Relationship Between Resilience and Self-Rated Health in Dental Hygiene Students and Registered Dental Hygienists

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Abstract: The aim of this study was to investigate whether two aspects of resilience—acquired and innate resilience—were related to self-rated health status in registered dental hygienists and students. In May through July 2017, 405 students at three dental hygiene programs and 85 registered dental hygienists, all in Fukuoka prefecture in Japan, were invited to participate in a survey including three scales: the Bidimensional Resilience Scale (BRS) to assess innate and acquired resilience, the Stress Response Scale-18 (SRS-18) to assess daily stress responses, and the Sense of Coherence 13-item scale (SOC-13) to assess the sense of coherence. Information about self-rated health status and number of years of clinical experience was also collected. Respondents were 398 students (98.2% response rate) and all 85 dental hygienists (100% response rate). The cohort with a self-rated "healthy" status scored higher on total scale and each domain of the BRS, SRS-18, and SOC-13 scales than the cohort with other self-rated health statuses. These three scales and self-rated health status were significantly correlated with each other. When innate resilience increased by one point, average self-rated health was 1.14-fold higher. In contrast, when the depression/anxiety domain score of SRS-18 increased by one point, self-rated health was 0.84-fold lower. The number of years of clinical experience was also negatively correlated with self-rated health. For these participants, innate resilience was a significant predictor of better self-rated health. To maintain the health of dental hygienists and students, it is important to understand their innate resilience as well as stress responses related to depression/anxiety factors and length of clinical experience.

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Resilience is the ability of individuals to bounce back or to cope successfully despite adverse circumstances.[1] The term "resilience" is used to describe the ability to recover easily and quickly from setbacks.[2] For adaptive stress responses to changing environments, resilience is a crucial trait. Ueno and Hirano suggested that the quality of resilience is dependent on the level of individual development.[3] Resilience has been referred to as a personality trait[4,5] and as a dynamic process.[6] Several scales for assessing resilience have been developed, including the Resilience Scale,[7] Connor-Davidson Resilience Scale,[8] Adolescent Resilience Questionnaire,[9] and Resilience Scale for Adults.[10] A common theme in the varied definitions of resilience is strength: people who are described as resilient persist in overcoming obstacles.

Based on findings in psychological research, Cloninger et al. suggested that personality is divisible into temperament and character components.[11] When resilience is considered an aspect of personality, differences in the ability of individuals to cope with stressful situations can be attributed to temperament or to character. In this line of thought, resilience traits are also divided into two aspects: temperament (which people can acquire) and character (which people cannot acquire). The Bidimensional Resilience Scale was developed to measure these two resilience factors: the temperament factor (innate resilience) and the character factor (acquired resilience).[12] Although previous studies have used this new scale for resilience, the BRS has not yet been used in any study of dental hygienists' health.

Antonovsky and Sagy, in their "salutogenic" theory, proposed the sense of coherence as a primary constituent factor of health.[13] The sense of coherence, comprised of three domains (comprehensibility, manageability, and meaningfulness), is a personal capacity related to preservation of physical and mental health and coping with strong mental distress or traumatic experiences.[14] The sense of coherence is related to resilience but is not the same. Eriksson et al. found that resilience and sense of coherence were different concepts, each contributing to good health.[15] Resilience consists of factors that help people to bounce back after negative experiences, whereas sense of coherence consists of factors that facilitate movement toward health.[16] This sense affects the choice of coping strategies against adversity.

As of 2016 in Japan, the number of registered dental hygienists in jobs related to their specialty was 123,831, and the number of dental clinics was 68,940.[17] Because each dental office requires two or three dental hygienists, the shortage of dental hygienists is now a serious problem in the Japanese dental service system. Almost 80% of dental hygienists reported having changed offices more than once, and 30% chose to leave the profession within two years of graduation. The reasons for separation from service included trouble with interpersonal relationships in the workplace (10.5%), which suggests that many dental hygienists experience mental distress.[18] A review by Gorter published in 2005 reported that dental hygienists had a higher risk of burnout than other professions.[19] The causes of work stress are various, including difficult or demanding patients, lack of support by practice management, and doubts about one's own capabilities. The main reasons for leaving the profession prematurely included health issues such as musculoskeletal complaints, lack of career perspective, and monotonous work. Gorter reported that dental hygienists complained of mental exhaustion (15%), physical complaints (18%), chronic headaches (16%), and feelings of anxiety (13%).

