ORIGINAL ARTICLE

The impact of COVID-19 pandemic-related stress experienced by Australian nurses

Christina Aggar,[1,2] Christina Samios,[1] Olivia Penman,[1] Nicola Whiteing,[1] Deb Massey,[1] Rae Rafferty,[2] Karen Bowen[2] and Alexandre Stephens[2]

[1]School of Health & Human Sciences, Southern Cross University, Bilinga, Queensland, and [2]Northern New South, Wales Local Health District, Ballina, New South Wales, Australia

ABSTRACT: *Globally, the impact of COVID-19 on healthcare workers' mental health has been a major focus of recent research. However, Australian research involving nurses, particularly across the acute care sector, is limited. This cross-sectional research aimed to explore the impact of pandemic-related stress on psychological adjustment outcomes and potential protective factors for nurses (n = 767) working in the Australian acute care sector during the COVID-19 pandemic. Nurses completed an online questionnaire with psychometrically validated measures of pandemic-related stress, psychological adjustment outcomes (depression, anxiety, and subjective well-being), and protective factors (posttraumatic growth and self-compassion). Descriptive analyses revealed that pandemic-related stress was reported by 17.7% of the participants. Psychological adjustment outcome scores above normal for depression (27.5%) and anxiety (22.0%) were found, and 36.4% of the participants reported poor subjective well-being. Regression analyses suggest that pandemic-related stress predicted greater depression (B = 0.32, SE = 0.02, 95% confidence interval [0.28, 0.35]) and anxiety (B = 0.26, SE = 0.01, 95% confidence interval [0.24, 0.29]) and less subjective well-being (B = −0.14, SE = 0.01, 95% confidence interval [−0.16, −0.12]). Self-compassion weakened the relationship between pandemic-related stress and greater depression, however, exacerbated the relationship between pandemic-related stress and less subjective well-being. Posttraumatic growth reduced the negative relationship between pandemic-related stress and psychological adjustment outcomes. These findings will inform strategies to facilitate psychological resources that support nurses' psychological adjustment, enabling better pandemic preparedness at both an individual and organizational level.*

KEY WORDS: *anxiety, COVID-19, depression, nurses, posttraumatic growth, psychological.*

INTRODUCTION

Pandemics often occur quickly and without warning. The current COVID-19 pandemic is one such example of a fast-emerging pandemic that has placed immense pressure on the healthcare workforce, globally (World Health Organization [WHO] 2021). The WHO has recommended that healthcare workers' physical and mental health and psychosocial well-being require identification and management (WHO 2020). Psychological burden has impacted between 12% and 67% of nurses during the COVID-19 pandemic (Vizheh et al. 2020). Consequently, suicide rates among nurses are predicted to increase during the COVID-19 pandemic as a result of work-related stressors and mental health problems (Davis et al. 2021). The monitoring and surveillance of clinician's mental health and associated workplace characteristics are critical (Jackson et al. 2020).

Nurses play an integral role in pandemic preparedness (Corless et al. 2018), yet frequently report to be left out of any response planning or decision-making (Corless et al. 2018; Wilkinson & Matzo 2015). This leads to a perception among nurses that their needs and concerns during a pandemic have not been considered (Maben & Bridges 2020). A recent systematic review reported that nurses feel ill-prepared to respond effectively to a pandemic and highlighted the benefits of further research to understand the experiences of nurses during pandemic events (Labrague et al. 2018). This study aims to explore the impact of pandemic-related stress experienced by nurses working in the acute care sector during COVID-19 on psychological adjustment outcomes.

BACKGROUND

From epidemics to pandemics, nurses have reported severe negative psychological responses, including post-traumatic stress, often leading to resignation (Marvaldi et al. 2021). It is estimated that between 30% and 80% of nurses do not wish to attend work during pandemics (Wilkinson & Matzo 2015). A nurse's role and work environment often change during a pandemic; new protocols and work practices, such as changing from face-to-face to video and telephone consultations, have particularly been the case for mental health and palliative care clinicians (Maben & Bridges 2020). Such redeployment during pandemics and working with new or emerging skills, often within a different team, increase nurses' stress symptoms (Wilkinson & Matzo 2015).

