.12	.35	.84
Direct effect of SOC on PCS (c' path)	.06	.11	-.28	.16
Indirect effect of SOC on PCS (path ab)	.66*	.09	.50	.86

Note. MCS = Mental component summary, SOC = Sense of coherence, PCS = Physical component summary. * $p < .001$

Discussion

The aim of the study was to examine the relationship between SOC and quality of life in patients with a chronic illness and analyze the mediating role of the mental component of quality of life. The sample's descriptive characteristics confirmed that SOC is a stable factor regardless of the person's health status. In fact, the recruited patients with different pathologies had an average SOC score comparable to that of the general population. Furthermore, the results showed that SOC scores were equal for the different pathologies and there did not appear to be any differences in terms of gender. According to the literature, SOC tends to be lower in females than males, but usually these differences were very slight, probably due to social factors.^{10 25}

The correlation analysis showed that SOC was more strongly correlated to MCS than PCS and the indirect effect analysis highlighted the mediating role of MCS. In other words, SOC is not directly related to PCS but rather indirectly through the mediation of MCS. In line with the previous studies, these findings support the idea that SOC is a psychological process that is related to patients' mental health status,^{11 23} which is positively associated with their physical health. This indirect effect is the additional value of this study. However, our findings are in line with SOC

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being a predictor of quality of life and confirm previous research on the association between SOC and health-related quality of life.^{32 33}

As expected, gender was not significantly related to the model outcomes. This means that whether a person is male or female does not contribute to explaining the relationship to both MCS and PCS. Age was negatively related to both MCS and PCS. This result indicates that both mental and physical health-related quality of life decreases as people get older.

Implications for public health and communities

The results of this study can help to address the efforts of health professionals in health promotion activities for people with chronic pathologies. Better knowledge of a person's SOC and how it affects quality of life may help to better plan tailoring interventions. The indirect effect found suggests that SOC is a marker of quality of life, especially of the mental component, which in turn influences the physical component. In this sense, high SOC may strengthen patients' mental health status on the one hand, but on the other hand, low SOC may result in poor outcomes in terms of quality of life.

Previous studies found that SOC is a stable entity in adulthood.^{34 35} Nevertheless, research showed that SOC may increase with age, reaching its highest levels at older ages¹³. In addition, age proved to be a possible confounder in our study as it was negatively related to both the MCS and PCS components of quality of life. However, recent studies have suggested that SOC could be strengthened in health promotion activities^{36 37} by using an approach that includes reflection and mindfulness (for additional information regarding the interventions see Kabat-Zinn's work).³⁸

Sometimes people possess sufficient resources to move to a more healthy state³⁹ but are unable to identify and use them, and therefore perceive their health condition as incomprehensible, unmanageable, and unmeaningful. Health professionals can contribute to empowering people to reflect on the available resources and on how to mobilize them to use them successfully.²⁴ They can facilitate people's reflection on difficult situations by looking uncritically at the present, rather than

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5 thinking about possible future problems.^{24 36} These interventions could contribute to increasing
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7 levels of SOC and improving quality of life. However, because of the reciprocal influence between
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9 SOC and resources¹, the interventions at individual level should be combined with interventions to
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11 strengthen external resources. Recent developments on future directions for the concept of
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13 salutogenesis⁴⁰ suggest that interventions should involve communities in identifying life demands
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15 and life opportunity to promote health, making decisions and creating shared visions on desired
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17 change processes. Specific interventions regard re-orienting professional leadership towards citizen
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19 empowerment to better respond to emerging challenges; giving priority to local strategies to
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21 improve community cohesion and enable stakeholders (citizens, professionals, and policy makers)
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23 an effective community action; creating supportive environments for health; develop advocacy
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25 competencies to allow citizens and health professionals to influence political decisions.
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Limitations

