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The association between resilience and academic performance among nursing students: a cross-sectional study in Japan

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Abstract

Objective: Medical science students, especially nursing students, are more likely to experience academic stress; therefore, resilience helps them focus on their lessons attentively. However, the results of a few existing studies regarding how resilience impacts the academic performance of medical science students are incongruent. This study aimed to investigate whether resilience impacts the academic performance of Japanese nursing students.

Methods: We conducted a cross-sectional, self-administered questionnaire survey from September to November 2020. A total of 229 undergraduate nursing students participated in this study; here, resilience was measured using the Bidimensional Resilience Scale, which includes innate factors (optimism, control, sociability, and vitality) and acquired factors (problem-solving, self-understanding, and understanding others). Academic performance was measured using the functional grade point average (f-GPA). Covariates were demographics, pre-entry academic performance levels, medical history, time spent walking, psychological distress, subjective economic status, and part-time jobs. Multivariate regression analyses were performed.

Results: Among the 229 participants, the f-GPA mean (standard deviation) was 2.93 (0.46). Only vitality was significantly associated with a higher f-GPA after multiple imputations (β = 0.06; 95% confidence interval = 0.03–0.09; $P<0.01$). The Poisson regression analysis of 212 participants with all data indicated that vitality was associated with the fourth quartile f-GPA (prevalence ratio, 1.05; 95% confidence interval, 1.03–1.08; $P<0.01$).

Conclusion: There was a significant association between the vitality of resilience components and academic performance among Japanese nursing students. This study suggests that an approach that develops resilience is necessary for the academic success of nursing students.

Key words: academic performance, cross-sectional study, Japan, nursing student, resilience

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Introduction

The academic performance of university or college students is efficiently measured using grade point average (GPA), which also evaluates their academic goals and educational quality. In Japan, the number of universities (n=795) and the percentage of students who attend university (54.4%) are increasing each year[1, 2]. Universities or colleges that include nursing faculties account for one-third of all the universities and colleges in Japan[3]. Therefore, the academic performance of nursing students and the quality of education in nursing colleges should be constantly improved.

Many studies have reported related factors, such as lifestyle (e.g., physical activity, sleep, eating habits, and part-time jobs), which impact the academic performance of university students[4–10]. Additionally, previous studies have focused on psychological factors such as self-efficacy, personality, psychological distress, learning, and motivation strategies[11–16]. Medical science students, including nursing students, must learn and retain a massive amount of information, thereby experiencing higher levels of aca-

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demic stress[12, 17]. Therefore, they must possess resilience to achieve their required or desired academic goals[17].

Resilience is defined as the ability of an individual to bounce back or recover from stress[18]. Although several studies have examined the association between resilience and academic performance among medical science students, the results were inconsistent[19–22]. For example, Beauvais *et al.*[19] reported that the association between resilience and academic performance was not observed in undergraduate nursing students but was observed in graduate nursing students. Conversely, Montas *et al.*[22] reported that dental students with high resilience or high grit achieved higher GPAs. The differences in results may stem from the characteristics of each department of a university, country, culture, or educational system. Furthermore, the components and concepts of resilience are not uniform[23], and previous studies have not focused on the components of resilience associated with academic performance. Hirano *et al.*[24] have developed the Bidimensional Resilience Scale (BRS), which provides a more multifaceted view of resilience and includes innate factors (optimism, control, sociability, and vitality) and acquired factors (problem-solving, self-understanding, and understanding others). Therefore, it is necessary to confirm which components of resilience are related to academic performance using a scale such as the BRS.

To the best of our knowledge, however, no study has examined which components of resilience are associated with academic performance among nursing students in Japan. The present study aimed to investigate the components of resilience associated with academic performance among Japanese nursing students using the BRS.

Materials and Methods

Study design and participants

We conducted a cross-sectional, web-based, self-administered questionnaire survey at a nursing college in Akita, northern Japan. We conducted the survey anonymously from September 25 to November 30, 2020. We distributed a web-based self-administered questionnaire to all undergraduate students (n=430), and a total of 293 students (68.1%) responded to the questionnaire. We excluded 61 students from the fourth year, as their academic performance was assessed differently than that of the first-to-third-year students. We also excluded three students who had no academic performance data. Thus, 229 students, who were in first to third year, were included in the analyses.