Prior to COVID-19, global trends in psychological burden and suicide among nurses were greater than the general population (Maharaj et al. 2018). Mindfulness and resilience programmes have been evaluated to support those experiencing work-related psychological burden (Jung et al. 2021). It is anticipated that nurse's psychological burden will potentially increase in the context of the COVID-19 global pandemic (Davis et al. 2021). Consequently, there has been a number of international studies exploring the psychological burden of healthcare workers during the COVID-19 pandemic. A large proportion of surveyed healthcare workers from 45 countries experienced secondary traumatic stress and burnout with high levels of emotional exhaustion and depersonalization (Orrù et al. 2021). These negative health outcomes were associated with increased exposure to patient physical pain and psychological suffering (Orrù et al. 2021). These findings reflect similar research conducted with frontline nurses in Wuhan who reported burnout related to emotional exhaustion, depersonalization, and reduced personal accomplishment (Zhang et al. 2020). Associated factors for increased psychological distress include fears of infection of self or loved ones, social stigma, lack of appropriate personal protective equipment, and increased volume and intensity workloads (Digby et al. 2021; Zhang et al. 2020).

During a disaster, a nurse's physical fitness and psychological adjustment are as important as technical or clinical skills in the provision of optimal care to patients (Gowing et al. 2017). Caring for patients during a pandemic can put great stress on nurses, resulting in negative psychological outcomes, such as burnout, compassion fatigue, depression, anxiety, irritability, and in some cases, a posttraumatic stress response (Greenberg et al. 2020; Said & Chiang 2020). The importance of good psychological care and a resilient nursing workforce was noted by Wenji et al. (2015) in ensuring nurses can 'bounce back' to maintain a sustainable way of working. Social and organizational support (Labrague & De los Santos 2020) and resilience coping and self-efficacy (Shahrour & Dardas 2020) have been highlighted to be protective factors against COVID-19-associated anxiety (Labrague & De los Santos 2020) and acute and post-traumatic stress (Shahrour & Dardas 2020).

Self-compassion, which broadly refers to being empathic and understanding towards oneself, as you might to a close friend, in times of suffering (Neff 2003), might be a protective factor for nurses' psychological adjustment in the face of pandemic-related stress. As defined by Neff (2003), self-compassion is comprised

of three dimensions, namely self-kindness (i.e. being kind and understanding towards oneself rather than overly self-critical at times of suffering), common humanity (i.e. perceiving one's experience of suffering as part of the larger human experience rather than an isolating experience), and mindfulness (i.e. holding painful thoughts and emotions in balanced awareness rather than over-identifying with them). Self-compassion has been shown to buffer the negative effect of perceived stress on job burnout in nurses (Abdollahi et al. 2020). However, there is also research to indicate that self-compassion amplifies the negative effect of stress on burnout in nurses (Dev et al. 2020). As such, it is important to understand the potentially complex role self-compassion plays in nurses' psychological adjustment to highly stressful work events, such as a pandemic.

In addition, the perception of positive outcomes and personal benefits following a highly stressful event (Tedeschi & Calhoun 1996), termed posttraumatic growth, might protect nurses' psychological adjustment to highly stressful events, such as the pandemic, because posttraumatic growth can transform the meaning of a stressor into something more positive. Posttraumatic growth can occur in areas such as perceiving new possibilities (e.g. establishing a new path for one's life), having a greater appreciation of life (e.g. appreciating each day), spiritual change (e.g. having a stronger religious faith), changes in relationships with others (e.g. perceiving a greater sense of closeness with others), and perceiving greater personal strength (e.g. knowing one can handle difficulties). A large-scale study of nurses ($n = 12\ 596$) identified that over one-thirds of nurses experienced posttraumatic growth due to the COVID-19 pandemic (Chen et al. 2021). Posttraumatic growth is associated with less depression and greater positive well-being (Helgeson et al. 2006) and has been identified to buffer the negative effects of work-related stress on psychological adjustment outcomes (Samios et al. 2012).

Gowing et al. (2017) asserts that research carried out during a pandemic event is important in evaluating the level of preparedness of individuals and organizations for the future. The level of COVID-19 outbreak, health impact, and government responses between countries have varied significantly, and consequently, the experiences of healthcare workers have differed across the globe (Orrù et al. 2021). Presently, much of the available literature on the COVID-19 pandemic has been conducted in countries that have experienced significant numbers of COVID-19 cases such as China (Chen et al. 2021; Master et al. 2020; Zhang et al.

2020), the United States of America (Feingold et al. 2021; Hennein et al. 2021), and European (Tomaszek & Muchacka-Cymerman 2020; Vindrola-Padros et al. 2020), Asian, and Middle Eastern countries (Labrague & De los Santos 2020; Shahrour & Dardas 2020). Research in the Australian context has been overlooked, with only a few studies exploring the experiences of Australian nurses during COVID-19. These studies are limited to nurses working in primary healthcare (Halcomb et al. 2020) and critical care (Hammond et al. 2021) sectors, small sample sizes (Digby et al. 2021; Dobson et al. 2021), and research conducted in single facilities (Digby et al. 2021; Dobson et al. 2021; Holton et al. 2021). Much of the nursing research has been carried out following the events of internal and external disasters, with a focus on the clinical and technical preparedness of speciality nurses employed in high acuity units (Gowing et al. 2017). Therefore, there is a critical need for research in the Australian context that explores the impact of COVID-19 on nursing staff working across the acute care sector.