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32 This study has a few limitations that should be addressed in future research. Its first
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34 weakness is its small sample size. However, statistical power analysis shows that our sample is
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36 representative of the general population. While we are aware that our sample is not representative of
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38 all chronic pathologies, one future aim of this study is to continue collecting data to obtain more
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40 data on different diseases and look at the transferability of the results.
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44 Second, the data were collected using a quantitative approach. Future studies could
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46 supplement this method by using a qualitative approach including interviews or focus groups to
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48 better understand how people experience the health-illness continuum in their daily lives.
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51 Another limitation is the cross-sectional design used, which did not allow us to draw
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53 conclusions regarding the causal relationships between variables. Future studies should use
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55 prospective designs to examine the long-term connections between SOC and quality of life and
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57 between possible tailoring interventions and SOC levels.
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Finally, further studies would need to examine other possible covariates such as social/family support to analyze if and how it contributes to improving both SOC and quality of life.⁴¹

However, despite these limitations, our findings offer a basis on which to develop future research in the area, and suggest that the salutogenic approach may support mental health-related quality of life among chronic patients.

Conclusion

SOC was more strongly correlated to MCS than PCS and indirectly affected PCS through the mediation of MCS. The findings underscore that SOC is a psychological process that impacts patients' mental health status, which in turn affects physical health. Our study would back the importance of gathering additional evidence on the mediating role of the mental component of quality of life.

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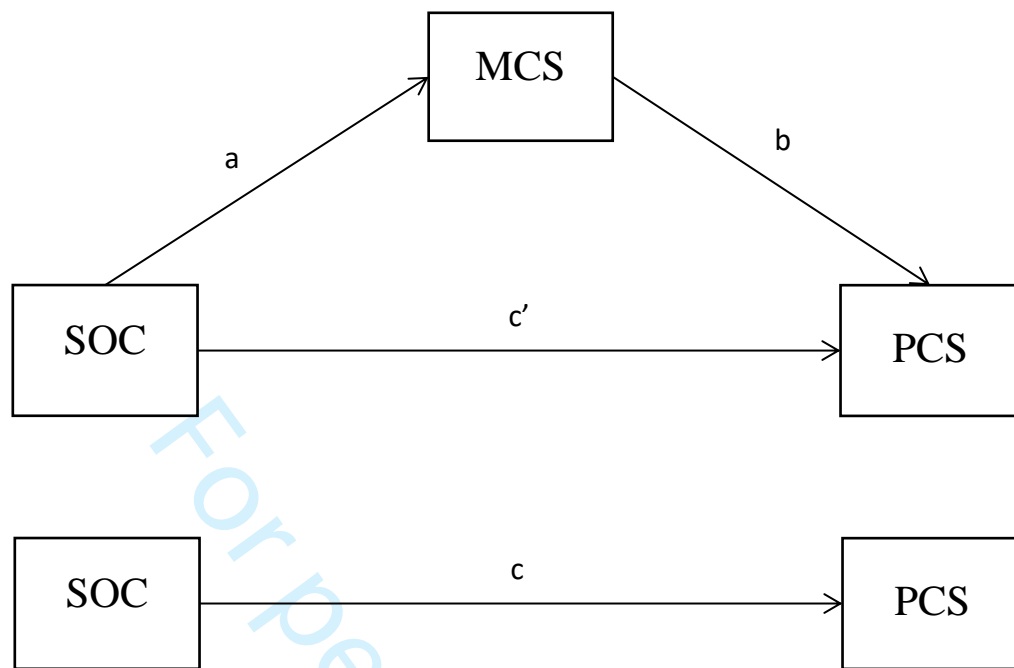
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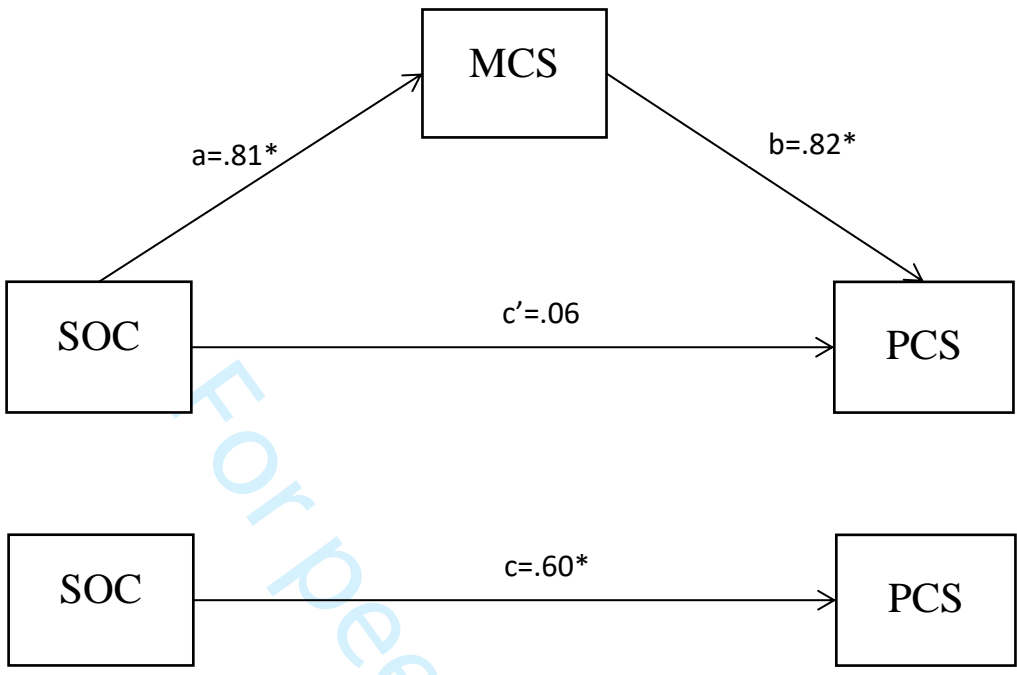
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39 *Figure 1.* Conceptual diagram for mediation analysis. Indirect effect of SOC on PCS through
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41 MCS = ab. Direct effect of SOC on PCS = c'. Total effect of SOC on PCS = c.
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46 *Figure 2.* Statistical diagram for mediation analysis. Indirect effect of SOC on PCS through
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48 MCS (ab) = .66, $p < .001$. * $p < .001$.
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Sense of coherence and physical health-related quality of life in Italian chronic patients: The mediating role of the mental component

