A study of pharmacists' resilience-enhancing behaviours to improve pharmacy student resiliency in Japan

Denise A. Epp [ID], Yukiko Fujii [ID], Tomonori Shiratani [ID]
Department of Pharmaceutical Sciences, Daiichi University of Pharmacy, Fukuoka, Japan

Correspondence
Denise A. Epp
Department of Pharmaceutical Sciences
Daiichi University of Pharmacy
Fukuoka
Japan
da-epp@umin.ac.jp

Abstract

Background: The word "resilience" has been trending since recent devastating natural disasters and the COVID-19 worldwide pandemic. This study sought to uncover how Japanese pharmacists perceive and define resiliency and quantify their resilient behaviours for the purpose of enhancing pharmacy education. **Methods:** A four-part, online questionnaire that included the 10 Factor Resilient Behavior Scale (F10RBS) was sent to pharmacists around Japan. **Results:** Pharmacists defined resilience as "*bouncing back*" and "*a positive adaptation after trauma*". An exploratory factor analysis of the resilience-enhancing behaviours led to three factors: personal health and well-being, altruism, and a positive outlook. **Conclusion:** The results of this study revealed that resilience is strengthened through experience and previously established behaviours and skills. This understanding of resilient behaviours can be integrated into pharmacy education by encouraging university students to maintain a healthy lifestyle and make choices that will nurture resilience before experiencing a traumatic event or the stress of professional work.

Introduction

Pharmacist activities following the continual natural disasters in Japan have been extensive in supporting local communities. Pharmacists displayed strong, resilient behaviours that sustained essential pharmaceutical care throughout and after the disasters, which led to this examination of their behaviours to understand and relate to the experiences and enhance pharmacy education. During the 2011 Tohoku triple disaster in Northern Japan, school pharmacists took leadership roles in setting up and maintaining evacuation centres in the school buildings (Epp *et al.*, 2016). Pharmacist training in environmental studies and sanitation allowed them to take the lead in educating evacuees and maintaining safety under the severe conditions of the evacuation centres. The experience of that Tohoku disaster led the local prefectural pharmaceutical association to create the model of what is now called "the Mobile Pharmacy", a portable

pharmacy on wheels (a camping car) that provides pharmaceutical services, such as delivering medicine, pharmaceutical items and counselling to evacuation centres (Epp *et al.*, 2016). The use of their personal and professional experiences to deliver medicines and infection prevention in disaster zones, even though setting up small pharmacies within temporary housing settlements, became the backbone of re-establishing healthcare in many devastated communities. The Mobile Pharmacy was initiated during the 2016 Kumamoto earthquakes, moving through the destroyed streets and communities to reach evacuation centres, and assisting emergency healthcare teams (Japan Pharmaceutical Association, 2018). Resiliency motivated these pharmacists to volunteer and continue to provide pharmaceutical support despite being victims of the disasters.

The word "resilience" is commonly understood as "recovery" or the ability to "bounce back" (Southwick & Charney, 2018), like a Japanese okiagari pop-up doll

when pushed down and then rebounds back to its original position (Figure 1). The word in Japanese is translated as "saiki-ryoku", meaning the power to return to a previous state with a full recovery (DeepL Translator, 2022; Google Translate, 2022). Other definitions include a process of preparation before an adverse event to recovery with traits and behaviours of personal growth and emotional reappraisal (Coutu, 2002; Kaye-Kauderer *et al.*, 2019). It helps individuals and organisations develop plans and interventions to combat future stressful situations and events (Aksha & Emrich, 2020; Lisi *et al.*, 2020; Austin & Gregory, 2021). Resilience can be measured using various scales by quantifying stress responses, coping capabilities, and adaptive behaviours exhibited in a traumatic or stressful situation during the return to physical and mental health.

Figure 1: Japanese "okiagari" pop-up doll

Despite the differences in their roles, pharmacists worldwide played a vital role in the delivery of healthcare through the COVID-19 pandemic from early in 2020. In Japan, pharmacists focused on infection prevention education to the public and prepared the vaccine solutions for the injections given by nurses, dentists, and doctors (Kyodo News, 2021; Mamiya & Yoshida, 2021). Many pharmacists volunteered to assist at the mass vaccination centres by preparing the solutions on top of their regular duties. Some also followed up with continued learning about injection administration in case their role absorbed that duty in the future. Globally, pharmacists required psychological resilience for personal well-being to support their workplaces and patients throughout the pandemic. Organisations needed to manage the pandemic challenges with science-based information and provide support to pharmacists with pre-COVID practices, routines, and effective scheduling (Austin & Gregory, 2021).

The COVID-19 pandemic exposed a new component of global emergency preparedness which was the necessity

to prepare pharmacists for their expected roles of providing medicines, pharmaceutical services, and education to the public while maintaining a safe and infection-controlled work environment, as well as personal, mental and physical health (Aruru *et al.*, 2021; Bahlol & Dewey, 2021). A web-based study in Italy during the first year of the pandemic confirmed that healthcare professionals, including pharmacists, psychologically suffered more than the general public (Lisi *et al.*, 2020). They faced various factors at work that were beyond their control, such as a lack of personal protective equipment (PPE), a heavy workload, and extreme stress. Educational interventions through training and workshops helped build personal resilience that assisted them to continue working throughout the pandemic and grow personally from that experience. The mental and physical support of healthcare workers was essential because they had to function professionally despite being victims of the traumatic experiences that resulted from the pandemic.