Aim

To explore the impact of pandemic-related stress experienced by nurses working in the acute care sector during COVID-19 on psychological adjustment outcomes.

RESEARCH QUESTIONS

1. What is the prevalence of COVID-19 pandemic-related stress among nurses?
2. What is the prevalence of depression, anxiety, and subjective well-being among nurses during the COVID-19 pandemic?
3. What is the impact of COVID-19 pandemic-related stress on nurses' psychological adjustment (i.e. on depression, anxiety, and subjective well-being)?
4. Do psychological resources such as self-compassion (i.e. treating oneself as you would a friend in times of suffering) and posttraumatic growth (i.e. experiencing growth as a result of the pandemic) protect nurses' psychological adjustment from the negative effects of pandemic-related stress?

METHODS

This study used a cross-sectional online survey with a convenience sample of nurses working in the acute care sector (healthcare services provided in a hospital

setting) across the state of NSW, Australia. All nurses, midwives or student nurses, or midwives registered with the Australian Health Practitioner Regulation Agency (AHPRA) and working in the state of NSW were eligible for inclusion in the study. Anyone not registered as a nurse, midwife, or student nurse or midwife with AHPRA and who do not work in NSW were not eligible to participate in the study. A link to the online survey was disseminated via email to all nurses and midwives in Local Health Districts and Health Networks across NSW. Data were collected from September to November 2020.

Measurement scales

The questionnaire included demographic characteristics and pandemic context variables (e.g. cared for a COVID-19 patient and years of nursing experience) alongside the following psychometrically validated scales:

Impact of Event Scale–revised (IES-R; Weiss & Marmar 1997)
The 22-item IES-R was used to measure the degree of nurses' subjective stress experienced in response to the COVID-19 pandemic (herein referred to as pandemic-related stress; Weiss & Marmar 1997). Items measure how distressing each difficulty has been during the past week with respect to the COVID-19 pandemic on a five-point Likert scale from 0 (*not at all distressing*) to 4 (*extremely distressing*). While this is not a diagnostic tool, a raw score of 33 or above is used as a cut-off to indicate likely posttraumatic stress (Di Crosta *et al.* 2020).

The Depression Anxiety Stress Scales 21 (DASS-21; Lovibond & Lovibond 1995)
The seven-item depression subscale and the seven-item anxiety subscale were used to measure nurses' symptoms of depression and anxiety during the past week. Items are rated on a four-point scale from 0 (*never*) to 3 (*almost always*). Scores are multiplied by 2 to be consistent with the full 42-item version of the scale. Higher scores indicate greater severity of depression and anxiety symptoms. Lovibond and Lovibond (1995) distinguish scores into mild, moderate, severe, and extremely severe symptoms of depression and anxiety (see Table 1).

The World Health Organisation Five Well-Being Index (WHO-5; Topp et al*. 2015)*
The widely used five-item WHO-5 measured nurses' subjective well-being over the past 2 weeks. Items were

TABLE 1 *Interpretation of depression and anxiety scores (Lovibond & Lovibond 1995)*

Interpretation	Depression score	Anxiety score
Normal	0–9	0–7
Mild	10–13	8–9
Moderate	14–20	10–14
Severe	21–27	15–19
Extremely severe	28+	20+

rated on a six-point Likert scale from 0 (*at no time*) to 5 (*all of the time*). Higher scores indicate greater subjective well-being, with a score below 13 reflecting poor subjective well-being (Topp *et al.* 2015).

Self-Compassion Scale–short form (Raes et al*. 2011)*
The 12-item Self-Compassion Scale–Short Form was used to measure nurses' global mindset of self-compassion. Items were rated on a five-point Likert scale from 1 (*almost never*) to 5 (*almost always*), with higher scores indicating greater self-compassion (Raes *et al.* 2011).

Posttraumatic Growth Inventory–short form (Cann et al*. 2010)*
The 10-item short form of the Posttraumatic Growth Inventory was used to measure the overall degree of positive change experienced by nurses as a result of the COVID-19 pandemic. Items were rated on a six-point Likert scale measuring the degree to which they had experienced the specific positive change as a result of the pandemic from 0 (*did not experience this change*) to 5 (*experienced this change to a very great degree*), with higher scores indicating greater positive change in response to the pandemic (Cann *et al.* 2010).