We obtained and used information from the anonymous self-administered questionnaires after obtaining written consent from participants. This study was reviewed and approved by the Ethics Committee of the Japanese Red Cross Akita College of Nursing (approval number: 2020-113).

Exposure: resilience

In this study, resilience was the independent variable, which was measured using the BRS[23–25]. Previous studies have confirmed the validity and reliability of the BRS[24, 26, 27]. The BRS comprises 21 items in two dimensions: innate and acquired resilience factors. Innate factors include optimism, control, sociability, and vitality; acquired factors include problem-solving, self-understanding, and understanding others. Each of the seven factors was assessed using three questions with five response levels, ranging from 1 (strongly disagree) to 5 (strongly agree). Thus, the score of each of the seven factors ranged from 3 to 15, with higher scores indicating a greater impact for each factor. Only one participant had missing values for this variable.

Outcome: academic performance

Academic performance was the dependent variable, which was measured using a functional grade point average (f-GPA)[28], calculated using the raw score (0–100), grade point (GP), and credits, where GP = (raw score-55) / 10. The f-GPA is calculated as Σ (GP × credit) / Σ credit and ranges from 0 to 4.5 (continuous variable). For the fourth-year students (n=61), academic performance was measured using GPA, which is different from f-GPA and calculated by a method using letter grades that correspond to raw score ranges[5, 28]. Therefore, we excluded them from the statistical analysis. We used the cumulative f-GPA until the presemester (until August 2020). The f-GPA was calculated by the college staff, and the participants were informed of their f-GPAs immediately prior to the survey. They self-reported their f-GPA levels during the survey.

The primary outcome reflected the f-GPA as a continuous variable. As the secondary outcome, we used a dichotomous variable of the f-GPA using a cut-off point in the fourth quartile.

Measurements

The web-based questionnaire requested the following information from each participant: year at the college, sex, high school, medical history (presence or absence), height, body weight, subjective health (good, somewhat good, normal, not good, or bad), frequency of having breakfast (every day, sometimes, or never), smoking status (current, past, or non-smoker/underage), frequency of drinking (every day, sometimes, or none/underage), time spent walking (< 0.5, 0.5-1, or ≥ 1 h/day), psychological distress (severe, moderate, or low), insomnia (presence or absence), subjective economic status (affluent, normal, or severe), commute time (< 0.5, 0.5–1 or ≥ 1 h/one way), part-time jobs (not working, 1–10 or ≥ 1 h/week), and sense of fulfillment in college life (fulfilling or not fulfilling).

We classified participants into tertiles using an adjusted standard deviation score of high school they graduated (pre-

entry academic performance levels): higher, middle, or lower group. Body mass index (BMI) was calculated as body weight in kilograms, divided by height in meters squared and classified into three groups (< 18.5, 18.5–24.9, or ≥ 25.0 kg/m^2). Psychological distress was measured using the Kessler Psychological Distress Scale (K6)[29]. The Japanese version of the K6 has been validated previously[30]. Total scores of the K6 ranged from 0 to 24, with a higher score indicating severe psychological distress. In accordance with previous studies, we classified participants into three groups using cut-off points of 4/5 and 12/13: low (0–4 points), moderate (5–12 points), and severe (13–24 points)[31, 32]. Insomnia was measured using the Athens Insomnia Scale (AIS)[33, 34], and its total point scores ranged from 0 to 24. We classified participants with scores of ≥ 6 as having insomnia and those with scores of ≤5 as not having insomnia[33].

We included, sex, year at the college, pre-entry academic performance levels, medical history, time spent walking, psychological distress, subjective economic status, and part-time jobs as covariates in the statistical analyses.

Statistical analysis

For baseline characteristics, we evaluated the proportion of each measurement, median (interquartile range) of each BRS score, and mean (standard deviation; SD) of f-GPAs of all participants, according to their year at the college. The f-GPA was normally distributed (Shapiro–Wilk test, P=0.114).