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Sense of Coherence and Quality of Life in chronic patients

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Sense of coherence and physical health-related quality of life in Italian chronic patients: The mediating role of the mental component

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Contributorship statement

MG and PC conceived and designed the study, conducted the data analysis, drafted the manuscript, and performed a critical revision of the manuscript; MC drafted the manuscript; AC, GL, VM, MP, FT, GZ, and SD collected data and contributed to drafting and editing the manuscript; PO, EM, EC, and FB contributed to drafting and editing the manuscript. All the authors read and approved the final manuscript.

Abstract

Objective To examine the relationship between sense of coherence (SOC) and physical health-related quality of life in patients with chronic illnesses by focusing on the mediating role of the mental component of quality of life.

Design Cross-sectional survey design.

Setting Secondary care; Three departments of an Italian university hospital.

Methods The participants (N=209) in the study were adult (≥ 18 years) outpatients with a chronic pathology (e.g., diabetes, thyroid disorders, or cancer) at any phase in the care trajectory (e.g., pre-treatment, undergoing treatment, follow-up care). They agreed to participate in the study after providing their informed consent. Data were collected using a structured self-reporting questionnaire. Data analysis was carried out using SPSS, and mediation analysis was performed via PROCESS macro.

Results The SOC score of the study sample was equivalent to that of the general population (mean difference = -2.50, 95%CI = -4.57-.00). Correlation analysis showed that SOC was mainly correlated to the mental component (MCS) ($r = .51, p < .01$) of quality of life and then to the physical component (PCS) ($r = .35, p < .01$). Mediation analysis showed that SOC was directly related to MCS ($p < .001, 95\%CI = .62-.99$) but not to PCS ($p = .42, 95\%CI = -.27-.12$). In turn, MCS was directly related to PCS ($p < .001, 95\%CI = .76-1.01$). The indirect effect of SOC on PCS through MCS was significant ($.71, p < .001, Boot 95\%CI = .54-.91$), thus supporting the mediating role of the mental component of quality of life.