Data analysis

All data were analysed using SPSS V26. Data were checked for completeness and grossly missing data were removed. Percentage of data that were missing and pattern of missingness were determined. The key variables were checked for internal consistency and Cronbach's α was calculated. A combination of one-way analysis of variance (ANOVA) and correlational analysis was performed to test for covariates.

Three hierarchical multiple regression analyses were performed to examine the relationship between pandemic-related stress and each indicator of psychological adjustment (i.e. depression, anxiety, and subjective well-being) as well as the potential moderating

roles of self-compassion and posttraumatic growth in the pandemic-related stress–psychological adjustment relationship. Predictors included in each regression analysis were pandemic-related stress, self-compassion, posttraumatic growth, and the interaction between pandemic-related stress and self-compassion and pandemic-related stress and posttraumatic growth. Pandemic-related stress was the predictor variable, and self-compassion and posttraumatic growth were treated as moderator variables. Pandemic-related stress and moderator variables were mean centred prior to entry into the regression model and computing of the interaction terms. All significant interactions were followed up with simple slopes analysis. Interaction effect sizes are typically small (Aguinis *et al.* 2005), and so we conducted an a priori power analysis in G*Power 3.1.9.2 (Faul *et al.* 2007) for a small effect size (f^2) of 0.02 with alpha 0.05, power 0.80, and seven predictors in total in the model. This indicated that $n = 395$ is required to detect a small effect and that the present sample size was more than adequate to detect a significant interaction. Significant differences were considered at $P < 0.05$ unless specified otherwise.

RESULTS

Missing data

After removing cases with fully or grossly incomplete responses, all variables had less than 5% missing data excluding pandemic-related stress (6.7%) and age (11.2%). Data were determined to be missing completely at random, $\square^2$ (168) = 195.13, $P = 0.075$. Missing data were addressed using list-wise deletion to include only cases with complete responses for all variables included in the model (years of experience, cared for a COVID-19 patient, depression, anxiety, subjective well-being, posttraumatic growth, self-compassion, and pandemic-related stress). This produced a final sample of 767 participants from a total 1265 responses received.

All scales were found to have good internal reliability (all observed Cronbach's α > 0.85).

Participants

Participant characteristics are presented in Table 2. Participants ranged in age from 21 to 74 years, with between less than 1 and 56 years of experience. Participants were predominantly female and working as registered nurses. Most participants were in a relationship

TABLE 2 *Participant characteristics*

Characteristic	M (SD), x–x
Age ($n = 685$)	45.93 (11.95), 21–74
Years of experience ($n = 767$)	21.20 (12.95), 0–56
Gender ($n = 758$)	n (%)
Female	678 (89.45)
Male	80 (10.55)
Relationship status ($n = 760$)	
In a relationship[†]	546 (71.84)
Single[‡]	214 (28.16)
Caring responsibilities ($n = 762$)	
Caring responsibilities	152 (19.95)
No caring responsibilities	610 (80.05)
Role ($n = 764$)	
Registered Nurse	682 (89.27)
Registered Midwife	48 (6.28)
Enrolled Nurse	28 (3.66)
Assistant in Nursing	4 (0.52)
Other	2 (0.26)
COVID-19 patient attended the service ($n = 767$)	
COVID-19 patient attended the service	515 (67.14)
COVID-19 patient did not attend the service	252 (32.86)
Provided care for a COVID-19 patient ($n = 767$)	
Provided care for a COVID-19 patient	369 (48.11)
Did not provide care for a COVID-19 patient	398 (51.89)
Redeployed ($n = 766$)	
Redeployed due to the COVID-19 response	183 (23.89)
Was not redeployed due to the COVID-19 response	583 (76.11)
Experienced an event in the previous 12 months (i.e. bushfire, flood, drought) ($n = 761$)	
Experienced an event in the previous 12 months	456 (59.92)
Did not experience an event in the previous 12 months	305 (40.08)

[†]In a relationship includes those who are married, in a de facto relationship, and have a partner, boyfriend, or girlfriend.

[‡]Single includes those who are single, separated, divorced, and widowed.

and approximately one-fifth had caring responsibilities. Approximately two-thirds of participants reported that a suspected or confirmed COVID-19 case had attended their service and half reported providing direct care to a COVID-19 patient. Over one-fifth of participants were redeployed due to COVID-19.