A correlation between emotional strain and personal strain was also found in research on the work environment of dental hygienists. For example, neck pain was negatively associated with satisfying a client and positively associated with feeling bad about inflicting pain.[20] Another study reported sources of stress in the workplace including too short scheduled treatment times, too many bookings of patients, non-cooperative patients, noise in the office, and poor salaries.[21] For dental hygiene students in the final year, sources of stress included patients with unclean mouths, late or no-show patients, expectations versus reality in school, and personal health.[22] These findings suggest that dental hygienists and dental hygiene students are exposed to many stressors with which they need to cope. Thus, to reduce the shortage of dental hygienists, it is necessary to comprehensively manage their health from their school days onward.

The aim of this study was to investigate whether two aspects of resilience—acquired and innate resilience—were related to self-rated health status in registered dental hygienists and students. We also assessed daily stress responses and the sense of coherence. The ultimate goal of this work is to contribute to preserving the health of dental hygienists and students.

Methods

This study was conducted with the approval of the Medical Ethics Committee of Kyushu Dental University, Fukuoka, Japan (No. 16-30). Informed consent was considered to have been obtained by agreeing to answer the questionnaires following oral agreement.

A total of 405 students at three dental hygiene programs in Fukuoka prefecture in Japan and 85 registered dental hygienists in the same prefecture were invited to participate in a survey. Two of the schools have three-year dental hygiene programs, and one is at a university and has a four-year program. The dental hygienists were attendees at a seminar hosted by the Fukuoka Dental Hygienists' Association. Questionnaires were mailed to each school and were returned for analysis. We mailed the questionnaire only once. The dental hygienists completed the survey at the seminar site.

Surveys for this cross-sectional study were conducted in May through July 2017. The questionnaires addressed the following demographic variables: gender, grade of a student, years of clinical experience of a registered dental hygienist, and self-rated health. The question addressing self-rated health allowed responses of healthy, passably healthy, neither healthy nor unhealthy, not very healthy, and unhealthy. In this study, self-rated health status was treated as a dichotomous variable categorized by two cohorts: healthy and other.

To assess resilience, we used the Bidimensional Resilience Scale (BRS), which was developed to measure two aspects of resilience: innate resilience and acquired resilience.[12] The BRS consists of 21

questions. Questions 1 to 12 test innate resilience, and questions 13 to 21 test acquired resilience. Each question is posed on a five-point scale, in which higher scores indicate greater resilience. The total possible score ranges from 21 to 105. Daily stress responses were measured using the Stress Response Scale (SRS)-18, which was developed in Japan as a scale to measure stress responses to daily life.[23] The SRS-18 contains 18 items, each using a four-point scale, and is composed of three domains: anxiety/depression, displeasure/anger, and apathy. Higher scores on the SRS-18 indicate greater stress. The total possible score ranges from 18 to 72. The Japanese version of the 13-item short-form Sense of Coherence Scale (SOC-13) was used to measure the sense of coherence.[24] The SOC-13 is a valid, reliable, and cross-culturally applicable instrument that has been widely used in Western and Eastern countries. This scale consists of three components: comprehensibility with five items, manageability with four items, and meaningfulness with four items, which are equally weighted. The items are rated on a five-point scale, with higher scores indicating a stronger sense of coherence. The total possible score ranges from 13 to 65.