Conclusion The indirect effect suggests that SOC is a marker of quality of life, especially of the mental component. The findings show that SOC is a psychological process that impacts patients' mental health status, which in turn affects physical health. Better knowledge of a person's SOC and how it affects his/her quality of life may help to plan tailoring interventions to strengthen SOC and improve health-related quality of life.

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4 **Keywords:** Chronic patient, Health, Mediating role, Quality of life, Sense of Coherence.

7 **Article summary**

9 **Strengths and limitations of this study**

- 11 • The sample is not representative of all chronic pathologies and future studies should expand
12 data collection to obtain more data from patients' with different diseases and look at the
13 transferability of the results;
- 14 • The study's cross-sectional design does not allow us to draw conclusions regarding the
15 causal relationships between variables. Prospective designs are needed to examine the long-
16 term connections between SOC and quality of life;
- 17 • Sense of coherence may be a marker of mental health-related quality of life, which in turn
18 influences physical quality of life;
- 19 • Better knowledge of a person's sense of coherence and how it affects his/her quality of life
20 may help to better plan tailoring interventions;
- 21 • The efforts of health professionals in health promotion activities could be addressed to
22 strengthen SOC.

39 **Sharing statement**

41 Extra data is available by emailing maura.galletta@gmail.com.

44 **Competing interests**

46 The authors declare that they have no competing interests.

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51 This research received no specific grant from any funding agency in the public, commercial or not-
52 for-profit sectors.

56 **Ethics approval**

57 The study was conducted according to the Helsinki Declaration and approved by the AOUCA
58 Independent Ethics Committee of Southern Sardinia, Italy (Prot. NP/2018/1635).

Introduction

Salutogenesis is a concept focusing on factors that promote health and wellbeing instead of focusing on those that cause disease.¹ The salutogenic approach involves the interaction between the individual, community and environment, in which the resources of individuals and communities are committed to strengthening health and well-being.² The concept relies not only on using resources (e.g., economic, social, healthy lifestyles, self-esteem, experience, knowledge resources, etc.), but also on the ability to identify and (re)use resources in a health-promoting way.

According to Antonovsky, life is a chaos in which individuals constantly have to cope with change. People are exposed to different sources of stress (e.g., family illness, family changes such as divorce, changes in the workplace such as organizational changes or unemployment, etc.) that may lead them away from positive healthy conditions toward negative conditions of illness, and vice versa. This approach goes beyond the traditional dichotomy of health and disease and instead considers them a continuum in people's lives.³ Some individuals manage to achieve good health despite their exposure to stressors. This depends on whether they are able to deal with, overcome, or avoid the tension generated by stressors (e.g., stressful events) effectively by identifying and (re)using resources.⁴ The ability to identify and (re)use resources to effectively cope with stressful events and promote health would positively influence one's own health condition.¹ It can be explained by the sense of coherence concept,^{5,6} which is an underlying resource enabling effective coping strategies that forms the basis of the salutogenic model.

Sense of Coherence Concept

Sense of coherence (SOC) is a dispositional orientation that allows individuals to be more resilient to stressors in daily life, stay well and improve their health. It includes three components: comprehensibility, manageability, and meaningfulness.^{6,7} The sense of comprehensibility refers to the degree to which life events make sense and are understandable for people. An individual who understands what is happening is more able to face difficult situations. The sense of manageability

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is the extent to which people perceive that they have sufficient available (internal and external) resources to satisfy their needs. Having control helps people to live better and healthier. Finally, the sense of meaningfulness represents the source of motivation, namely the extent to which people feel that life has emotional meaning and the problems faced are seen as challenges rather than hindrances. Attributing meaning to events increases people's motivation to make an effort to face life.