Descriptive statistics

Descriptive statistics for outcome variables are presented in Table 3. Mean scores for depression, anxiety, and IES-R scales were within the normal range. Just over one-quarter of the participants (27.5%) scored

TABLE 3 *Descriptive statistics for key outcome variables* (n = 767)

Outcome	M	SD	95% CI Lower	95% CI Upper	Min	Max
Depression	6.71	9.17	6.06	7.36	0.00	42.00
Anxiety	4.62	7.37	4.09	5.14	0.00	42.00
Well-being	14.01	5.62	13.61	14.41	0.00	25.00
Pandemic-related stress	16.37	8.04	37.61	38.75	18.00	60.00
Self-compassion	38.18	8.05	37.61	38.75	18.00	60.00
Posttraumatic growth	21.60	11.72	20.77	22.43	0.00	50.00

above normal for depression; 8.7% had mild, 9.4% had moderate, 4.2% had severe, and 5.2% had extremely severe symptoms of depression. Similarly, mean scores for anxiety were within the normal range. One-fifth (22.0%) of participants scored above normal for anxiety; 5.9% had mild, 7.0% had moderate, 3.4% had severe, and 5.7% had extremely severe anxiety. On the IES-R, 17.7% of participants scored 33 or above, indicating the likely presence of posttraumatic stress (Di Crosta *et al.* 2020). Additionally, 36.4% had subjective well-being scores below 13, indicating poor subjective well-being (WHO 1998).

Covariate analysis

We empirically tested for demographic and pandemic context variables that relate to the variables under investigation in order to adjust for their effects in the regression analyses. One-way ANOVAs and correlations were performed, and we used a conservative alpha value of $P < 0.001$ to determine significant covariates. Significant covariates are presented below.

Caring for COVID-19 patients was associated with greater depression ($r = 0.11$, $P < 0.001$) and less subjective well-being ($r = -0.12$). Additionally, years of experience was negatively associated with anxiety ($r = -0.16$, $P < 0.001$) and positively correlated with subjective well-being ($r = 0.11$, $P < 0.001$) and self-compassion ($r = 0.14$, $P < 0.001$). Therefore, years of experience and cared for a COVID-19 patient were controlled for in the regression models.

Correlations between key variables

Greater pandemic-related stress was associated with greater depression and less subjective well-being, less self-compassion, and greater posttraumatic growth (Table 4). Greater depression was associated with greater anxiety and less subjective well-being, less self-compassion, and less posttraumatic growth. Greater anxiety was associated with less subjective well-being, less self-compassion, and less years of experience. Greater subjective well-being was associated with greater self-compassion and posttraumatic growth and more years of experience.

Moderated regression analysis

The covariates years of experience and cared for a COVID-19 patient were entered at Step 1. Pandemic-related stress was entered at Step 2, followed by moderator variables self-compassion and posttraumatic growth at Steps 3 and 4, respectively. On the final step of the regression equation, the interaction terms between pandemic-related stress and self-compassion and the interaction term between pandemic-related stress and posttraumatic growth were entered. Significant interactions were followed up with simple slopes analyses to determine moderator effects. Normality was assumed through the inspection of standardized and predicted residual plots. Additionally, Cook's distance

TABLE 4 *Correlations between variables* (n = 767)

	1	2	3	4	5	6	7
1. Pandemic-related stress	–						
2. Depression	0.59***	–					
3. Anxiety	0.62***	0.75***	–				
4. Subjective well-being	−0.44***	−0.66***	−0.52***	–			
5. Self-compassion	−0.26***	−0.42***	−0.28***	0.48***	–		
6. Posttraumatic growth	0.14***	−0.14***	−0.03	0.25***	0.16***	–	
7. Years of experience	−0.06	−0.06	−0.14***	0.10**	0.13***	−0.04	–
8. Cared for a COVID-19 patient[†]	0.12***	0.10***	0.08*	−0.10**	−0.07	0.02	−0.23***

*$P < 0.05$. **$P < 0.01$. ***$P < 0.001$.

[†]Did not care for a COVID-19 patient = 1, cared for a COVID-19 patient = 2.

values of <1 indicated no influential cases, tolerance values well above 0.10, and VIF values well below 10, indicated that there were no issues with multicollinearity.

The final models accounted for a significant amount of the variance in depression, anxiety, and subjective well-being (Table 5). Years of experience corresponded to reduced anxiety. Pandemic-related stress was a significant positive predictor of depression and anxiety, and a significant negative predictor of subjective well-being. As such, greater pandemic-related stress predicted greater depression and anxiety and less subjective well-being.

Self-compassion was related to less depression and anxiety and greater subjective well-being. After accounting for the role of self-compassion in psychological adjustment outcomes, posttraumatic growth also related to less depression and anxiety and greater subjective well-being.

The relationship between pandemic-related stress and depression and subjective well-being varied as a function of self-compassion. Additionally, the relationship between pandemic-related stress and each psychological adjustment outcome varied according to posttraumatic growth. This suggests that the relationship between pandemic-related stress and depression and subjective well-being was moderated by self-compassion and posttraumatic growth. The relationship between pandemic-related stress and anxiety was moderated by posttraumatic growth.