Resiliency was a term designated previously as a predominant military service or sports trait; however, it has also become a predictor of well-being and success in education (Stoffel & Cain, 2018). Students who develop resilience can overcome the daily struggles of school and society through training exercises that focus on self-reflection and problem-solving skills (Hermelin *et al.*, 2020). Although resilience is tested through an adverse event, it can be developed and built up through life skill education in relation to adaptation and personal growth (Coutu, 2002; Kaye-Kauderer *et al.,* 2019). Research also shows that students who have high levels of resilience suffer less from anxiety and depression and have more academic success, with the ability to overcome future negative experiences (Stoffel & Cain, 2018). For example, behaviours that enhance self-discipline in daily routines, build a stronger mindset, develop a social network, and improve decision-making skills, lead to more confidence in new, unexpected situations (Dwivedi, 2020). On the other hand, mental health issues and distractions from too many non-related extracurricular activities can lower academic resilience and inhibit successful learning.

The authors of this study observed how the changes of this pandemic affected their pharmacy students differently. Students were all thrown into sudden isolation and forced to study online, often without the necessary tools or skills for this new online learning method. As a result, many students dropped out, deferred their studies, or quit entirely, while others were able to "bounce back" in their studies and continue online, maintaining their academic success. The two years of online learning highlighted the necessity of access to proper learning resources and the creative strategies of the professors. However, it also exposed the resiliency of some students to adjust to the sudden

changes and challenges without suffering mentally, academically, and socially. A study of medical students in Fukushima found that resilient behaviours motivated them to continue their studies and give back to the community through volunteer work after the 2011 Tohoku triple disaster (Anderson *et al*., 2016; Kaye-Kauderer *et al*., 2019). These students displayed a resilience that developed into self-growth and drove them further into their medical pursuits with meaning and purpose. Students' increasing difficulty in concentrating on their studies, pursuing their goals until graduation, achieving academic success, and avoiding burnout demonstrate the necessity of academic resilience (Whitfield *et al*., 2021). Therefore, students must develop resilience skills academically and psychologically while in university for academic success, the ability to combat stress, and problem-solving skills for the unexpected events and challenges of the future (Calo *et al*., 2019).

Just as resilience was a critical factor in the personal and professional behaviours that pushed pharmacists towards preparation, acceptance, adaptation, recovery, and even pursuing greater challenges during the COVID-19 pandemic, students need to develop resilient behaviours to prepare for their pharmacist career. This study quantified the resilient behaviours of pharmacists through an online questionnaire to understand resilience-enhancing behaviours and perspectives that could, in turn, be integrated into the pharmacy education programme to help students prepare for future unexpected events. In addition, it identified the resilient behaviours and life skills that needed to be developed while in university to strengthen personal and academic behaviours and ultimately improve the professional livelihoods of future pharmacists.

Method

A questionnaire called the "Pharmacist Resilience Survey" was created with four parts related to pharmacist demographics, personal and workplace disaster preparation, stressors and resilience definitions, and resilience-enhancing behaviours. The first three parts were self-developed based on resilience literature. Part 1 on demographics asked standard questions about the pharmacists' gender (male or female in Japan), workplace, years of work experience, association membership, and disaster volunteer experience. The aspects of home and workplace disaster readiness and preparation that formed the questions for Part 2 were based on the responses and reflections of pharmacists found in recent COVID-19 articles (Aruru *et al*., 2021; Austin & Gregory, 2021; Gregory & Austin, 2020). A

question about work emergency drills and exercises determined if the pharmacists' workplaces were prepared and had basic provisions for emergency response (Aruru *et al*., 2021). Part 3 inquired about the personal and professional stressors that pharmacists faced, how they defined resilience and their self-perceived level of resilience. Pharmacists chose their biggest stressors at home and in the workplace from a list of the most common stressors people face in their lifetime (Wick, 2010; Mayers, 2018). The ten definitions of resilience were taken from various research articles and divided into nouns and verbs (Coutu, 2002; Southwick & Charney, 2018; Stoffel & Cain, 2018; Kaye-Kauderer *et al.,* 2019; Aksha & Emrich, 2020; Fallah-Aliabadi *et al*., 2020; Lisi *et al*., 2020; Austin & Gregory, 2021). The participants could choose more than one definition.

The final section (Part 4) had participants rate their resilience-enhancing behaviours from the 10 Factor Resilience Behavior Scale (F10RBS) using a Likert scale of one to five: 1) Being not true at all; 2) Rarely true; 3) Sometimes true; 4) Often true; 5) True nearly all the time. The F10RBS was developed from well-known resilience and stress tests and based on the ten behaviours discovered by psychiatrists Dennis Charney and Steven Southwick in their professional practices of people who displayed resilience (Southwick & Charney, 2018; Kaye-Kauderer *et al*., 2019) (Table I). The F10RBS was first used in northern Japan shortly after the Tohoku disaster in 2011 and repeated six years after to study resilient behaviours exhibited by medical students from Fukushima Medical School.