Therefore, SOC is an overall orientation that conveys a feeling of trust because stressors are predictable, that resources to face challenges are available, and that the challenges are worth the individual's effort because they have meaning for him/her.^{4 8} However, despite the importance of considering the different components of SOC, Antonovsky^{4 9} strongly highlights the indivisibility of the construct. The literature indicates that SOC is related to an individual's ability to identify and (re)use resources from his/her internal (e.g., cognitive, emotional, and behavioral strategies) or external (e.g., social support, social fairness, relationships, outdoor life, culture) environment to cope with difficulties and maintain good health.^{10 11 12 13} According to Antonovsky,^{4 6} individuals with high SOC perceive stressors as challenges, and thus anticipate events and the resources available to modify their perception of life and move from a condition of illness to one of health. High SOC strengthens resilience and promotes an individual state of well-being.^{1 4}

Salutogenic Approach and Health-related Quality of Life

The literature suggests that the salutogenic model promotes health, improves resilience and fosters positive physical and mental health conditions.^{14 15} Langeland et al.¹⁶ show that SOC predicted life satisfaction in patients with mental health problems. Lindström and Eriksson,⁷ in their systematic review, indicate that SOC is associated with quality of life in different patient populations.

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Health-related quality of life is a multidimensional concept encompassing the physical, mental, and social aspects of an individual's health and his/her relationship to the environment.^{17 18 19}

It focuses on the impact of illness and treatment on quality of life and reflects how people respond to the physical and psychological effects of illness, which can influence life satisfaction.²⁰

Health-related quality of life can be measured by two main components: physical (e.g., physical functioning, role limitations due to physical problems, bodily pain, and general health) and mental (e.g., vitality, social functioning, role limitations due to emotional problems, and mental health). As coping strategies to overcome difficulties and maintain good health involve psychological processes focused on cognitive and behavioral efforts²¹ that require willingness and motivation, it is likely that SOC is more closely linked to the mental than the physical component of quality of life. A recent study has shown that mental health plays a mediating role in the association between physical disease and self-reported health.²² Moreover, other studies show a strong relationship between SOC and the mental component of health-related quality of life in patients with different chronic illness.^{11 23} Nevertheless, it is not clear how SOC affects the physical component. It is likely that resilience entails emotional effort and is directly related to mental quality of life that, in turn, is related to physical quality of life.

As there is still uncertainty regarding the relationship mechanisms between SOC and health,²⁴ this study aims to examine the relationship between SOC and physical health-related quality of life in patients with chronic illness by focusing on the mediating role of the mental component of quality of life.

Methods

Study design

This is a cross-sectional study to investigate the association between SOC and physical health-related quality of life through the mediating role of mental component.

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4 **Setting**

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6 Research was carried out in three departments (e.g., Endocrinology, Diabetology, and
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8 Oncology) of a southern Sardinia university hospital in Italy, after being approved by the health
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10 director of the hospital.
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13 **Patient involvement**

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15 Participants were recruited during the check-up consultation and approached in the waiting
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17 room. The inclusion criteria used in recruitment were: (1) patients had a chronic pathology such as
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19 diabetes, a thyroid disorder, cancer, etc. at any phase in the care trajectory (e.g., pre-treatment,
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21 undergoing treatment, follow-up care); (2) patients were adults (≥ 18 years); (3) patients agreed to
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23 participate in the study after providing informed consent.
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28 Written and oral information on the purpose of the study was provided to each participant.
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30 Participation was voluntary and subject to informed consent for all outpatients agreeing to the
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32 study. Participants were also informed that they could interrupt their participation at any time
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34 without any prejudice.
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37 **Data collection**

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39 Patient data were collected between May and September 2018 using a structured self-
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41 reporting questionnaire. All the patients completed the questionnaire independently, and then
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43 returned it directly to the researchers.
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46 **Instruments**

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48 The questionnaire consisted of two sections. The first regarded patient demographics,
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50 including information such as gender, age, education, employment, type of pathology, time of onset
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52 of illness, medications, and medical history (including surgery and possible complications related to
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54 the disease). The physician completed this part of the questionnaire via patient interviews. The
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56 second part of the questionnaire was self-administered and concerned validated scales regarding the
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study variables (e.g., SOC and health-related quality of life). The first and second parts of the questionnaire were then matched via a coding scheme to guarantee the patients' privacy.

