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Website: www.jehp.net
DOI: 10.4103/jehp.jehp_758_20

Relationship between the sense of coherence, self-directed learning readiness, and academic performance in Malaysian undergraduate dental students

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Abstract:

BACKGROUND: Stress and low psychological well-being among students in higher education impact their academic performance. The purpose of this study was to determine the relationship between SOC, SDLR, and academic performance in year 3, 4, and 5 undergraduate dental students.

MATERIALS AND METHODS: Two hundred and ten students completed a validated questionnaire on SOC and SDLR. The percentage of marks obtained by these students in their year-end examination was used as their academic performance. The SOC scores were further divided into three hierarchical clusters using cluster analysis. The data were analyzed to determine the difference in the SDLR scores and academic performance among the three clusters. Furthermore, the relationship between SOC scores, SDLR scores, and academic performance was assessed.

RESULTS: The SDLR scores significantly increased from the low SOC cluster to the high SOC cluster ($P = 0.026$). However, there was no significant change in academic performance. A positive relationship was found between the SOC and the academic performance ($R = +0.025$; $P > 0.05$). The SDLR had a significant positive relationship with both SOC and academic performance ($R = +0.27$; $P < 0.001$).

CONCLUSION: Although SOC may not have a direct influence on academic performance, SDLR can play an intermediary role. Early identification and timely intervention in students with a weak SOC and low SDLR can have a beneficial influence on their academic life.

Keywords:

Academic performance, dental students, Malaysia, self-directed learning, sense of coherence

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Received: 29-06-2020
Accepted: 31-08-2020
Published: 31-03-2021

Introduction

Studying dentistry is a demanding and stressful professional training.^[1] In terms of surgical training, at the end of the 2nd year of the dental undergraduate program, the students have to complete their preclinical simulation of surgical techniques and material manipulation. They then have to demonstrate their competency in it to be introduced to patient care in

year 3. From year 3–5, students undertake surgical training by rendering treatment and managing cases under supervision. This part of the training requires the completion of several cases that satisfy the specific procedural criteria.^[2] Finding these explicit cases at times is difficult for the students. Along with this, the students undertake theoretical learning, problem-based learning (PBL), case-based learning, and study for their internal and university examination; complete a student research project; participate and organize

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How to cite this article: Siddiqui FS, Nerali JT, Telang LA. Relationship between the sense of coherence, self-directed learning readiness, and academic performance in Malaysian undergraduate dental students. *J Edu Health Promot* 2021;10:105.

cocurricular activities; and organize and conduct community dental health programs.^[2] During all of this, they have to deal with patients' expectation and their behavior, interact with their supervisor and their expectations, cope with the parental expectation and their own expectation, and finally, absorb the high and lows of their own personal and social life. Considering all these factors, it would not be untrue to conclude that dental students are under constant psychological stress to perform.

An outlet of this psychological stress is the burnout phenomenon, which includes manifestations of emotional exhaustion, depersonalization, and reduced performance levels.^[3] Fortunately, dropout and failure rates due to burnout are rare in dentistry, but it is very much present, and it can have life-changing consequences for that student.^[4]

Psychological stress is an incongruent interplay between three factors, namely the perception of the person, the elements of the environment, and resources available to deal with elements of the environment. The interplay will decide the fate of the psychological well-being of the person.^[5] For example, an event such as an examination may be perceived as stressful by some students and nonstressful by some.^[6] This perception depends on the availability of resources and elements in their surroundings such as class notes, books, helpful friends, friendly faculty, and mental preparedness for the examination. Not surprisingly, mental health was found to be a prevalent health issue among dental students. Poor mental health was attributed to negative academic consequences.^[7] This could be extrapolated as those with sound mental health can survive through the challenging and stressful circumstances, while those who cannot cope could have a nervous breakdown and dropout of the program. While there is abundant literature on the prevalence of stress among dental students, no study has measured the ability of the students to cope with the stress.^[1]