Kaye-Kauderer and colleagues in 2017 compared the results of the medical students using the F10RBS scale and the well-known Connor-Davidson Resilience Scale (CD-RISC) for quantifying stress resilience. They concluded that, while the CD-RISC measured resilience as an inherent characteristic not susceptible to change, the F10RBS focused on resilience-enhancing behaviours that developed through an individual's interactions with their environment and community. The F10RBS was determined to be reliable and valid, so the authors of this study decided to use the scale with Japanese pharmacists to determine predominant resilient behaviours and how the results could be applied to the six-year pharmacy programme to improve the personal and academic resilient behaviours of the students. One of the creators of this scale permitted the authors to include the F10RBS questions within the online questionnaire for Japanese pharmacists by e-mail on 19 October 2020. It was translated into Japanese, but the authors and participating pharmacists modified some of the questions slightly to make them more comprehensible to the pharmacists.

Table I: Factor 10 Resilience Behavioral Scale questions (used in Part 4 of the survey)

Number	Behaviour
B1	Optimism: I engage in activities in order to make the situation better.
B2	Facing fears: I confront my fears and problems head-on.
B3	Social support: I seek out the support of others to overcome difficulties.
B4	Community service/altruism: I engage in activities (service, volunteer) to help support my community
B5	Faith, spirituality or religion: I draw upon faith that makes me feel connected to something greater as a source of strength.
B6	Physical well-being: I take care of my physical well-being with exercise, diet, and sleep.
B7	Foster strengths: I actively use my best qualities and strengths (instead of my weaknesses) in times of challenge.
B8	Cognitive reappraisal: I actively try to find something good in bad situations.
B9	Openness with emotions: I talk about my emotions to help me process challenges.
B10	Meaning and purpose: I engage in activities that bring me a sense of meaning and purpose.
B11	Negative emotions: I try to use my negative emotions (anger, guilt, anxiety, sadness) to help me cope.
B12	Acceptance: I work to accept reality as it is when I face an unsatisfactory situation that is difficult to change.

Permission granted from author by e-mail 2020 Oct. to use F10RBS in English and Japanese (modified). From: (Kaye-Kauderer *et al.,* 2019).

As pharmaceutical academic and association meetings were cancelled because of the COVID-19 pandemic, the survey had to be sent out by e-mail and social media platforms such as Messenger, Facebook, and Line. The online survey was distributed using snowball sampling, starting with personal acquaintances, colleagues, and friends, and then spreading to colleagues and contacts using a hyperlinked URL and QR Code. The inclusion criteria were Japanese licensed pharmacists living and working in Japan, regardless of work experience, who may or may not have had a disaster response experience. The questionnaire was provided only in Japanese.

After collecting the pharmacists' responses, the data were analysed statistically using various tests, such as a t-test and one-way analysis of variance (ANOVA), for studying relationships between the mean scores. P-values < 0.05 were considered statistically significant. A factor analysis was conducted for the resilience-enhancing behaviours (Part 4 of the questionnaire) and compared to the results of demographics (Part 1) and disaster responses (Part 2), which was later followed by another factor analysis on the definition of resilience responses (Part 3) (Figure 2). The software JMP (version 14) was used for the data analyses (SAS Institute Inc., 2021).

Ethics review approval was given in September 2021 (#R03-0010) by the Ethical Research Committee of Daiichi University of Pharmacy. Informed consent from participating pharmacists was received within the online survey with an explanation of the project and a

"yes/no" response. The participants' e-mail addresses were required for this Google Forms survey and then replaced with an identification number to maintain participant privacy.

Results

The online questionnaire was open to responses for five weeks in October and November 2021 and gathered 119 responses from pharmacists across Japan who provided informed consent.

Demographics (Part 1)