We conducted a multivariate regression analysis to estimate the non-standardized coefficients (βs) and 95% confidence intervals (CIs). First, we analyzed the responses of participants who responded to all questions (n=212). Subsequently, we conducted a sensitivity analysis, including participants who had missed some of the items on the BRS or covariates (n=229). Multiple imputations were conducted for missing values of the BRS and covariates to create 10 output datasets. In these imputations, we used the scores of the BRS, covariates, BMI, subjective health, frequency of having breakfast, smoking status, frequency of drinking, insomnia, commute time, and sense of fulfillment in college life as predictor variables. Multivariate regression models were applied to the imputed data to recalculate the pooled β and 95% CI for f-GPA. No multicollinearity was observed in any model in the regression analysis (VIF <5). We also conducted a Poisson regression analysis with a robust error variance to estimate the prevalence ratios (PRs) and 95% CIs for examining the association between the BRS and the fourth quartile f-GPA[35, 36]. The following two models were used to analyze the association between resilience and academic performance. Model 1 was adjusted for year at college and sex. Model 2 was adjusted for all potential confounding factors, including year at college, sex, pre-entry academic performance levels, medical history, time spent walking, psychological distress, subjective economic status, and part-time jobs.

All statistical analyses were performed using IBM SPSS Statistics version 25 (IBM SPSS Software Group, Chicago, IL, USA). All statistical tests were two-sided, and differences were accepted as significant at P<0.05.

Results

Table 1 shows the characteristics of all participants, including those who were stratified by their college year. The proportion of women was 93.0% (n=213), and the number of participants in each year for first, second, and third years was 88 (38.4%), 84 (36.7%), and 57 (24.9%), respectively. The number of participants with severe and moderate psychological distress was 25 (10.9%) and 101 (44.1%), respectively. There was no difference in BRS scores between the different years in college. The mean (SD) f-GPA among all participants was 2.93 (0.46). Compared to the first (mean, 3.03; SD, 0.46) and third years (mean, 3.00; SD, 0.40) in college, the mean f-GPA among the second-year students was lower (mean, 2.77; SD, 0.45).

Table 2 shows the association between resilience and academic performance using multivariate regression analysis. In Model 1, after adjusting for year at college and sex, there was a significant positive association between the vitality of innate factors and f-GPA (β = 0.06; 95% CI, 0.03–0.09; P<0.01). In Model 2, after adjusting for full covariates, there was a significant positive association between the vitality of innate factors and f-GPA (β = 0.06; 95% CI, 0.03–0.09; P<0.01).

Table 3 shows the results of the multivariate regression analysis after multiple imputations. The results, even after multiple imputations, remained unchanged. In Model 1, after adjusting for year at college and sex, there was a significant positive association between the vitality of innate factors and f-GPA (β = 0.06; 95% CI, 0.05–0.08; P<0.01). In Model 2, after adjusting for full covariates, there was a significant positive association between the vitality of innate factors and f-GPA (β = 0.06; 95% CI, 0.03–0.09; P<0.01).

Table 4 shows the results from the Poisson regression analysis as a sensitivity analysis; the association between each score of the BRS and the fourth quartile f-GPA. The fourth quartile f-GPA was 3.25, and the number of participants who scored ≥ 3.25 and < 3.25 were 61 (26.6%) and 168 (73.4%), respectively. In Model 1, after adjusting for year at college and sex, the vitality of innate factors was significantly associated with a higher f-GPA (PR = 1.05; 95% CI, 1.03–1.07; P<0.01). Model 2, after adjusting for full covariates, also showed that the vitality of innate factors was significantly associated with a higher f-GPA (PR = 1.05; 95% CI, 1.03–1.08; P<0.01).

Table 1. Characteristics of the study participants (n=229)