Simple slopes analysis demonstrated that self-compassion reduced the strength of the relationship between pandemic-related stress and greater depression; self-compassion was found to exacerbate the negative effect of pandemic-related stress on subjective well-being; and posttraumatic growth reduced the negative relationship between pandemic-related stress and each psychological adjustment outcome (Table 6).

DISCUSSION

Nurses require sufficient knowledge, competence, and physical and psychological preparedness to effectively manage unprecedented pandemic situations and deliver effective patient care (Wilkinson & Matzo 2015). The aim of this study was to explore the impact of pandemic-related stress experienced by nurses working in the acute care sector during COVID-19, on psychological adjustment outcomes. The study found that greater pandemic-related stress was a significant predictor of poorer psychological adjustment and was significantly associated with caring for COVID-19 patients. Self-compassion weakened the negative relationship between pandemic-related stress and depression, however, exacerbated the relationship with subjective well-being. Posttraumatic growth reduced the negative relationship between pandemic-related stress and psychological adjustment outcomes.

Pandemic-related stress

The majority of nurses in this study reported normal levels of COVID-19 pandemic-related stress. However, approximately one-fifth of nurses reported high levels

TABLE 5 *Regression model predicting depression, anxiety, and subjective well-being* (n = 767)

Model variable	Depression			Anxiety			Subjective well-being		
	ΔR^2	B	$SE\ B$	ΔR^2	B	$SE\ B$	ΔR^2	B	$SE\ B$
Step 1	0.01**			0.02***			0.02***		
Years of experience		−0.03	0.03		−0.07***	0.02		0.04*	0.02
Cared for a COVID-19 patient[†]		1.71	0.68		0.75	0.54		−0.95*	0.41
Step 2	0.34***			0.37***			0.18***		
Pandemic-related stress		0.32***	0.02		0.26***	0.01		−0.14***	0.01
Step 3	0.07***			0.01***			0.13***		
Self-compassion		−0.32***	0.03		−0.11***	0.03		0.27***	0.02
Step 4	0.03***			0.01***			0.06***		
Posttraumatic growth		−0.14***	0.02		−0.06***	0.02		0.12***	0.01
Step 5	0.03***			0.01***			0.02***		
Pandemic-related stress × self-compassion		−0.01***	0.002		−0.002	0.001		−0.003**	0.001
Pandemic-related stress × posttraumatic growth		−0.01***	0.001		−0.003**	0.001		0.003***	0.001
Total R^2	0.48***			0.42***			0.41***		

*P < 0.05. **P < 0.01. ***P < 0.001.

[†]Did not care for a COVID-19 patient = 1, cared for a COVID-19 patient = 2. Regression coefficients reported are unstandardized. Regression coefficients for each predictor are reported at the point of entry.

TABLE 6 *Simple slopes analysis for the relationship between pandemic-related stress and each psychological adjustment outcome* (n = 767)

	Psychological adjustment outcome								
	Depression			Anxiety			Subjective well-being		
Values of the moderator	B (SE B)	t	P	B (SE B)	t	P	B (SE B)	t	P
Low self-compassion	0.33 (0.02)	18.64	<0.001		n/a[†]		−0.11 (0.01)	9.38	<0.001
High self-compassion	0.24 (0.02)	10.48	<0.001				−0.16 (0.02)	9.38	<0.001
Low posttraumatic growth	0.34 (0.02)	16.34	<0.001	0.29 (0.02)	16.11	<0.001	−0.17 (0.01)	12.63	<0.001
High posttraumatic growth	0.23 (0.02)	12.50	<0.001	0.22 (0.02)	14.12	<0.001	−0.10 (0.01)	8.11	<0.001

[†]No simple slopes analysis conducted due to non-significant interaction. Regression coefficients reported are unstandardized. Simple slopes are for relatively high (+1 *SD*) and low (−1 *SD*) levels of the moderator.

of COVID-19 pandemic-related stress to indicate clinical concern for posttraumatic stress (Di Crosta *et al.* 2020). While the heterogeneity of the validated measurement tools makes it difficult to compare results, the prevalence of pandemic-related stress reported in this study is lower than levels reported in healthcare workers in other states of Australia (29%; Dobson *et al.* 2021) and China (73.8%; Master *et al.* 2020), and substantially higher than in Singapore during the COVID-19 pandemic (5.7%; Tan *et al.* 2020).