There were 62 male and 57 female responses, mainly working at community pharmacies. Other workplaces included hospitals, clinics, public health centres, and academic institutions. The majority (53 participants) had over 20 years of experience in pharmacy work, with 32 between 11 and 20 years, 19 with four to ten years, and 15 with three or fewer years of experience. Professional memberships were primarily held with local and national pharmaceutical associations, and those employed at hospitals were also members of the hospital pharmacists association. A week after the survey began, some of the hospital pharmacists requested that their association be included in the survey, which was added at that time. Approximately 28 (one-third) of the participants had volunteer experience in a disaster, and 91 had no disaster volunteer experience.
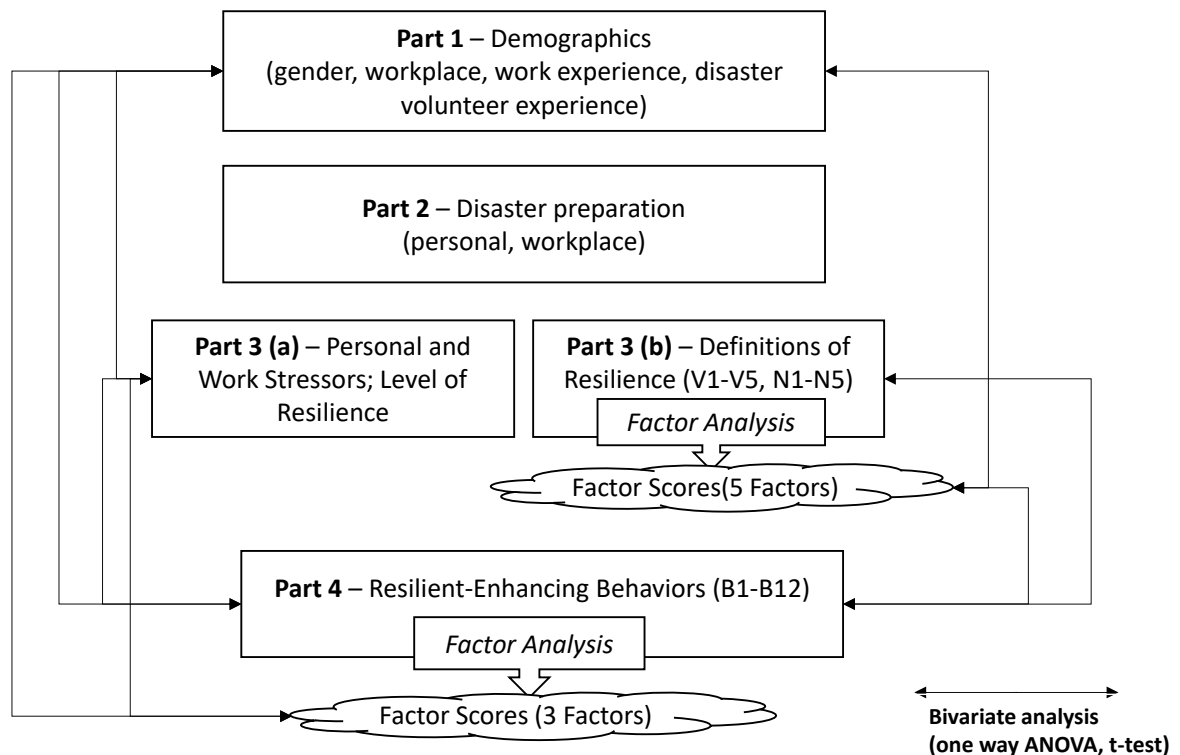
Note: Bivariate analysis was performed on the arrow variables.

Figure 2: Research analysis framework for the pharmacist resilience survey

Disaster preparation (Part 2)

In the second part of the survey on disaster preparation, 25 participants felt ready to assist in a disaster. Twenty-two participants believed their workplaces were prepared for a disaster, with most responding that there was an adequate supply of PPE and masks, a work schedule, guidelines for disaster procedures and duties, and access to medicines and medical equipment. Some workplaces had prepared emergency access to the Internet and communication media, and others had access to patient history and records. Only two participants stated they had an emergency supply of point-of-care testing at work. Twenty-eight participants responded that their workplace held regular emergency drills and exercises, 13 of those from hospitals, ten from community pharmacies, four from academic institutions, and one from a public health centre.

Stressors and definitions (Part 3)

The third part of the questionnaire identified the top five sources of personal stress as work stress (42 participants), life transitions including child and family issues (n: 16), the COVID-19 pandemic (n: 15), the death of a loved one (n: 14), and a disaster event (n: 5). On the other hand, the top five professional stressors as a pharmacist were a lack of skilled colleagues or being understaffed (n: 26), bullying and harassment (n: 22), a heavy workload (n: 20), negative patient behaviour and attitudes (n: 15), and uncontrollable changes within the workplace (n: 12). Seven participants felt that COVID-19 was their biggest work-related stress. The pharmacists were also asked to rate their self-perceived resilience levels concerning their stress responses. Based on their Likert responses, 20 participants perceived their resilience to be extremely strong (Likert 5), 36 were mostly strong (Likert 4), 38 were undecided because it depended on the situation (Likert 3), 22 had a little resilience (Likert 2), and three were not resilient at all (Likert 1). A one-way ANOVA found a significant difference between more work experience and a higher self-perceived resilience level ($p < 0.0131$). Finally, when asked if they desired to become more resilient as a pharmacist, 86% of the participants responded positively.

The pharmacists were also asked to choose from ten definitions of resilience, five stated as verbs and five as nouns. Twenty-two participants chose more than one definition from the list (Table II). The verb-based definitions included "*bouncing back*" (V1), "*continuing strength to not give up*" (V2), "*fighting back with speed and strength*" (V3), "*preparing, planning for, absorbing, recovering, and adapting*" (V4), and "*recovering stronger with personal growth*" (V5). There was no response at all to the V3 definition, but 15% of responses supported V1. The noun-based definitions included "*the process of recovery and growth*" (N1),

"*the ability to maintain mental health*" (N2), "*the capacity to cope*" (N3), "*positive adaptation after trauma*" (N4), and "*survival with a good life after hardship*" (N5). While the nouns attracted more attention than the verbs, the highest response was to N3 with 28%, and the lowest was N5 with 3%. A contingency analysis of the definitions and demographics revealed no clear relationship between the chosen definitions and the pharmacists' workplace, years of work experience, or the desire to have more resiliency.