Values represent mean±standard deviation or median with upper and lower limits. Good-poor (G-P) analysis was used to assess discriminant validity. Briefly, the participants were divided into tertiles for total score, and the lowest and highest tertiles were compared on each domain using the Mann-Whitney U test. Binominal regression analysis was used to analyze factors correlated with self-rated healthy status, and odds ratios were calculated for good self-rated health. The statistical analyses were performed using SPSS (version 22; SPSS Japan Inc., Tokyo, Japan). We calculated two-tailed p-values in all analyses. The alpha level for significance was set at 0.05.

Results

Respondents were 398 students (98.2% response rate) and all 85 dental hygienists (100% response rate). All participants were female (Table 1). For the registered dental hygienists, years of clinical experience ranged from less than ten to over 30 (mean years of experience: 27.2±9.3). The mean age of the students was 19.6±0.5 years. The healthy cohort was 27.2% of the total (Table 2).

For the BRS, Cronbach's α was 0.806 for innate resilience, 0.704 for acquired resilience, and 0.839 for the total score. The G-P analysis results showed

Table 1. Description of total study participants (N=483)

Variable	Number	Percentage
Gender	483	100%
Women	483	100%
Grade (students)	398	100%
1st	121	30.4%
2nd	122	30.7%
3rd	130	32.7%
4th (university)	25	6.3%
Years of clinical experience (RDH)	85	100%
<10	4	4.7%
10-20	11	12.9%
20-30	32	37.6%
More than 30	31	36.5%

	Mean	SD
BRS	71.6	9.4
Innate resilience	40.1	6.4
Acquired resilience	31.5	4.3
SRS-18	31.1	10.1
Depression/anxiety	10.7	4.0
Irritability/anger	9.5	3.5
Helplessness	10.9	4.0
SOC-13	38.4	7.2
Comprehensibility	15.8	3.5
Manageability	11.9	2.8
Meaningfulness	10.7	2.6

BRS=Bidimensional Resilience Scale; SRS-18=Stress Response Scale-18; SOC-13=Sense of Coherence scale

Table 2. Level of self-rated health state of study participants (N=483)

Level	Number	Percentage
Healthy	132	27.2%
Passably healthy	275	56.6%
Neither healthy nor unhealthy	45	9.3%
Not very healthy	29	6.0%
Unhealthy	2	0.4%

significant differences between the lowest and highest tertiles in all factors and in the total BRS score (p<0.01), verifying good discriminability. For the SRS-18, Cronbach's α was 0.837 for depression/anxiety, 0.835 for irritability/anger, 0.825 for helplessness, and 0.918 for the total score. For the SOC-13, Cronbach's α was 0.766 for comprehensibility, 0.756 for manageability, 0.747 for meaningfulness, and 0.734 for the total score.

Table 3 shows a comparison of scores on the BRS, SRS-18, and SOC-13 and their domains

Table 3. Participants' median of BRS, SRS-18, and SOC-13 by self-rated health status

Scale (Min-Max)	Healthy (N=132)			Other (N=351)			p-value
	Median	Min	Max	Median	Min	Max	
BRS (21-105)	76.5	43	101	71	37	92	<0.01
Innate resilience (12-60)	44	24	60	39	17	55	<0.01
Acquired resilience (9-45)	33	16	44	31	19	43	<0.01
SRS-18 (18-72)	23.5	18	60	31	18	65	<0.01
Depression/anxiety (6-24)	8	6	21	11	6	24	<0.01
Irritability/anger (6-24)	7	6	19	9	6	24	<0.01
Helplessness (6-24)	8	6	23	11	6	24	<0.01
SOC-13 (13-65)	36	17	54	40	20	59	<0.01
Comprehensibility (5-25)	15	5	24	16	4	19	<0.01
Manageability (4-20)	11	4	18	12	4	19	<0.01
Meaningfulness (4-20)	10	4	18	11	5	19	<0.01

BRS=Bidimensional Resilience Scale; SRS-18=Stress Response Scale-18; SOC-13=Sense of Coherence scale

Note: The p-values were determined by Mann-Whitney U test.