Similar to current research, greater pandemic-related stress experienced by nurses in this study was associated with caring for COVID-19 patients (Master *et al.* 2020; Shahrour & Dardas 2020). Labrague and De los Santos (2020) reported that nurses are more likely to experience lower stress related to COVID-19 if they perceive higher organizational and social support, and demonstrate resilience. Integral to fostering resilience to better cope with trauma is nurturing the ability to derive meaning from, and the belief that positive change can be achieved in response to negative life experiences (i.e. posttraumatic growth), as well as kindness towards oneself (i.e. self-compassion; Basharpoor *et al.* 2021; Scoglio *et al.* 2018). Therefore, to better support vulnerable, at risk nurses, therapeutic interventions offered by organizations to develop psychological resources to better cope with pandemics may be warranted.

Psychological adjustment outcomes (depression, anxiety, and subjective well-being)

Mild-to-extremely severe symptoms of depression were reported by 27.5% of nurses in this study, and 22% reported mild-to-extremely severe symptoms of anxiety. This severity of depression and anxiety symptoms are similar to those reported by Australian and New Zealand critical care healthcare workers during COVID-19

(n = 320, 21%, and 20%, respectively, Dobson *et al.* 2021; n = 2871, 21.6%, and 28.6%, respectively, Hammond *et al.* 2021). Similarly, a recent systematic review and meta-analysis reported that 25% of healthcare workers worldwide have experienced depression and anxiety during COVID-19 (Pappa *et al.* 2020), with higher levels reported by nurses (Vizheh *et al.* 2020). In addition to the heterogeneity of validated measurement tools, culture differences and the degree of the spread of COVID-19 make it difficult to compare reported levels of psychological distress.

It is well reported that nurses are a higher risk group for depression and anxiety than the national average (Creedy *et al.* 2017; Maharaj *et al.* 2018; Mealer *et al.* 2009). Concerns for nurses and midwives' mental health prior to COVID-19 have been highlighted in the literature, including the collective and organizational responsibility for resilience (Maben & Bridges 2020). The current study is unable to determine whether depression and anxiety among nurses and midwives are greater than prior to the COVID-19 pandemic, or is it able to determine whether any increases are a consequence of the pandemic. However, there is evidence that brief mindfulness-based interventions may reduce stress in frontline healthcare workers, including during the COVID-19 pandemic (Rodríguez-Rey *et al.* 2020).

Poor subjective well-being was reported by 36% of nurses in this study. Subjective well-being reflects a person's own subjective judgement about the degree to which they experience positive emotions (in balance with negative emotions) and feel satisfied with their life (Diener 1984). Measuring subjective well-being provides important additional information about psychological adjustment than would be possible with a single focus on distress (i.e. depression and anxiety). As such, a nurse who reports poor subjective well-being is not only experiencing greater distress but is also

experiencing fewer positive emotions and poorer quality of life (Topp *et al*. 2015). Positive emotions are important for nurses' ability to manage stress in general because positive emotions promote resilience in times of stress, restoring coping resources, and promoting strategies that are distinct from those that regulate distress (Tugade & Fredrickson 2007).

This study found that pandemic-related stress was a significant predictor of poorer psychological adjustment. This finding is consistent with previous research that demonstrated subjective distress was associated with poorer psychological adjustment in people who experienced various stressors (Samios *et al*. 2020) and pandemic-related stress was associated with greater depression and anxiety (Vanaken *et al*. 2020). Given that the present study is cross-sectional, as is the bulk of the research, it is possible that while theory supports the notion that pandemic-related stress would impact psychological adjustment outcomes (Park 2010), in fact poorer psychological outcomes might mean a nurse experiences and reports greater pandemic-related stress.

Psychological resources (self-compassion and posttraumatic growth)

Self-compassion is an emotion regulation capacity whereby in times of suffering people are kind to themselves rather than judgemental, they recognize they are not alone in their suffering because it is part of the human experience, and they hold their thoughts and feelings in balanced awareness rather than over-identifying with them (Neff 2003). The nurses in this study reported mean self-compassion scores (38.18 + 8.05) representative of non-healthcare worker samples (36.00 ± 7.33; Raes *et al*. 2011), with more experienced nurses reporting greater self-compassion. This is valuable information, given self-compassion is associated with less pandemic-related stress, better psychological adjustment outcomes, and greater posttraumatic growth. Less experienced nurses may require more support to develop psychological resources to better cope with future pandemics and disasters. Graduate nurses transitioning to practice during pandemics may particularly benefit from the emotional support of more experienced nurses (Gellerstedt *et al*. 2019

Importantly, results demonstrated that in addition to predicting better psychological adjustment outcomes, self-compassion also protected nurses' depressive symptoms from the negative impact of pandemic-related stress. This indicates that, consistent with the literature

(Neff *et al*. 2007), in general, self-compassion is beneficial for adaptive psychological functioning during a pandemic (Lau *et al*. 2020). As such, mindful self-compassion interventions could be used to bolster self-compassion (Neff & Germer 2013) in nurses. However, careful attention should be paid to enhancing self-compassion in relation to subjective well-being in nurses. This is because, unexpectedly, self-compassion was found to exacerbate the negative effect of pandemic-related stress on subjective well-being.