Table II: Factor loading based on ten definitions of resilience (Part 3)

Definition verb (V); noun (N)	Factor 1	Factor 2	Factor 3	Factor 4	Factor 5	Definition description
N1	0.9961					The process of recovery and growth after adversity
N5		0.5755				The survival and ability to have a good life after hardship
V1		0.5389				Bouncing back
N2		0.5093				The ability to maintain mental health
N4			0.6216			The positive adaptation after adversity
N3			-0.4067			The capacity to cope successfully with adversity
V5				0.5846		Recovering stronger with personal growth
V2					-0.3657	Continuing strength to not give up
V4					0.4924	Preparing, planning for, absorbIng, recovering and adapting after adversity

n = 119; Varimax factor loading to five eigenvalues more than one
Eigenvectors are shown above 0.4 or below -0.3.
No response for (V3) "*fighting back with speed and strength*", so it was dropped.

The definitions were further studied with a principal component analysis and resulted in five eigenvalues over 1.0 with values of 1.70, 1.28, 1.19, 1.12, and 1.04, respectively. An exploratory factor analysis using Varimax rotation led to factors that focused on a process of moving to recovery or retrospection after adversity (Table II). Factor 1, which was (N1) "*the process of recovery and growth after adversity*", showed a correlation to Factor 5's defining verbs (V2) "*continuing strength*" and (V4) "*preparing, planning for, absorbing, recovering and adapting to the event*" (Spearman's Rank Correlation (SRC) $\rho=0.28$, $p<0.0017$), which explored resilience from before the event until recovery. In addition, Factor 2 included (N5) "*survival,*" (N2) "*the ability to maintain mental health*", and (V1) "*bouncing back*", which negatively correlated with Factor 4's (V5) "*recovering with personal growth*" (SRC $\rho=0.46$, $p<0.0001$), and demonstrated retrospection after an adverse event. Further analysis of these responses compared to various demographics (Part 1), such as gender, workplace, and years of work

experience, and the item about the desire to be more resilient showed no significant difference.

However, a one-way ANOVA of variance found a significant difference between the definitions of resilience and some of the resilience-enhancing behaviours (B1 to B12, Table I) from the last section of the survey (data not shown). For example, the pharmacists who tended to rate themselves low in having cognitive appraisal to find good in bad situations (B8) also tended to define resilience as (N1) "*the process of recovery with personal growth*" (one-way ANOVA $p=0.0098$) and (N2) "*the ability to maintain mental health*" ($p=0.0318$). Pharmacists who felt strong in optimism (B1) tended to define resilience as (N3) "*the capacity to cope successfully with adversity*" ($p=0.0252$). Those who scored low on fostering strengths over weaknesses in times of challenge (B7) tended to focus on (N1) ($p=0.0250$), whereas those who scored high chose (V5) "*recovering stronger with personal growth*" ($p=0.0448$). There was no significant relationship between altruistic behaviour (B4) and the definitions of resilience.

Resilience-enhancing behaviours (Part 4)

The final section of the questionnaire focused on the F10RBS resilience-enhancing behaviours (Table I) that pharmacists self-assessed using the Likert scale responses with "*true nearly all of the time*" as a high score of five and "*not true at all*" as a low score of one. A principal component analysis was also performed on this section's responses resulting in eigenvalues over 1.0 of 4.20, 1.23, and 1.13, respectively. A Varimax rotation was then conducted and loaded to three factors (Table III). Factor 1 was named Personal Health

and Well-Being with seven behaviours, such as optimism (B1), facing fears (B2), social support (B3), physical well-being (B6), fostering strengths (B7), openness with emotions (B9), and finding meaning and purpose (B10). Factor 2 was called Altruism (B4) with volunteering behaviours to support the community, and Factor 3 became Positive Outlook (B8) with cognitive reappraisal to find good in bad situations. These factors were then analysed with other parts of the questionnaire to identify relationships between the pharmacists' responses.

Table III: Rotated factor loading and naming based on the resilient behaviour responses (part 4)

Factor/Question	Loading values		
	Factor 1	**Factor 2**	**Factor 3**
Factor 1 - Personal Health and Well-Being			
B10. Meaning and purpose from engaging in activities	0.5883	0.3519	0.0240
B2. Facing fears and problems head on	0.5856	0.2167	0.1536
B1. Optimism by engaging in activities	0.5568	0.2627	0.1976
B9. Openness with emotions and talking out	0.5566	0.0219	-0.0741
B7. Foster strengths over weaknesses	0.5439	0.3242	0.3231
B3. Social support to overcome difficulties	0.5385	0.0705	-0.0712
B6. Physical well-being (exercise, diet, sleep)	0.5181	0.1308	0.0740
Factor 2 - Altruism (giving back through volunteering)			
B4. Volunteer to support the community	0.1312	0.9913	-0.0095
Factor 3 - Positive Outlook			
B8. Cognitive reappraisal to seek good over bad	0.5829	0.2650	0.7681

n = 119; Varimax factor loading to three eigenvalues more than one
Eliminated behaviours (eigenvectors were < 0.40): (B5) Draw on faith, spirituality, or religion for strength; (B11) Use of negative emotions to cope; (B12) Acceptance of reality