between subjects rating themselves as healthy and other. The healthy cohort scored higher than the other cohort for the total score and for each domain of each scale. The correlations between BRS, SRS-18, SOC-13, years of clinical experience, and self-rated health status were analyzed by Pearson's product moment correlation analysis (Table 4). The total BRS score and each domain of the BRS had a negative correlation with the total score and each domain of the SRS-18. In contrast, both the total score and each domain of the BRS were positively correlated with self-rated health status and with the total scale and each domain of the SOC-13. Years of clinical experience were negatively correlated with the depression/anxiety domain of the SRS-18, the manageability domain of the SOC-13, and self-rated health status.

The results of the binominal logistic regression analysis are shown in Table 5. In model 1, entering total scores on the three scales and years of clinical experiences as variables, the BRS score was a positive predictor, and SRS-18 and years of clinical experience were negative predictors of self-rated health status. The SOC-13 score had no significant relation with self-rated health status. In model 2, entering all domains of all three scales as variables, innate resilience was positively correlated, and depression/anxiety was negatively correlated, with self-rated health. The odds ratio for self-rated health as a function of innate resilience was 1.14: when the innate resilience increased by one point, self-rated health became 1.14-fold higher on average. In contrast, when the depression/anxiety score increased by one point, self-rated health became 0.84-fold lower on average. Similarly, when the duration of clinical

experience was prolonged by one year, self-rated health became 0.94-fold lower. No subdomain of the SOC-13 was significantly related to self-rated health.

Table 6 shows the association between self-rated health and innate resilience in these dental hygienists and students, using logistic regression. In the student cohort, innate resilience was 1.14-fold higher on average after adjustment for acquired resilience and subdomain scores for the SRS-18 and SOC-13. In the dental hygienist cohort, innate resilience was 1.24-fold higher on average in a single regression model.

Discussion

The results of the binominal regression analysis indicated that innate resilience was a significant predictor of self-rated health, but not acquired resilience, for these dental hygienists and dental hygiene students. Length of clinical experience and stress related to depression/anxiety had negative correlations with self-rated health.

Although the Pearson correlation analysis indicated a modest correlation, sense of coherence was not a statistically significant predictor of self-rated health in the binominal logistic regression analysis. Previous studies have found an association between a higher sense of coherence and better quality of life[25-27] and health.[28] A recent study reported that the sense of coherence had a strong relation with oral health behaviors, knowledge, and attitudes.[29] Another study reported that the sense of coherence was able to grow through education.[30] These findings sug-

Table 4. Correlation among Bidimensional Resilience Scale (BRS), Stress Response Scale-18 (SRS-18), and Sense of Coherence scale (SOC-13)

Scale	1	1-1	1-2	2	2-1	2-2	2-3	3	3-1	3-2	3-3	4
1 BRS	1											
1-1 Innate resilience	0.920**	1										
1-2 Acquired resilience	0.807**	0.513**	1									
2 SRS-18	-0.365**	-0.388**	-0.216**	1								
2-1 Depression/anxiety	-0.295**	-0.332**	-0.147**	0.902**	1							
2-2 Irritability/anger	-0.248**	-0.243**	-0.179**	0.833**	0.625**	1						
2-3 Helplessness	-0.409**	-0.436**	-0.241**	0.894**	0.733**	0.599**	1					
3 SOC-13	0.364**	0.378**	0.230**	-0.603**	-0.544**	-0.443**	-0.592**	1				
3-1 Comprehensibility	0.230**	0.254**	0.122**	-0.526**	-0.475**	-0.382**	-0.517**	0.880**	1			
3-2 Manageability	0.264**	0.277**	0.162**	-0.500**	-0.435**	-0.409**	-0.469**	0.846**	0.678**	1		
3-3 Meaningfulness	0.413**	0.403**	0.298**	-0.420**	-0.395**	-0.266**	-0.432**	0.664**	0.350**	0.341**	1	
4 Years of clinical experience	0.086	0.078	0.070	-0.070	-0.108*	0.003	-0.071	0.001	0.085	-0.133**	0.001	1
5 Self-rated health	0.308**	0.341**	0.163**	-0.275**	-0.278**	-0.199**	-0.242**	0.224**	0.238**	0.093*	0.058	-0.175**