To measure the stress coping ability in a difficult situation, the model of sense of coherence (SOC) was introduced, which is based on the concept of salutogenesis.^[8] The model measures three things of a person which are (a) comprehensibility which means whether the person understands that the stimuli from his/her internal and external environments are structured and predictable, (b) manageability which means whether the person has sufficient resources to meet the demands of the stimuli, and finally, (c) meaningfulness which means whether the person takes up the challenges and demands as worthy to be engaged with. A strong SOC has been associated with good health and is protective against anxiety, depression, and burnout.^[9]

Academically, in nursing students, it was found that students with low SOC underperformed and the authors of that study recommended the measurement of SOC as a screening tool to identify students who may be at risk of underperformance.^[10]

In higher education, stress can be from learning itself, and it was found that students who engaged in self-regulated learning and perceived the learning task as having value achieved higher levels of academic performance.^[11] Self-directed learning readiness (SDLR) has been reported to be a strong predictor of academic achievement.^[12] To apply self-regulated learning strategies, students should demonstrate readiness toward self-directed learning (SDL) which is an amalgamation of necessary attitudes, abilities, and personality for SDL.^[13] In dental education, this is particularly important because, from the vast pool of information available (print and digital), students have to filter the information they need to meet their learning needs. The SDLR, therefore, is the cornerstone of dental education, and it is no surprise that the practice of SDL is inculcated into the students through PBL in the curriculum.^[12]

While both SOC and self-regulated and motivational learning have been widely investigated in nursing and medical education, there is still a paucity of information in understanding the role of SOC and SDLR with each other and with academic performance in dental students. This knowledge will be beneficial for dental educators in planning the curriculum and initiating an appropriate student support system. Therefore, the objective of this study was to determine the SOC and SDLR of dental students and correlate it with each other and with students' academic performance.

Materials and Methods

Study design and setting

This was a cross-sectional analytical study conducted in a dental college setting. The study was reviewed and approved by the Institutional Review Board (****/IRB/FRP/9/18). The study recruited all the undergraduate dental students enrolled in years 3, 4, and 5 of a private dental college in Malaysia. Those students who consented to participate in the study were asked to complete a structured close-ended questionnaire. Those students who submitted an incomplete form or did not consent to the study or were absent on the day were excluded from the study. The academic performance of the participating students in their year-end professional examination was retrieved from the administration section of the college at the end of the academic year. Confidentiality and anonymity of the participants were maintained using the coding of the questionnaire.

Instruments for data

Data collection tools

The study collected the demographic details of the participants and measured three variables, namely SOC and SDLR and academic .

Sense of coherence

This was measured using Antonovsky's 13-item scale (SOC-13) Orientation to Life Questionnaire.^[8] The response was collected on a 7-point Likert scale. The total SOC score for each participant was obtained by summing the subscores from the 13 items. The score could range from 13 (lowest) to 91 (highest). A higher score meant a strong SOC. Examples of questions were: *Has it happened that people whom you counted on disappointed you?; Do you have the feeling that you're being treated unfairly?; How often do you have feelings that you're not sure you can keep under control?* The questionnaire was obtained for use with kind permission from Dr. Avishai Antonovsky, Israel. The SOC scores were grouped into three clusters by hierarchical cluster analysis using a within-group linkage cluster method, using Euclidean distance to separate the cluster. The three clusters were named low, moderate, and high depending on the mean score of the cluster.

Self-directed learning readiness

Self-efficacy in the management of learning needs and resources was measured using a 29-item SDLR scale proposed for nursing education.^[13] This scale measured self-management, desire for learning, and self-control. The response was collected on a 5-point Likert scale. The total SDLR score for each participant was obtained by summing the subscores, which could range from 29 (lowest) to 145 (highest). A higher score meant good SDLR. Examples of statements were: *I can be trusted to pursue my learning; I am confident in my ability to search out new information; I want to learn new information.*

Academic performance

This was measured by calculating the cumulative percentage of marks obtained by each student in their respective year-end professional examination.

Statistical analysis

All statistical analyses of the data set were done with the statistical package SPSS version 20. The data were analyzed for normality using Kolmogorov–Smirnov and Shapiro–Wilk tests. The values of Cronbach's alpha for the SOC score and SDLR score were calculated to investigate for internal reliability of the questionnaire. One-way ANOVA test was used to compare for group differences in the SOC clusters for SDLR and academic performance. Univariate linear regression analysis was performed between SOC, SDLR, and academic performance to understand the strength and direction of the relationship. Since the data measured psychological

variables, the strength of relationship was kept as (a) weak <0.1, (b) moderate 0.2–0.4, and (c) high >0.4. The confidence limit was set at 5% and the alpha level of <0.05 was set as the threshold for statistical significance.