This unexpected finding is consistent with the finding that self-compassion amplifies the negative effect of stress on burnout in nurses (Dev *et al*. 2020). Indicating that while self-compassion might be protective of depressive symptoms, it might exacerbate the negative impacts of pandemic-related stress on subjective well-being, which, like burnout, includes a cognitive appraisal of one's situation, whether regarding work or life in general. It is possible that this finding can be attributed to nurses experiencing a lack of control in their work environment (Dev *et al*. 2020), and that self-compassion (and in particular the self-kindness dimension) is of no benefit to nurses' degree of happiness and appraisal of life.

Longitudinal nursing research that examines the dimensions of self-compassion are needed to better understand self-compassion as it relates to different indicators of psychological adjustment over time. It is possible that nurses with greater self-compassion will be more aware of their negative thoughts and feelings about the pandemic because they can 'sit with' pain and suffering in a non-judgemental way, that is, they have greater mindfulness (Neff 2003). This means their subjective well-being will initially be more negatively impacted by pandemic-related stress, but that over time their subjective well-being will improve because of their lack of experiential avoidance and resulting ability to cognitively process pandemic-related stress.

Posttraumatic growth focuses on positive outcomes perceived following a traumatic or highly stressful event or situation (Tedeschi & Calhoun 1996), such as COVID-19, and has been found to increase emotional intelligence (Li *et al*. 2015) and life satisfaction (Itzhaki *et al*. 2015) in nurses. Posttraumatic growth scores ($M = 21.60 \pm 11.72$) were lower than those of nurses in China ($M = 28.00 \pm 11.5$; Chen *et al*. 2021) and a general population sample in Spain ($M = 36.51 \pm 7.60$; Vazquez *et al*. 2021) during COVID-19. This disparity is not unexpected because people, including nurses, in countries more profoundly impacted by COVID-19 may experience greater pandemic-related stress, which

drives a search for positives in a traumatic or highly stressful situation as a means to restore a sense that the world is comprehensible and that their own life matters (Park 2010).

Posttraumatic growth was an important predictor of better psychological adjustment and pandemic-related posttraumatic growth reduced the strength of the relationship between pandemic-related stress and poorer psychological adjustment. This indicates that pandemic-related posttraumatic growth reduces the negative impact of pandemic-related stress on nurses' psychological adjustment outcomes, and that although posttraumatic growth is not always linked to or protective of better psychological adjustment in the short term (Helgeson et al. 2006), it was for nurses in this study 8–10 months into the COVID-19 pandemic. In addition to psychological resources such as self-compassion (Wong & Yeung 2017), interventions at the individual and organization level such as sharing experiences and counselling can also facilitate posttraumatic growth (Jackson 2021).

Limitations

While the study analysed 767 complete surveys, this only represents a small proportion of the population of nurses working in acute care settings in NSW. The study is also at high risk of non-response bias, which may impact the generalizability of the findings. In addition, and common to stress research, we were unable to measure psychological adjustment in this sample of nurses before the pandemic, which would strengthen the results by adjusting for the effects of nurses' pre-pandemic psychological adjustment. Furthermore, due to the cross-sectional design, the causal impact of pandemic-related stress on psychological adjustment outcomes cannot be concluded. Longitudinal and qualitative studies would provide a more comprehensive understanding of nurses' experiences, and the long-term impact of COVID-19.

CONCLUSION

The findings of this study provide key information with regard to supporting nurses working in the acute care sector during a pandemic by acknowledging the relationship between pandemic-related stress and nurses' psychological adjustment, and the facilitation of psychological resources. Nurse leaders and those more experienced nurses are key to supporting positive

psychological change during highly challenging and stressful times. The extent and ability of growth by individuals and organizations post-COVID-19 requires further examination.

IMPLICATIONS FOR CLINICAL PRACTICE

This new knowledge will inform not only the current initiatives to support nurses' health and well-being but also those of the future to enable better preparation at an individual and organizational level. Most importantly, this research highlights the opportunities that COVID-19 presents to improve our nursing practices and grow as a profession. By acknowledging the impact of COVID-19 and the ongoing consequences, we can leverage our growth to reassess and re-evaluate our shared values for positive change.

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