	Year at the college			
	All (n=229)	First (n=88)	Second (n=84)	Third (n=57)
Sex (%)				
Male	16 (7.0)	6 (6.8)	7 (8.3)	3 (5.3)
Female	213 (93.0)	82 (93.2)	77 (91.7)	54 (94.7)
Pre-entry academic performance levels (%)				
Higher	85 (37.1)	30 (34.1)	28 (33.3)	27 (47.4)
Middle	70 (30.6)	27 (30.7)	32 (38.1)	11 (19.3)
Lower	64 (27.9)	28 (31.8)	19 (22.6)	17 (29.8)
Missing	10 (4.4)	3 (3.4)	5 (6.0)	2 (3.5)
Past medical history (%)				
Presence	23 (10.0)	5 (5.7)	12 (14.3)	6 (10.5)
Absence	204 (89.1)	82 (93.2)	71 (84.5)	51 (89.5)
Missing	2 (0.9)	1 (1.1)	1 (1.2)	0 (0.0)
BMI (kg/m^2) (%)				
≤18.4	41 (17.9)	11 (12.5)	19 (22.6)	11 (19.3)
18.5–24.9	175 (76.4)	74 (84.1)	61 (72.6)	40 (70.2)
≥25.0	12 (5.2)	3 (3.4)	4 (4.8)	5 (8.8)
Missing	1 (0.4)	0 (0.0)	0 (0.0)	1 (1.8)
Subjective health (%)				
Good	86 (37.6)	38 (43.2)	33 (39.3)	15 (26.3)
Somewhat good	64 (27.9)	25 (28.4)	26 (31.0)	13 (22.8)
Normal	65 (28.4)	21 (23.9)	22 (26.2)	22 (38.6)
Not good	12 (5.2)	3 (3.4)	3 (3.6)	6 (10.5)
Bad	2 (0.9)	1 (1.1)	0 (0.0)	1 (1.8)
Frequency of having a breakfast (%)				
Everyday	176 (76.9)	69 (78.4)	65 (77.4)	42 (73.7)
Sometimes	46 (20.1)	18 (20.5)	16 (19.0)	12 (21.1)
None	7 (3.1)	1 (1.1)	3 (3.6)	3 (5.3)
Smoking status (%)				
Current smoker	8 (3.5)	0 (0.0)	6 (7.1)	2 (3.5)
Past smoker	4 (1.7)	1 (1.1)	1 (1.2)	2 (3.5)
Non-smoker	217 (94.8)	87 (98.9)	77 (91.7)	53 (93.0)
Frequency of drinking (%)				
Everyday	4 (1.7)	1 (1.1)	2 (2.4)	1 (1.8)
Sometimes	97 (42.4)	3 (3.4)	51 (60.7)	43 (75.4)
None	128 (55.9)	84 (95.5)	31 (36.9)	13 (22.8)
Time spent walking (%)				
≥1 h/day	38 (16.6)	13 (14.8)	17 (20.2)	8 (14.0)
0.5–1 h/day	108 (47.2)	48 (54.5)	40 (47.6)	20 (35.1)
<0.5 h/day	83 (36.2)	27 (30.7)	27 (32.1)	29 (50.9)
Psychological distress (%)				
Severe	25 (10.9)	7 (8.0)	10 (11.9)	8 (14.0)
Moderate	101 (44.1)	45 (51.1)	37 (44.0)	19 (33.3)
Low	99 (43.2)	33 (37.5)	37 (44.0)	29 (50.9)
Missing	4 (1.7)	3 (3.4)	0 (0.0)	1 (1.8)
Insomnia (%)				
Presence	84 (36.7)	31 (35.2)	25 (29.8)	28 (49.1)
Absence	144 (62.9)	56 (63.6)	59 (70.2)	29 (50.9)
Missing	1 (0.4)	1 (1.1)	0 (0.0)	0 (0.0)
Subjective economic status (%)				
Affluent	26 (11.4)	8 (9.1)	12 (14.3)	6 (10.5)
Normal	109 (47.6)	40 (45.5)	44 (52.4)	25 (43.9)
Severe	94 (41.0)	40 (45.5)	28 (33.3)	26 (45.6)
Commute time (%)				
≥1 h/one way	34 (14.8)	17 (19.3)	13 (15.5)	4 (7.0)
0.5–1 h/one way	52 (22.7)	21 (23.9)	17 (20.2)	14 (24.6)
<0.5 h/one way	143 (62.4)	50 (56.8)	54 (64.3)	39 (68.4)
Part-time job (%)				
Not working	77 (33.6)	45 (51.1)	19 (22.6)	13 (22.8)
1–10 h/week	77 (33.6)	28 (31.8)	29 (34.5)	20 (35.1)
≥11 h/week	75 (32.8)	15 (17.0)	36 (42.9)	24 (42.1)
A sense of fulfillment in the college life (%)				
Fulfilling	189 (82.5)	77 (87.5)	65 (77.4)	47 (82.5)
Not fulfilling	40 (17.5)	11 (12.5)	19 (22.6)	10 (17.5)
BRS, median (interquartile range)				
Innate factors				
Optimism	12 (10.00–12.50)	12 (10.00–12.75)	12 (10.00–13.00)	12 (10.00–12.00)
Control	10 (9.00–12.00)	11 (9.00–12.00)	10 (9.00–12.00)	10 (7.00–12.00)
Sociability	10 (7.00–12.00)	10 (8.00-12.00)	10 (7.00-12.00)	9 (7.00-11.50)
Vitality	12 (10.00–13.00)	12 (10.00–13.00)	12 (10.00–13.00)	11 (9.00–12.00)
Acquired factors				
Problem-solving	11 (9.00–12.00)	11 (10.00–12.00)	11 (9.00–12.00)	10 (9.00–12.00)
Self-understanding	10 (9.00–12.00)	10 (9.00–12.00)	10 (9.00–12.00)	11 (9.00–12.00)
Understanding others	12 (11.00–13.00)	12 (11.00–13.00)	12 (11.00–13.00)	12 (11.00–13.00)
f-GPA, mean (SD)	2.93 (0.46)	3.03 (0.46)	2.77 (0.45)	3.00 (0.40)