*p<0.05, **p<0.01

gested that training to enhance the sense of coherence might be a useful strategy for retention of medical staff. Our results, however, were at least partly incompatible with these previous reports. One reason why total and domain scores for the SOC-13 were not significant predictors of self-rated health in the binominal logistic regression analysis might be that the BRS and SRS-18 scores more directly reflected the self-rated health of Japanese women. The results of our study indicated that resilience might be more important to the participants than conceptual factors such as intentions.

In our study, innate resilience, but not acquired resilience, was identified as a positive predictor of self-rated health. In the student cohort, the association between innate resilience and health was significant after adjustment for subdomain scores on the SRS-18 and SOC-13 (Table 5). This finding suggests strategies for managing the health of dental hygienists and students. The BRS was constructed with the "Temperament and Character Inventory" (TCI) scale as an external criterion.[12] The TCI scale, based on a psychobiological model of personality, integrates contributions from behavioral genetics, neurobiology, and psychology in the description of human personality.[11] In the TCI, personality is divided into two dimensions: temperament, which consists of heritable traits, and character, which consists of acquired traits. The temperament domain incorporates four dimensions: novelty seeking, harm avoidance, reward dependence, and persistence.[31] Innate resilience is related to these dimensions, with the exception of novelty seeking.[12] In contrast, the character domain incorporates three dimensions: self-directedness, cooperativeness, and self-transcendence. The acquired resilience related to these dimensions is shaped by environmental and cultural learning. Our results lead us to suggest that it is beneficial for the maintenance of self-rated health status in dental hygienists and students to focus on their heritable traits, such as optimism and sociability. Conversely, we should consider the possibility that qualities such as problem-solving and receptiveness to others are not related to self-rated health status.

Strategies used by nurses to build resilience may help to preserve the health of dental hygienists and students.[32] Among the possible strategies, a qualitative study suggested teaching new graduate nurses about critical reflection and acceptable compromises.[33] Other strategies include grounding connections with family, friends, and colleagues and a well-proportioned work-life balance.[32]

Scale	Model 1 (Total Scale)					Model 2 (Subdomain)				
	B	SE	Wald	p	OR	B	SE	Wald	p	OR
BRS	0.07	0.01	23.87	<0.01	1.07					
Innate resilience						0.13	0.03	26.18	<0.01	1.14
Acquired resilience						-0.01	0.03	0.08	0.78	0.99
SRS-18	-0.05	0.02	8.64	<0.01	0.95					
Depression/anxiety						-0.18	0.06	10.28	<0.01	0.84
Irritability/anger						0.00	0.05	0.01	0.93	1.00
Helplessness						0.05	0.05	1.11	0.29	1.05
SOC-13	-0.04	0.02	3.45	0.06	0.96					
Comprehensibility						0.09	0.05	3.75	0.06	1.10
Manageability						-0.02	0.06	0.10	0.75	0.98
Meaningfulness						0.03	0.06	0.23	0.63	1.03
Years of clinical experience	-0.06	0.01	18.65	<0.01	0.94	-0.07	0.01	19.77	<0.01	0.94
Constant	-3.06	1.37	4.98	0.03	0.05	-3.11	1.51	4.25	0.04	0.04

BRS=Bidimensional Resilience Scale; SRS-18=Stress Response Scale-18; SOC-13=Sense of Coherence scale

Table 6. Association between health states and innate resilience using logistic regression

Group	Health State	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Total	Healthy	1.00 (ref.)	<0.001	1.00 (ref.)	<0.001
	Other	1.15 (1.11, 1.20)		1.14 (1.08, 1.20)	
Students	Healthy	1.00 (ref.)	<0.001	1.00 (ref.)	<0.001
	Other	1.15 (1.11, 1.20)		1.14 (1.08, 1.20)	
RDH	Healthy	1.00 (ref.)	0.017	1.00 (ref.)	0.190
	Other	1.24 (1.04, 1.49)		1.17 (0.93, 1.47)	

RDH=registered dental hygienist

Note: "Adjusted OR" was adjusted by acquired resilience, subdomain of SRS-18 (Depression/Anxiety, Irritability/Anger, and Helplessness), and subdomain of SOC-13 (Comprehensibility, Manageability, and Meaningfulness).