Results

The response rate of the participants was 94% ($n = 210$). The mean age of the participants was 23.6 (± 1.3) years. Sixty-eight percent of the participants were female ($n = 142$) and 32% were male ($n = 68$). The participants were from three ethnic backgrounds, namely Chinese, $n = 89$, 42%; Malay, $n = 68$, 32%; and Indian, $n = 53$, 25%.

The Kolmogorov–Smirnov and Shapiro–Wilk tests were not significant for SOC score, SDLR score, and academic performance. The data were, therefore, considered to be normally distributed and eligible for parametric testing. The values of Cronbach's alpha for SOC score and SDLR score were 0.76 and 0.85, respectively, which indicated good internal reliability.

Table 1 presents the distribution of SOC and SDLR scores and the academic performance of the study population.

The mean SOC score was 49.5 ± 10.06 (54.4% on a scale of 13–91). Year 3 students had the lowest score, while the year 5 students had the highest. Male students had a higher SOC score. The SOC score was highest among Chinese, followed by Malay and then by Indian students. Although there were differences in scores in all

Table 1: Distribution of students' demographics, sense of coherence score, self-directed learning readiness score, and academic performance ($n=210$)

Group variables	n	Mean \pm SD		Mean \pm SD Academic performance
		SOC score	SDLR score	
Total	210	49.5 \pm 10.06	108.8 \pm 10.29	-
Percentage		54.5	75.0	64.6 \pm 5.5
Year of study				
Year 3	65	48.6 \pm 10.8	108.5 \pm 11.1	65.2 \pm 5.8
Year 4	75	49.9 \pm 8.8	108.0 \pm 10.7	63.8 \pm 5.0
Year 5	70	50.1 \pm 10.6	110.1 \pm 9.0	64.9 \pm 5.7
Significant		0.632	0.424	0.278
Gender				
Male	68	50.7 \pm 9.9	108.2 \pm 10.5	63.6 \pm 5.3
Female	142	49.0 \pm 10.1	109.1 \pm 10.2	65.1 \pm 5.6
Significant		0.237	0.564	0.059
Ethnic background				
Chinese	89	50.5 \pm 9.4	108.7 \pm 9.4	66.1 \pm 5.8
Malay	68	49.7 \pm 10.0	108.4 \pm 11.9	64.3 \pm 4.7
Indian	53	47.8 \pm 11.0	109.6 \pm 09.6	62.6 \pm 5.4
Significant		0.314	0.734	0.001

SD=Standard deviation, SOC=Sense of coherence, SDLR=Self-directed learning readiness

the group variables, these differences were statistically insignificant.

The mean score of SDLR was 108.83 ± 10.29 (75% on a scale of 29–145). The SDLR score of year 3 and year 4 students was very similar, but year 5 students had the highest score. Contrary to the SOC score, female students had a higher SDLR score. SDLR score among Indian students was highest, followed by Chinese and then by Malay students. Again, the differences observed were not statistically significant.

The mean academic performance was 64.6% ($\pm 5.5\%$). Female students had a higher academic performance as compared to male students. Students of Chinese ethnicity had the highest academic performance.

The results of the one-way ANOVA test for the three SOC clusters are reported in Table 2. The highest number of students was in the low SOC cluster. The difference between the mean SOC score between the three clusters was significantly different. The mean SDLR score significantly increased from the low cluster to the high cluster. However, there was no significant change in the academic performance observed among the three clusters.

To further investigate the strength and direction of the relationship between the three variables of SOC, SDLR, and academic performance, univariate regression analysis was performed using Pearson's correlation test.

As presented in Table 3, all three variables showed a positive linear relationship with each other. SOC score and SDLR score had a moderate strength-significant correlation, while SOC and academic performance showed a weak strength-insignificant correlation. SDLR score and the academic performance had a moderate strength-significant positive correlation.