BMI: body mass index; BRS: bidimensional resilience scale; f-GPA: functional grade point average; SD: standard deviation.

Table 2. Multivariate regression analysis: association between resilience and academic performance[†] (n=212)

BRS	Model 1[‡]				Model 2[§]			
	β	95% CI		*P*	β	95% CI		*P*
Innate factors								
Optimism	0.00	−0.04	0.03	0.89	0.00	−0.03	0.03	0.96
Control	−0.03	−0.07	0.01	0.10	−0.03	−0.06	0.01	0.14
Sociability	−0.02	−0.04	0.01	0.22	−0.01	−0.04	0.01	0.36
Vitality	0.06	0.03	0.09	<0.01	0.06	0.03	0.09	<0.01
Acquired factors								
Problem-solving	−0.01	−0.04	0.03	0.83	−0.01	−0.04	0.03	0.77
Self-understanding	0.00	−0.03	0.04	0.60	0.01	−0.03	0.03	0.52
Understanding others	−0.01	−0.05	0.03	0.58	−0.02	−0.05	0.03	0.48

BRS: bidimensional resilience scale; CI: confidence interval. [†]Academic performance was measured by the functional grade point average. [‡]Model 1: Year at the college and sex were adjusted. [§]Model 2: Model 1 + pre-entry academic performance levels, medical history, time spent walking, psychological distress, subjective economic status, and part-time jobs.

Table 3. Multivariate regression analysis after multiple imputation: association between resilience and academic performance[†] (n=229)

BRS	Model 1[‡]				Model 2[§]			
	β	95% CI		*P*	β	95% CI		*P*
Innate factors								
Optimism	0.00	−0.03	0.04	0.86	0.00	−0.03	0.04	0.77
Control	−0.03	−0.06	0.00	0.07	−0.03	−0.06	0.01	0.11
Sociability	−0.02	−0.05	0.00	0.11	−0.02	−0.04	0.01	0.20
Vitality	0.06	0.05	0.08	< 0.01	0.06	0.03	0.09	< 0.01
Acquired factors								
Problem-solving	−0.01	−0.04	0.02	0.63	−0.01	−0.04	0.02	0.55
Self-understanding	0.00	−0.03	0.03	0.86	0.00	−0.03	0.03	0.93
Understanding others	−0.01	−0.05	0.03	0.77	−0.01	−0.04	0.03	0.79

BRS: bidimensional resilience scale; CI: confidence interval. [†]Academic performance was measured by the functional grade point average. [‡]Model 1: Year at the college and sex were adjusted. [§]Model 2: Model 1 + pre-entry academic performance levels, medical history, time spent walking, psychological distress, subjective economic status, and part-time jobs.

Table 4. Poisson regression analysis: association between resilience and the first quartile f-GPA (n=212)

BRS	Model 1[†]				Model 2[‡]			
	PR	95% CI		*P*	PR	95% CI		*P*
Innate factors								
Optimism	0.99	0.96	1.01	0.39	0.99	0.97	1.01	0.38
Control	0.99	0.97	1.02	0.50	0.99	0.96	1.02	0.45
Sociability	0.99	0.97	1.01	0.33	1.00	0.98	1.01	0.61
Vitality	1.05	1.03	1.07	<0.01	1.05	1.03	1.08	<0.01
Acquired factors								
Problem-solving	1.00	0.97	1.02	0.72	0.99	0.97	1.02	0.57
Self-understanding	1.00	0.97	1.02	0.84	1.00	0.97	1.03	0.93
Understanding others	1.00	0.96	1.03	0.80	1.00	0.96	1.03	0.87

BRS: bidimensional resilience scale; CI: confidence interval; f-GPA: functional grade point average; PR: prevalence ratio. [†]Model 1: Year at the college and sex were adjusted. [‡]Model 2: Model 1 + pre-entry academic performance levels, medical history, time spent walking, psychological distress, subjective economic status, and part-time jobs.