A one-way ANOVA was used to compare the three resilience-enhancing behavioural factors to various demographics, such as gender, workplace, self-perceived level of resilience, and years of work experience (Table IV). Gender played a prominent role only for Factor 2 Altruism with slight significance (t-test $p=0.0167$), where male responses were higher (mean 3.40, SD 0.16) than female responses (mean 2.86, SD 0.16). There was no significant difference found between the resilient behaviours and the workplaces of the pharmacists. However, the question "*How resilient*

do you consider yourself?" in Part 3 of the questionnaire showed significance with the behaviours in Factors 1 and 2, but not Factor 3. There was also a significance noted between resilient behaviours and years of work experience, with mean scores for the three factors being the highest in pharmacists with 20 plus years of work experience and the lowest in those with three or fewer years of experience; $p=0.0340$, $p<0.0001$, and $p=0.0001$ for each factor, respectively (one-way ANOVA).

Table IV: Comparison of the behavioural factors (part 4) and pharmacist demographics (Part 1)

Factor	Factor description	Years of experience*	Gender †	Workplace ‡	Self-perceived resilience ¶
1	Personal Health and Well-Being	**0.0340**	0.1615	0.8725	**<.0001**
2	Altruism	**<.0001**	**0.0283**	0.3188	**0.0004**
3	Positive Outlook	**0.0001**	0.3827	0.3460	0.2618

n = 119; p < 0.05; * 4 groups of 20 years plus, 11 to 20 years, 4 to 10 years, 3 or fewer years; one-way ANOVA; † 2 groups of male or female (t-test)
‡ workplace of community pharmacy, hospital, clinic, public health centre or academic institution; one-way ANOVA
¶ Likert-5 scale with extremely strong resilience (5); mostly strong (4); it depends (3); little (2); no resilience (1); one-way ANOVA

A one-way ANOVA also found that B4 behaviour in Factor 2 Altruism and the disaster volunteer experience of the pharmacists showed a significant difference (t-test $p<0.0001$) (data not shown). Pharmacists who had this experience had a mean Likert score of 4.00 (SD 1.26) for altruistic behaviour, whereas those with no volunteer experience scored 2.89 (SD 1.15). Of those who had volunteer experience in a disaster, 75% had over 20 years of work experience, but of that per cent, only 16% were female volunteers. Also, pharmacists who had volunteer experience in a disaster scored themselves higher in having a positive outlook (mean 4.07, SD 0.81) than those without such volunteer experience (mean 3.68, SD 0.98), showing a significant difference of $p=0.0393$ (t-test).

Finally, a one-way ANOVA was conducted on behaviours eliminated in the factor analysis (B11, B5, and B12). There was no significant difference between the use of negative emotions to cope between the 20 plus work experience group and the three or less year group, nor with the gender responses. However, there was a difference between pharmacists who had experience volunteering in a disaster (mean 2.36, SD 0.19) and those who did not (mean 2.82, SD 0.10) in using negative emotions (t-test $p=0.0209$). Despite these lower Likert scores for using negative emotions to cope, many pharmacists chose "work" as a high personal stressor, with professional work stress arising due to a lack of skilled coworkers or understaffing, and bullying and harassment.

Another behaviour eliminated in the factor analysis was drawing upon faith, spirituality, or religion as a source of strength (B5), which held the lowest mean Likert scores of all the resilience-enhancing behaviours (2.39, SD 1.23) in this study. An analysis of variance showed the most significant difference between responses of pharmacists with over 20 years of work experience (2.68, SD 1.09) and those with three or fewer years (1.67, SD 1.29) (one-way ANOVA $p=0.0368$). There seemed to be no connection between this behaviour and the responses to disaster volunteer experience or the personal definitions of resilience.

Finally, the behaviour of trying to accept reality in a difficult situation (B12) had the most significant difference for the 20 plus years of work experience group (Tukey-Kramer HSD $p=0.0004$). The three or fewer years of work experience group had a mean score of 2.93 (SD 1.03), compared to the other groups with more than four years of experience and mean scores over 3.81. Pharmacists strong in acceptance behaviour (Likert 4 or 5) scored high in their self-perceived level of resilience (one-way ANOVA $p=0.0012$). It was also observed that pharmacists with low acceptance behaviour chose the definition (N4)

"*positive adaptation after adversity*" (one-way ANOVA $p=0.0476$).

Cronbach's alpha of the resilience-enhancing behaviours using the F10RBS items on the questionnaire was 0.8009, which was comparable to the creators' results (Kaye-Kauderer *et al.,* 2019).

The final comment section provided in the questionnaire was generally neglected but included one comment that the results would benefit public health institutions.