To measure SOC, we used the Italian version of Antonovsky's SOC-13 original scale,⁶ validated by Sardu et al.²⁵ The scale includes 13 items with a 7-point Likert scale.

To measure health-related quality of life, the Short Form-36 Health Survey (SF-36) of Apolone et al.²⁶ was used, based on the original version by Ware and Sherbourne.²⁷ The scale includes a total of 36 items that assess eight health domains: physical functioning (PF; 10 items), role physical (RP; 4 items), bodily pain (BP; 2 items), general health (GH; 5 items), vitality (VT; 4 items), social functioning (SF; 2 items), role emotional (RE; 3 items), and mental health (MH; 5 items). Finally, one single item measures the change in patients' general health status over the past year.

As shown by Schroder et al.²⁸, the eight domains can be combined into two main components: Physical Component Summary (PCS), which includes the PF, RP, BP, and GH domains, and Mental Component Summary (MCS), which includes the VT, SF, RE, and MH domains. In our study, we used this combined measure to assess health-related quality of life and its association with SOC.

Statistical analysis

Data analysis was carried out by using the SPSS (SPSS Inc., Chicago, IL, USA) 20.0 program. Missing value (from 5% to 10%) were randomly distributed throughout the sample [MCAR test: $\chi^2(202) = 218.2, p > .05$] and were treated using the EM algorithm (Expectation-Maximization), as suggested by Schafer and Graham²⁹. The significance of the sample size was calculated using statistical power analysis. Mean values were used to perform analyses. SOC of the study sample was compared to that of the general population to examine if SOC is a stable factor. Descriptive analyses were performed for the study variables and bivariate analysis was conducted using Pearson's correlation. SOC was identified as the independent variable (X), PCS was the

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outcome variable (Y), and MCS was the mediator variable (M). Demographic variables such as gender and age were considered as control variables. Levene's test was computed to examine the homogeneity of variances in the sample subgroups (e.g., for both gender and pathology) for the independent variable. To examine the indirect effect of X on Y through M, mediation analysis was performed via PROCESS macro³⁰ using Model 4 (simple mediation). Mediation analysis allows the relationship between independent (SOC) and the dependent (PCS) variables through a mediating variable (MCS) to be examined. A mediator (or intervening variable) transfers the effect of an independent variable to a dependent variable. The mediator produces variation in the predicted variable and itself is caused by the predictor variable³¹. In our research, we assume that MCS intervenes in the relationship between SOC and PCS. Simple mediation is a conventional model used to explore mediating effect and allows one mediator to be added to the regression model at a time³⁰ (Figure 1). The bootstrapping procedure to measure indirect effect was carried out and confidence intervals (95%) were calculated with 5000 bias-corrected bootstrapped random resamples of the data with replacement.³² Control variables such as age and gender were introduced in the model as covariates.

Results

A minimum total sample size of 209 individuals (general population N=913) was required for a statistical power of 90% at the $p < .05$ level of significance. Thus, a total of 209 (71 males and 138 females) outpatients with three different pathologies were recruited. Patients were affected by diabetes (n = 71 patients, 37 males and 34 females), thyroid disorders (n = 77 patients, 9 males and 68 females), and cancer (n = 61 patients, 25 males and 36 females).

Table 1 shows the mean scores and standard deviations for the SOC measure.

Table 1: *SOC scores for the general population and the study sample.*

Variable	N	SOC score	SD
General population*	913	60.3	13.6

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Study sample	209	62.8	14.5
Males	71	61.7	15.2
Females	138	63.4	14.1
Diabetic patients	71	61.3	14.6
Patients with a thyroid disorder	77	61.8	15.5
Cancer patients	61	65.9	12.8