Discussion

This cross-sectional study is the first in Japan to investigate and report on the association between resilience and academic performance among Japanese nursing students. It was found that Japanese nursing students with high vitality of resilience components had higher f-GPAs.

This result is consistent with an earlier study in the United States, which examined the relationship of grit and resilience with academic success, such as GPA, among dental students[22]. It reported that high grit and resilience were associated with a higher level of academic performance. Conversely, the present results are inconsistent with earlier studies on medical or nursing students[19–21]. Burgis-Kasthala *et al.*[20] have suggested the need to interrogate definitions and conceptualize resilience in terms of their relationship with self-efficacy and social capital. Conceptualization issues in which different components are covered by each resilience scale may have led to discrepancies in the research results. Beauvais *et al.*[19] found an association between resilience and academic performance among undergraduate nursing students in New England. It is known that the resilience level of students varies across countries in terms of nursing[17], and the curriculum of nursing schools varies between countries[37]. Therefore, these findings suggest that the impact of resilience on academic performance may vary among countries and cultures.

In this study, among the components of resilience, only the vitality of innate factors was significantly associated with academic performance. Vitality consists of the following items: "I can follow my decisions through until the end", "I value hard work", and "I think I am a persistent person"[24, 25]. These items are similar to the items of grit, defined as perseverance and passion toward long-term goals[38]. Montas *et al.*[21] reported that the impact of grit on GPA was larger than that of resilience. Further, Terry and Peck[39] reported that grit was a significant predictor of clinical and academic performance. These results support our findings. In previous studies, motivation and self-regulated strategies predicted academic performance[12, 16]. Although these strategies may be directing factors for students' activities to achieve academic goals, investigations revealed that grit makes people persevere and direct their focus even in the face of adversity[39]. Therefore, it may be important to not only promote students' levels of motivation but also develop their resilience factors, such as vitality and grit, for their academic success.

This study has some strengths. We used the resilience scale, the BRS, which confirmed its validity and reliability, and encompassed multiple components of resilience. Further, we used an objective rather than a subjective variable, f-GPA, as our outcome variable. We also included many potential confounders, such as pre-entry academic performance levels, psychological distress, subjective economic status, and part-time jobs, in the analyses.

This study, however, also has some limitations. First, we conducted the cross-sectional study in only a single site, and the sample size was relatively small. Although this is the first study to examine the association between resilience and academic performance among Japanese nursing students, our results are not fully representative of Japan. Second, the f-GPA as an outcome measurement was based on self-reports. Hence, there is a possibility of its misclassification. However, participants were informed of their f-GPAs immediately prior to the survey and could confirm their scores anytime and anywhere on the web. Third, this survey was conducted from September to November 2020, which was after the beginning of the COVID-19 pandemic. Although the infection rate of COVID-19 in Japan, especially in the study area, was low, participants were forced to attend online classes for several months before the survey. Therefore, their psychological stress levels may have deteriorated than that of before the beginning of the COVID-19 pandemic. In our study, the prevalence of severe psychological distress was 10.9%, and that of moderate psychological distress was 44.1%, which was higher than that of the Japanese nationally representative survey in 2019 (severe psychological distress, 6.2%; moderate psychological distress, 24.4% among adults aged 20–24 years old)[40]. However, our results remained unchanged even after adjusting for psychological distress. Lastly, because this study used a cross-sectional design, we did not include data on when the participants enrolled in college. Further studies with a cohort design are required.

Conclusion

This cross-sectional study showed that, in Japan, high resilience and vitality in nursing students were associated with higher f-GPAs. It suggests that an approach that develops resilience is necessary for academic success among nursing students.

Author contributions: Fumiya Tanji: Conceptualization, writing the original draft, data collection, data analysis, writing-review, and making critical revisions for important intellectual content. Hirohito Nanbu: Conceptualization, data collection, and writing-review. Mayuko Ono: Data collection and writing-review. Noriko Abe: Data collection and writing-review. Junko Nitta: Data collection and writing-review. All authors critically reviewed and approved the final manuscript.

Conflict of interest: The authors declare that they have no competing interests.