Discussion

The word resilience appeared increasingly during the COVID-19 pandemic on TV and social media, but many Japanese wondered what exactly it was. The Part 3 question on a personal definition of resilience was added to the survey to determine if definitions influenced resilient behaviours, but this was not the case. Instead, the daily routines and patterns established before a traumatic or stressful event seemed to influence resilient responses with positive thinking, social support, proper exercise, diet, and sleep. The factor analysis conducted on the ten definitions revealed that resilience could be defined as a process throughout an event or retrospection after an event, but this had only a minor effect on the resilient responses of the pharmacists, too.

Stress can be combatted by eating well, sleeping well, exercising, and maintaining a work-life balance (Wick, 2010; Mayers, 2018). The strong personal health and wellness routines and behaviours observed in the pharmacists (Factor 1 of resilient behaviours) were developed over the years from their childhoods. Japanese education from preschool onwards is focused on set routines with strict mental and physical training. Elementary and junior high schools provide daily school lunches that include nutrition and a balanced diet for growing youth. Annual sports festivals are a highlight for students and parents as they participate in various challenging dance, track and field, and game activities. These healthy habits in eating and physical exercise continue throughout life. One can find sports gyms packed with the elderly who gather for social and physical interaction in a community setting. Since physical resilience requires proper nutrition and sleep for recovery (Southwick & Charney, 2018), it is fathomable that the traditional Japanese "washoku" diet and daily routines of fitness and prepare them for facing difficult situations and lead to more confidence in the unexpected (Dwivedi, 2020).

Resilience was also evident in the Japanese response to volunteering during disasters, displaying altruistic character traits, and maintaining a positive outlook. Therefore, students also should learn to volunteer their abilities and develop social support networks and interact with the community while they are in university. For example, Fukushima's medical students developed higher confidence levels and stronger mental health after the Tohoku triple disaster (Anderson *et al.,* 2016). The action of giving to the community boosted other resilience-enhancing behaviours, such as a positive outlook. Although the results of this study showed gender as an influence on altruism, cultural consideration is necessary because women often stay home to take care of the children and have less mobility than men when it comes to participating in out-of-work activities. Men often have more freedom to leave home as domestic duties are still often carried out by women in a traditional setting in Japan. Out of the 57 female participants in this study, the more experienced, thus older pharmacists, participated in volunteer activities. Therefore, the years in school as a student may offer the best opportunity to develop altruism and gain volunteer experience, especially for women.

The 2011 Tohoku triple disaster and other big natural disasters reminded Japanese individuals and organisations to prepare for future disasters. Every small earthquake and aftershock cautioned that another "big one" could hit, so home and work evacuation kits should be checked and updated again. Despite these regular warnings, the results of this study showed that only 22 out of 119 participants believed that their workplaces were ready for a natural disaster, with access to PPE and medicines and emergency guidelines set in place. Furthermore, only 28 responded that their workplaces held regular emergency drills and exercises. On the other hand, an example of preparing for emergencies can be observed at a local kindergarten, where the teachers, the three to five-year-old students, and their parents regularly practice how to respond to disasters with emergency drills. This preparation includes the planning and practice of safe exit, passage, and reunion of children with their parents to avoid panic in an actual event. Unfortunately, this study's results indicate that this preparation is neglected at most pharmacies.

To overcome fear and the hesitancy to react in a disaster event, it is imperative that mental and physical preparation beforehand include the practice of emergency routines, with regular drills in pharmacies and universities. The psychological resilience of healthcare professionals was challenged globally with the COVID-19 pandemic, and pharmacists working on the frontline of healthcare were not an exception. A report from 2010 in Washington State, USA, after snow emergencies and the H1N1 influenza pandemic explained a collaboration created between the public health agencies, pharmacist association, and a pharmacy school that enforced student volunteering and volunteer training to ensure a strong future emergency response (Woodward *et al.,* 2010). Drills and exercises tested the system and gave an opportunity for pharmacists and future pharmacists to practice their responses. The students were equipped with knowledge, experience, and training to prepare for future emergency responses, which promote resilience. Therefore, in anticipation of future natural disasters and worldwide pandemics, further preparation through regular training exercises is necessary to increase the resilience of the future workforce.

Many pharmacists indicated work to be a high personal stressor, confirming that resilience is necessary for coping with the daily stresses of work and personal life. However, the behaviour of "*using negative emotions to cope*", rated high in a study after the Tohoku triple disaster by medical students (Kaye-Kauderer *et al.,* 2019), was not observed in this study as a motivator of pharmacists' resilience. This study may have been influenced by its timing during the COVID-19 pandemic. Japanese pharmacists, along with pharmacists worldwide, reported heavy workloads, staffing issues, lack of pharmaceutical supplies, demanding customers, and increased duties and roles during the pandemic (Austin & Gregory, 2021). The questionnaire's demographic responses showed that they were active members of various local and national pharmaceutical organisations, which would have offered social support and provided necessary information during the pandemic. Nevertheless, cultural factors like senior/junior hierarchy may have also contributed to the stressful situation with more bullying and harassment, making it one of the leading professional stressors in this study. Regardless of these work experiences, pharmacists indicated they wanted to become more resilient.