Note. *From the study by Sardu et al.²⁵

If we compare SOC scores, we can say that the SOC value in the study sample is equivalent to that of the general population²⁵ (mean difference = -2.50, 95% CI = -4.57–.00). Regarding the study sample, the Levene's test for equality of variances shows that the SOC scores are equal for both males and females ($F = .63$, $p = .43$; mean difference = -1.68, 95% CI = -2.50–5.85), as well as for the different pathology subgroups ($F = 2.02$, $p = .13$; mean difference for diabetic and cancer patients = -4.65, 95% CI = -10.72–1.42; mean difference for patients with diabetes and a thyroid disorder = -.50, 95% CI = -6.24–5.24; mean difference for patients with a thyroid disorder and cancer = -4.15, 95% CI = -10.13–1.83). As there is no significant difference in the average SOC scores of the sample subgroups, we considered the sample as a whole.

Table 2 shows mean values, standard deviations, and correlations for all the variables. The results are in line with the theoretical purpose insofar as they show that SOC is mainly correlated to MCS ($r = .51$) and then to PCS ($r = .35$). Moreover, the correlation between MCS and PCS was .74.

Table 2: Means, Standard deviations and Pearson's correlations for the study variables.

Variable	M	SD	SOC	PCS	MCS
SOC	62.8	14.5	1		
PCS	62.2	26.2	.35**	1	
MCS	58.5	22.7	.51**	.74**	1

Note. N = 209. ** $p < .01$ (two-tailed).

As expected, the results from Model 4 indicate that SOC is directly and positively related to MCS ($\beta=.81$, $p<.001$, 95%CI = .62–.99) but not to PCS ($\beta=-.08$, $p=.42$, 95%CI = -.27–.12). In turn, MCS is positively and directly related to PCS ($\beta=.88$, $p<.001$, 95%CI = .76–1.01). Among the control variables, gender and age are not significantly related to both MCS ($\beta=3.63$, $p=.21$, 95%CI = -2.09–9.35; $\beta=-3.05$, $p=.27$, 95%CI = -8.47–2.37) and PCS ($\beta=.56$, $p=.83$, 95%CI = -4.63–5.75; $\beta=.97$, $p=.70$, 95%CI = -3.94–5.88), respectively. The indirect effect of SOC on PCS through MCS is significant (Table 3 and Figure 2). The model explains 55% of the variance in the outcome variable.

Table 3: *Mediation analysis of MCS on SOC-PCS relationship.*

Model	Path coefficient	SE	Bias corrected bootstrap 95% CI	
			Lower limit	Upper limit
SOC on MCS (path a)	.81*	.09	.62	.99
MCS on PCS (path b)	.88*	.06	.76	1.01
Total effect of SOC on PCS (c path)	.63*	.12	.40	.87
Direct effect of SOC on PCS (c' path)	-.08	.10	-.27	.12
Indirect effect of SOC on PCS (path ab)	.71*	.09	.54	.91

Note. N=209. MCS = Mental component summary, SOC = Sense of coherence, PCS = Physical component summary. * $p<.001$

Discussion

The aim of the study was to examine the relationship between SOC and quality of life in patients with a chronic illness and analyze the mediating role of the mental component of quality of life. The sample's descriptive characteristics confirmed that SOC is a stable factor regardless of the person's health status. In fact, the recruited patients with different pathologies had an average SOC score comparable to that of the general population. Furthermore, the results showed that SOC scores were equal for the different pathologies and there did not appear to be any differences in terms of

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gender. According to the literature, SOC tends to be lower in females than males, but usually these differences were very slight, probably due to social factors.^{10 25}

The correlation analysis showed that SOC was more strongly correlated to MCS than PCS and the indirect effect analysis highlighted the mediating role of MCS. In other words, SOC is not directly related to PCS but rather indirectly through the mediation of MCS. In line with the previous studies, these findings support the idea that SOC is a psychological process that is related to patients' mental health status,^{11 23} which is positively associated with their physical health. This indirect effect is the additional value of this study. However, our findings are in line with SOC being a predictor of quality of life and confirm previous research on the association between SOC and health-related quality of life.^{33 34}

As expected, gender was not significantly related to the model outcomes. This means that whether a person is male or female does not contribute to explaining the relationship to both MCS and PCS. Similarly, age was not related to both MCS and PCS. Although previous research showed that both mental and physical health-related quality of life are lower in elderly people³⁵, this result supports our findings by showing that age and gender are not confounders in our study.