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References

1. Ministry of Education Culture, Sports, Science and Technology, Japan. (2013) Report & Statistics, Statistics, Overview. https://www.mext.go.jp/en/publication/statistics/title01/detail01/1373636.htm.
2. Ministry of Education Culture, Sports, Science and Technology, Japan. (2020). The report on Basic Research on School. https://www.mext.go.jp/b_menu/toukei/chousa01/kihon/kekka/k_detail/1419591_00003.htm (in Japanese).
3. Japan Association of Nursing Programs in Universities (2020). JANPU member universities. https://www.janpu.or.jp/en/outline-member/.
4. Currie LK, Pisarik CT, Ginter EJ, *et al*. Life-skills as a predictor of academic success: an exploratory study. Psychol Rep 2012; 111: 157–164. [Medline] [CrossRef]
5. Dubuc MM, Aubertin-Leheudre M, Karelis AD. Relationship between academic performance with physical, psychosocial, lifestyle, and sociodemographic factors in female undergraduate students. Int J Prev Med 2017; 8: 22. [Medline] [CrossRef]
6. El Hangouche AJ, Jniene A, Aboudrar S, *et al*. Relationship between poor quality sleep, excessive daytime sleepiness and low academic performance in medical students. Adv Med Educ Pract 2018; 9: 631–638. [Medline] [CrossRef]
7. Gomes AA, Tavares J, de Azevedo MH. Sleep and academic performance in undergraduates: a multi-measure, multi-predictor approach. Chronobiol Int 2011; 28: 786–801. [Medline] [CrossRef]
8. Marta OFD, Kuo SY, Bloomfield J, *et al*. Gender differences in the relationships between sleep disturbances and academic performance among nursing students: A cross-sectional study. Nurse Educ Today 2020; 85: 104270. [Medline] [CrossRef]
9. Reuter PR, Forster BL, Brister SR. The influence of eating habits on the academic performance of university students. J Am Coll Health 2020. [Medline] [CrossRef]
10. Salamonson Y, Andrew S. Academic performance in nursing students: influence of part-time employment, age and ethnicity. J Adv Nurs 2006; 55: 342–349, discussion 350–351. [Medline] [CrossRef]
11. Morales-Vives F, Camps E, Dueñas JM. Predicting academic achievement in adolescents: the role of maturity, intelligence and personality. Psicothema 2020; 32: 84–91. [Medline] [CrossRef]
12. Nabizadeh S, Hajian S, Sheikhan Z, *et al*. Prediction of academic achievement based on learning strategies and outcome expectations among medical students. BMC Med Educ 2019; 19: 99. [Medline] [CrossRef]
13. Richardson M, Abraham C, Bond R. Psychological correlates of university students' academic performance: a systematic review and meta-analysis. Psychol Bull 2012; 138: 353–387. [Medline] [CrossRef]
14. Shirazi F, Heidari S. The relationship between critical thinking skills and learning styles and academic achievement of nursing students. J Nurs Res 2019; 27: e38. [Medline] [CrossRef]
15. Sobowale K, Ham SA, Curlin FA, *et al*. Personality traits are associated with academic achievement in medical school: a nationally representative study. Acad Psychiatry 2018; 42: 338–345. [Medline] [CrossRef]
16. Wu H, Li S, Zheng J, *et al*. Medical students' motivation and academic performance: the mediating roles of self-efficacy and learning engagement. Med Educ Online 2020; 25: 1742964. [Medline] [CrossRef]
17. Chow KM, Tang WKF, Chan WHC, *et al*. Resilience and well-being of university nursing students in Hong Kong: a cross-sectional study. BMC Med Educ 2018; 18: 13. [Medline] [CrossRef]
18. Smith BW, Dalen J, Wiggins K, *et al*. The brief resilience scale: assessing the ability to bounce back. Int J Behav Med 2008; 15: 194–200. [Medline] [CrossRef]
19. Beauvais AM, Stewart JG, DeNisco S, *et al*. Factors related to academic success among nursing students: a descriptive correlational research study. Nurse Educ Today 2014; 34: 918–923. [Medline] [CrossRef]
20. Burgis-Kasthala S, Elmitt N, Smyth L, *et al*. Predicting future performance in medical students. A longitudinal study examining the effects of resilience on low and higher performing students. Med Teach 2019; 41: 1184–1191. [Medline] [CrossRef]
21. Elizondo-Omaña RE, García-Rodríguez ML, Hinojosa-Amaya JM, *et al*. Resilience does not predict academic performance in gross anatomy. Anat Sci Educ 2010; 3: 168–173. [Medline] [CrossRef]
22. Montas M, Rao SR, Atassi HA, *et al*. Relationship of grit and resilience to dental students' academic success. J Dent Educ 2021; 85: 176–186. [Medline] [CrossRef]
23. Mitsuishi H, Endo S, Ishiwata T, *et al*. The effects of resilience on subjective stress response and salivary secretory immunoglobulin A in university students. J Phys Fit Sports Med 2016; 5: 319–327. [CrossRef]
24. Hirano M. A study of the classification of resilience factors: development of the Bidimensional Resilience Scale (BRS). Jpn J Pers 2010; 19: 94–106 [in Japanese].
25. Ueno Y, Hirano M, Oshio A. The development of resilience in Japanese adults: a two-wave latent change model. Health Psychol Open 2020; 7: 2055102920904726. [Medline] [CrossRef]
26. Hirano M. Validity of the Bidimensional Resilience Scale for junior high and high school students: an analysis using the twin method. Jpn J Pers 2011; 20: 50–52 [in Japanese].
27. Hirano M. The relationship between the Bidimensional Resilience Scale and life events. Jpn J Pers 2012; 21: 94–97 (in Japanese).
28. Handa M. Comparative study on GPA computation methods: transition from traditional GPA to functional GPA and its optimal compatibility. Higher Education and Student Support: Transaction of Ochanomizu University Education Secretariat 2011; 2: 22–30 (in Japanese).
29. Kessler RC, Andrews G, Colpe LJ, *et al*. Short screening scales to monitor population prevalences and trends in non-specific psychological distress. Psychol Med 2002; 32: 959–976. [Medline] [CrossRef]
30. Furukawa TA, Kawakami N, Saitoh M, *et al*. The performance of the Japanese version of the K6 and K10 in the World Mental Health Survey Japan. Int J Methods Psychiatr Res 2008; 17: 152–158. [Medline] [CrossRef]
31. Prochaska JJ, Sung HY, Max W, *et al*. Validity study of the K6 scale as a measure of moderate mental distress based on mental health treatment need and utilization. Int J Methods Psychiatr Res 2012; 21: 88–97. [Medline] [CrossRef]
32. Tanji F, Tomata Y, Zhang S, *et al*. Psychological distress and completed suicide in Japan: a comparison of the impact of moderate and severe psychological distress. Prev Med 2018; 116: 99–103. [Medline] [CrossRef]
33. Okajima I, Nakajima S, Kobayashi M, *et al*. Development and validation of the Japanese version of the Athens Insomnia Scale. Psychiatry Clin Neurosci 2013; 67: 420–425. [Medline] [CrossRef]