Discussion

Sense of coherence

SOC is a health-promoting resource.^[14] It works on the principle of information processing which is aimed at resolving conflicts within the mind and therefore helps in coping with inevitable stress in life.^[15] A high SOC protects people from stress by the way they perceive life events as challenges, not threats. They believe that life events occur for a reason and that, even if not under their control, they can handle it by a resource at their disposal instead of feeling overwhelmed and helpless.^[16] The SOC develops most effectively during early life and is tested and reinforced during childhood and in early adulthood. The years before the age of 30 are the most important period in the development of SOC.^[17]

Table 2: Cluster analysis of the sense of coherence with self-directed learning readiness score and academic performance (n=210)

Clusters	n (%)	Mean \pm SD		Mean \pm SD
		SOC	SDLR	Academic performance
Low	99 (47)	41.1 \pm 6.0	107.1 \pm 10.3	64.7 \pm 5.6
Moderate	78 (37)	53.8 \pm 2.4	109.4 \pm 11.0	64.5 \pm 5.6
High	33 (16)	65.0 \pm 5.0	112.6 \pm 7.3	64.7 \pm 5.0
Significant		0.000	0.026	0.949

SD=Standard deviation, SOC=Sense of coherence, SDLR=Self-directed learning readiness

Table 3: Univariate linear regression analysis of the three study variables (n=210)

Variables	Pearson coefficient	Significant
SOC score - SDLR score	+0.269	0.000
SOC score - academic performance	+0.025	0.722
SDLR score - academic performance	+0.271	0.000

SOC=Sense of coherence, SDLR=Self-directed learning readiness

The SOC can be improved or can deteriorate with life events impacting the psychological well-being of a person. Students' SOC has often been challenged by stresses arising from academic tasks and demands in university education.^[18] Evidence shows that the level SOC systematically decreases with increasing students' workload.^[19]

The mean score of SOC in our study was 49.5 (± 10.06), and nearly half of the participants (47%, $n = 99$) were in low SOC clusters with a mean score of 41.1 (± 6.0). This was comparatively low as compared to other dental students around the globe. Peker *et al.*, 2012, reported that in a group of Turkish dental students, the mean SOC was 56.89 (± 10.68).^[20] Dental students from Australia/New Zealand and Chile were found to have a mean SOC score of 58.01 (± 11.29) and 55.56 (± 10.67), respectively.^[21] In a study on stress among undergraduate dental students in Malaysia, the prevalence of stress was reported as 100%.^[22] The same study further reported that academic items such as examinations and grading, fear of failing the course, fear of being unable to catch up if falling behind, inadequate time for relaxation, PBL, completing the requirement to sit for the examination, patients arriving late or not showing up for appointments, and needing to find one's patients were the most common stressor. These findings were consistently confirmed by other studies done in Malaysian undergraduate dental students.^[23,24] Apart from academic stressors, the high cost of dental studies, student loans, financial responsibilities, performance pressure, and the need to cope well with the academic environment have also been cited as a stressor for dental students.^[24] Our respondents' low SOC can be explained by the evidence that perceived stress was found to be

negatively associated with the SOC when controlled for sociodemographic and lifestyle-related variables.^[20] It is also reported that nonacademic events such as difficulties with the journey to university, family responsibilities, money, and social distractions could be sources of a stressor for the students as well.^[25] Therefore, the low SOC score for our respondents may be considered as normative value for the study population.

Self-directed learning readiness

Health-care professionals require a high aptitude for learning new knowledge and skills which enables them to cope with the challenging health-care environment.^[26] A self-directed learner is one who appreciates learning and manages it effectively and efficiently. They have a sense of goal to be achieved and persist at achieving them. In dentistry, it is more imperative that students have high SDLR because they are exposed to multiple surgical clinical scenarios under challenging conditions. They must ascertain the relevance of sources of information and critically evaluate them before they put their surgical skills to practice. It is the student's accountability to rely on SDL to understand the clinical situation and read further on it. Recognizing this, the American Dental Education Association Commission on Change and Innovation in Dental Education emphasized the need for inculcating critical thinking and SDL in the educational best practices.^[27] The Faculty of General Dental Practice of the Royal College of Surgeons of England also lists SDL as one of the important learning methods in designing continuing education programs.^[28] Literature shows that SDL attitude was also considered as a factor for predicting academic achievement.^[12]