Implications for public health and communities

The results of this study can help to address the efforts of health professionals in health promotion activities for people with chronic pathologies. Better knowledge of a person's SOC and how it affects quality of life may help to better plan tailoring interventions. The indirect effect found suggests that SOC is a marker of quality of life, especially of the mental component, which in turn influences the physical component. In this sense, high SOC may strengthen patients' mental health status on the one hand, but on the other hand, low SOC may result in poor outcomes in terms of quality of life.

Previous studies found that SOC is a stable entity in adulthood.^{36 37} Although research showed that SOC may increase with age, reaching its highest levels at older ages¹³, the study

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supports that age is not a confounder in our model, as it was not significantly related to both the MCS and PCS components of quality of life. However, recent studies have suggested that SOC could be strengthened in health promotion activities^{38 39} by using an approach that includes reflection and mindfulness (for additional information regarding the interventions see Kabat-Zinn's work).⁴⁰ Sometimes people possess sufficient resources to move to a more healthy state⁴¹ but are unable to identify and use them, and therefore perceive their health condition as incomprehensible, unmanageable, and unmeaningful. Health professionals can contribute to empowering people to reflect on the available resources and on how to mobilize them to use them successfully.²⁴ They can facilitate people's reflection on difficult situations by looking uncritically at the present, rather than thinking about possible future problems.^{24 38} These interventions could contribute to increasing levels of SOC and improving quality of life. However, because of the reciprocal influence between SOC and resources¹, the interventions at individual level should be combined with interventions to strengthen external resources. Recent developments on future directions for the concept of salutogenesis⁴² suggest that interventions should involve communities in identifying life demands and life opportunity to promote health, making decisions and creating shared visions on desired change processes. Specific interventions regard re-orienting professional leadership towards citizen empowerment to better respond to emerging challenges; giving priority to local strategies to improve community cohesion and enable stakeholders (citizens, professionals, and policy makers) an effective community action; creating supportive environments for health; develop advocacy competencies to allow citizens and health professionals to influence political decisions.

Limitations

This study has a few limitations that should be addressed in future research. Its first weakness is its small sample size. However, statistical power analysis shows that our sample is representative of the general population. While we are aware that our sample is not representative of

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4 all chronic pathologies, one future aim of this study is to continue collecting data to obtain more
5 data on different diseases and look at the transferability of the results.
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9 Second, the data were collected using a quantitative approach. Future studies could
10 supplement this method by using a qualitative approach including interviews or focus groups to
11 better understand how people experience the health-illness continuum in their daily lives.
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15 Another limitation is the cross-sectional design used, which did not allow us to draw
16 conclusions regarding the causal relationships between variables. Future studies should use
17 prospective designs to examine the long-term connections between SOC and quality of life and
18 between possible tailoring interventions and SOC levels.
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25 Finally, further studies would need to examine other possible covariates such as
26 social/family support to analyze if and how it contributes to improving both SOC and quality of
27 life.⁴³
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32 However, despite these limitations, our findings offer a basis on which to develop future
33 research in the area, and suggest that the salutogenic approach may support mental health-related
34 quality of life among chronic patients.
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39 **Conclusion**

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41 SOC was more strongly correlated to MCS than PCS and indirectly affected PCS through
42 the mediation of MCS. The findings underscore that SOC is a psychological process that impacts
43 patients' mental health status, which in turn affects physical health. Our study would back the
44 importance of gathering additional evidence on the mediating role of the mental component of
45 quality of life.
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52 **References**

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Figure 1. Conceptual diagram for mediation analysis. Indirect effect of SOC on PCS through MCS = ab . Direct effect of SOC on PCS = c' . Total effect of SOC on PCS = c .

Figure 2. Statistical diagram for mediation analysis. Indirect effect of SOC on PCS through MCS $(ab) = .71, p < .001$. $*p < .001$.

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