34. Soldatos CR, Dikeos DG, Paparrigopoulos TJ. Athens Insomnia Scale: validation of an instrument based on ICD-10 criteria. J Psychosom Res 2000; 48: 555–560. [Medline] [CrossRef]
35. Knol MJ, Le Cessie S, Algra A, *et al*. Overestimation of risk ratios by odds ratios in trials and cohort studies: alternatives to logistic regression. CMAJ 2012; 184: 895–899. [Medline] [CrossRef]
36. Zhang J, Yu KF. What's the relative risk? A method of correcting the odds ratio in cohort studies of common outcomes. JAMA 1998; 280: 1690–1691. [Medline] [CrossRef]
37. Ramjan LM, Watanabe H, Salamonson Y. Diabetes knowledge and perceptions among nursing students, and curriculum differences in Japan and Australia: A cross-sectional study. Nurse Educ Today 2017; 53: 7–12. [Medline] [CrossRef]
38. Duckworth AL, Peterson C, Matthews MD, *et al*. Grit: perseverance and passion for long-term goals. J Pers Soc Psychol 2007; 92: 1087–1101. [Medline] [CrossRef]
39. Terry D, Peck B. Academic and clinical performance among nursing students: what's grit go to do with it? Nurse Educ Today 2020; 88: 104371. [Medline] [CrossRef]
40. Ministry of Health, Labour and Welfare, Japan. (2020) National Livelihood Survey in 2019. https://www.e-stat.go.jp/stat-search/files?page=1&toukei=00450061&tstat=000001141126.