Trying to accept reality in a challenging situation (B12) was also eliminated from the behavioural factor analysis, but it is a behaviour that is strongly considered among Japanese as endurance ("gaman" in Japanese). Acceptance is defined as a resilience-enhancing behaviour accented with continual self-reflection, reactive decision-making, and flexibility in any situation (Southwick & Charney, 2018). The lower mean score from pharmacists with three or fewer years of work experience could reflect the lack of opportunity to develop these skills because they are younger and inexperienced. However, they can learn these resilient behaviours through observation and interaction with

their seniors without personally experiencing the stressful event itself. Positive role models of resilience through the traumatic experience could demonstrate and teach such values and attitudes to the next generation of survivors through their example (Southwick & Charney, 2018). Therefore, preceptor pharmacists and senior pharmacists can pass these skills and behaviours on to the younger pharmacists. Resiliency will not only improve the patients' quality of life (QOL) but also that of the pharmacists.

Japanese are known to have a deep reverence for the power of nature through the cultural Shinto religion and daily practices, but it is not viewed as a religion but rather a way of thinking in society. Many holidays centre on seasonal changes and nature. The mean scores for the item in the questionnaire on "*drawing upon faith, spirituality or religion to connect to something greater as a source of strength*" (B5) were overall low on the Likert scale. However, pharmacists with more work experience and who were, therefore, older scored higher than those with fewer years of experience. This result could stem from many traditional practices, such as going to the shrines to pay respect, spending time in nature for holidays, or praying at the ancestral home altar, followed more by the older generations than the younger. In contrast, many other cultures look specifically to their faith or religion as a source of comfort, recovery, and social reference during a disaster (Kaye-Kauderer *et al*., 2020). The collective thinking in Japanese society and reverence for nature is a substantial part of the culture and not distinguished specifically as "*faith, spirituality or religion*", so after the questionnaire, some Japanese pharmacists expressed that this item was particularly tough to respond to.

Educational application

Through this survey, it became apparent how pharmacists in the field think about resilience. Pharmacists, who are deeply connected with humanity (e.g. altruism), must accept the consequences of each experience, learn to overcome the trauma or hardship, re-energise, and reorganise for professional practice. Pharmacy students who aspire to become pharmacists also need to develop this connection to humanity and an awareness of the dignity of life as professionals. This study showed how pharmacists maintain behaviours for health and well-being that build resiliency. In the same way, students should learn to develop personal habits and routines of eating, sleeping, studying, exercising, and interacting socially. Pharmacy students may not have had a traumatic experience yet; however, they must learn how to cope with and overcome various difficulties that they may encounter in the future with strong mental and physical health.

There is a strong need for resilience-building education in pharmaceutical education from the early years of study onwards. For example, in the early clinical experiences of their first year, students can deepen their awareness of resilience by discussing life-threatening events and disasters in society and the world through small group discussions (SGDs) and brainstorming how to overcome them. It is also possible to expand their personal perspectives through studying multidisciplinary subjects like English, economics, philosophy, science, and the humanities. Students can develop self-awareness of their learning styles and social behaviours throughout their university studies by reflecting daily on what went well or did not go well and what they could do better next time. Life skills such as self-reflection and problem-solving capability are necessary to "de-escalate a situation" and handle stress (Coutu, 2002; Wick, 2010). During the fifth-year clerkship training period, students can reflect on their ability to adjust to changing environments (from the classroom to the pharmacy), their communication with actual patients, and the stress of the practical training. The awareness of improving academic resilience will help students develop greater self-control, face their fears, and build stronger social relationships for future professional practice.

Therefore, pharmacy education must include programmes that assist students in developing resilience-enhancing behaviours while in school. This education would improve concentration and performance and build problem-solving skills needed for everyday life as a student and a future pharmacist. By developing these resilient behaviours as students, they will learn to respond flexibly to sudden changes in their environment, such as a major disaster, and respond appropriately to stress caused by colleagues, patients, and uncontrollable factors.

Limitations of the study

This preliminary retrospective study needs to be tested further to more understand the relationship between resilient behaviours and pharmacist experiences or perspectives. A future comparative study of demographics and experiences could make these relationships more transparent. For example, it was difficult to conclude that self-perception of resilience was high because pharmacists had strong resilience-enhancing behaviours or vice versa. Also, this study was conducted in 2021 during the COVID-19 pandemic, possibly influencing the responses of the pharmacists.

Conclusion

This study found that resilient behaviours were most defined in pharmacists who had consistent personal health and well-being routines, participated in volunteer activities, and retained a positive outlook. This understanding of resilience-enhancing behaviours can be integrated into pharmacy education programmes through modelling and self-reflection to nurture greater resilience in students. Resilience can be taught, practised, and developed by encouraging students from the first year of pharmacy education to establish healthy study habits, daily routines, and social networks, guaranteeing academic success in their pharmacy clerkships, exams, and future practice as a pharmacist.

Conflict of interest

The authors declare no conflict of interest.

Author contributions

Conceptualization: DE; Investigation: DE, TS; Data analysis: DE, YF; Writing - original draft: DE, TS; Writing - review and editing: DE, YF, TS. All authors have read and agreed to the published version of the manuscript.

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