The resilience of the registered dental hygienists in our study had no relation to their number of years of clinical experience (Table 3). Previous studies of the relationship between resilience traits and social demographic features of nurses found that age, experience, education, and years of employment did not contribute to resilience at a statistically significant level.[34,35] Our findings were consistent with these reports. The finding that there was a modest inverse correlation between years of clinical experience and depression/anxiety as assessed by the SRS-18 suggests that clinical experience has a beneficial effect on stress related to depression and anxiety. The manageability domain of the SOC-13 also had a modest inverse correlation with years of clinical experience. In nurses with more years of overall work experience, scores on the SOC-13 tended to be higher.[36] A recent study of the workplace health of dental workers, including dental hygienists, found that the cohort with

10-19 years in dental service had the highest total and meaningfulness scores on the SOC-13, but not the highest manageability scores,[37] suggesting variability between employee characteristics. Antonovsky suggested that the sense of manageability comes into play when an individual perceives the environment as being under control.[14] A person with a strong sense of manageability is convinced that difficulties are solvable.[38] Although differences exist as a function of workplace, profession, education, and ethnicity, this type of conviction might not be dependent on years of clinical experience.

In addition, years of clinical experience had an inverse correlation with self-rated health in our study. The relationship between years of clinical experience and health is controversial. A study of the mental health of medical doctors and nurses, as assessed by the General Health Questionnaire-30, found that professional experience in excess of five years was

a significant predictor of an increased risk of lower mental well-being.[39] In contrast, another study found that fewer years of clinical experience predicted psychological ill health.[40] Nurses who had clinical experience in excess of 20 years showed good self-perceived mental health and felt less distress.[41,42] It is not clear whether the inverse relation between self-rated mental health and years of clinical experience found in our study was attributable to the number of years spent working as a dental hygienist or to aging.

This study had several limitations. The first is the generation gap between the registered dental hygienist cohort and the student cohort. The difference in mean age was 27.2 years. Second is the locality in which participants lived. Antonovsky argued that sociocultural background factors such as ethnic group, gender, location, and economic status would affect the strength of sense of coherence.[43] In line with this argument, both innate and acquired resilience might also be influenced by locality. A future inter- or intranational analysis of the effects on resilience of ethic or local factors is necessary. Third is the scale used to measure the sense of coherence in this study. Several scales have been created to measure the sense of coherence, including the SOC-13 and SOC-29, and they have versions with three-, five-, or seven-point scales. In our study, we used the five-point version of the SOC-13. If we had used a different SOC scale, it is possible that the relation between self-rated health and sense of coherence might have been statistically significant.

The results of this study imply that innate resilience is more important than acquired resilience for preserving the self-rated health of dental hygienists and students. This evidence suggests that the most useful approach would be to provide extra support in dental offices or classes to people who have low innate resilience.

Conclusion

This study found that strength of innate resilience was significantly related with the self-rated health status in these dental hygienists and students. In addition, years of clinical experience and daily stress response-related depression/anxiety had inverse correlations with self-rated health. In our results, the dental hygienists and students who had the highest levels of acquired resilience, including factors such as sociability and the ability to solve problems, did not necessarily see themselves as the

healthiest. It is necessary for health maintenance to assess both the daily stress and the innate resilience in dental hygienists and students, preventing burnout and premature departure from their jobs.

Disclosure

The authors reported no conflicts of interests.

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