In the present study, the mean score of SDLR was 108.83 ± 10.29 (75% on a scale of 29–145). The female students and year 5 students showed a higher SDLR score. This was considered to be on a higher side, but information on the SDLR among dental students is practically nonexistent in contrast to the literature on the SDLR scores of medical, nursing, and pharmacy students. A longitudinal study showed that dental students' SDL scores decreased significantly at the end of year 1 and stayed low for the rest of the program.^[29] This trend was similar in medical and pharmacy students.^[30-32] However, a longitudinal study on nursing students enrolled in a PBL curriculum showed an increase in SDL scores, indicating that curriculum delivery strategies may play an important role in promoting SDL.^[33] The present study was a cross-sectional study, and therefore, the results could not be compared with other longitudinal studies.

Importantly, in our study, we found that SDLR was positively correlated to academic performance. This finding strengthens the presumption that locus of

control, self-efficacy, and SDL are significantly correlated with success in higher education.^[34]

Sense of coherence and academic performance

In the present study, we found that academic performance had a very weak nonsignificant but yet positive relationship with SOC, and this result was in agreement with another study on college students.^[35] However, in nursing students, a direct association between SOC and academic achievement was reported.^[10] It is postulated that students with a high SOC are more motivated to learn and use problem-focused coping strategies.^[35,36] There is very limited literature on SOC concerning academic performance among dental students. Our results could be explained by the finding that having high intelligence does not guarantee academic achievement, because learning style can also be a contributing factor.^[37]

Sense of coherence and self-directed learning readiness

Our study found a significant direct relationship between SOC and SDLR. This was in agreement with the study which reported that those with higher SOC are more likely to use adaptive coping skills^[38] and self-regulated learning strategies, thus improving their academic performance.^[39] Self-efficacy together with SOC were found to be predictors of academic success.^[40] SDL has been explicitly stated as an educational philosophy in dental education, and most schools are actively promoting it in their students. One example of SDL is the introduction of PBL in the curriculum. However, PBL can itself be challenging for some and may cause extreme anxiety and frustration.^[41] For Asian dental students, it was suggested that, for those who do not prefer independent learning, a better pedagogical approach needs to be considered to match the instructional design with students' gradual engagement in self-direct learning.^[42]

It would be logical to point out that weak SOC may not directly influence the academic performance but can impact the performance through the intermediary of SDLR. The high SDLR in the present study compensates for the weak SOC, and hence, no difference was found in the academic performance. This study also shows that the SDLR scale for nursing education is a valid tool in dental education as well.

Limitation and suggestions for future research

The limitation of this study is that both SOC and SDLR are self-reported and therefore are affected by recall bias. The predictive analysis was not performed because the objective was to determine the relationship first. Most of the studies use a questionnaire to assess the self-regulated and motivational learning strategies, but we felt that SDLR is the broader concept applicable

to adult education. There can be more psychological variables involved in academic performance such as the concept of grit. This requires further investigation and more research. The findings of our study emphasize the teaching of stress management and personal awareness for dental students. Further investigations are needed to understand the implication of designing and implementing interventional strategies aimed at improving SOC and SDLR and then measuring their effect on academic performance.

Conclusion

This study highlights the relationship between SOC, SDLR, and the academic performance of dental students. A high SOC and SDLR will improve academic performance. This may be marginal for the high achievers, but this is crucial for underachievers. In a highly stressful dental educational environment, early screening and identification of students with a weak SOC and SDLR can help to reduce academic failure, dropouts, and burnout phenomena. Furthermore, the development of strategies that concentrate on an increasing SOC and SDLR would be more objective and measurable as compared to focusing on merely stress management.

SOC and SDLR are lifelong qualities that can be improved under cognizant teaching and learning environment. Not only the academic performance will improve, but also the students can benefit from it throughout his/her lifetime.

Acknowledgment

The authors wish to thank all the students who participated in this study. This study was conducted in accordance with the moral ethical codes and ethical standards of the Institutional Review Board of the Penang International Dental College, Malaysia (PIDC/IRB/FRP/9/18).

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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