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CLINICAL RESEARCH ARTICLE



Finding the positives from the COVID-19 pandemic: factors associated with posttraumatic growth among nurses in Hong Kong

Nelson Chun-Yiu Yeung ^a, Eliza Lai-Yi Wong ^b, Annie Wai-Ling Cheung ^b, Cecilia Shih-Ya Leung^a, Eng-Kiong Yeoh ^b and Samuel Yeung-Shan Wong ^a

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ABSTRACT

Background: Due to active involvement with patients for COVID-19 treatments, nurses are susceptible to adverse psychological outcomes amid the COVID-19 pandemic. Despite the distress, studies have suggested that nurses are able to experience positive changes (i.e. posttraumatic growth; PTG) during the pandemic. Research on other populations has also indicated that COVID-19-specific worries and work-related coping resources are associated with people's positive changes during the pandemic.

Objective: This study examined how socio-demographic characteristics, COVID-19-related worries, and work-related variables (satisfaction with work and workplace pandemic guidelines) were associated with PTG among nurses in Hong Kong.

Methods: Nurses ($N = 1510$) working in hospitals and community settings were recruited through nursing associations in Hong Kong between 8 August 2020 and 22 September 2020. They were invited to complete a cross-sectional survey measuring their sociodemographic characteristics, COVID-19 worries, and satisfaction with work and workplace pandemic-control measures.

Results: Results from hierarchical regressions found that those working non-full-time ($\beta = -0.06$), affiliating with a religion ($\beta = 0.24$), having higher COVID-19-related worries and psychological distress (β s ranging from 0.12–0.15), and having higher work satisfaction ($\beta = 0.14$) were associated with higher PTG ($ps < .05$). Moreover, a significant interaction between psychological distress and satisfaction with workplace pandemic control guidelines emerged in explaining PTG ($\beta = 0.08$, $p < .05$), such that guideline satisfaction was only associated with higher PTG among those with higher distress ($\beta = 0.09$, $p = .03$), but not those with lower distress ($\beta = -0.05$, $p > .05$).

Conclusions: Nurses in Hong Kong did report positive changes amid the COVID-19 pandemic. Future studies could focus on the contributing factors of PTG to design for effective strategies to enhance resources for nurses to promote positive psychosocial outcomes.

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COVID-19; enfermeras;
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关键词

創傷後成長; 新冠肺炎; 護士; 工作滿意度; 擔憂

HIGHLIGHTS

- Work satisfaction was associated with nurses' posttraumatic growth (PTG) amid COVID-19.
- Workplace pandemic control guidelines satisfaction was associated with PTG only among nurses with higher distress.
- To enhance nurses' PTG, those work-related factors should be addressed.

Encontrar los aspectos positivos de la pandemia COVID-19: Factores asociados con el Crecimiento Postraumático entre las(os) enfermeras(os) en Hong Kong

Antecedentes: Debido a la participación activa de pacientes en los tratamientos de COVID-19, las/os enfermeras son susceptibles a resultados psicológicos adversos en medio de la pandemia de COVID-19. A pesar de la angustia, los estudios han sugerido que las(os) enfermeras(os) pueden experimentar cambios positivos (es decir, crecimiento postraumático; CPT) durante la pandemia. Investigación en otras poblaciones también ha indicado que las preocupaciones específicas por COVID-19 y los recursos de afrontamiento relacionados con el trabajo están asociados a cambios positivos de las personas durante la pandemia.

Objetivo: Este estudio examinó cómo las características sociodemográficas, las preocupaciones relacionadas a COVID-19 y las variables relacionadas con el trabajo (satisfacción con el trabajo y pautas pandémicas en el lugar de trabajo) se asociaron con el CPT entre las(os) enfermeras(os) de Hong Kong.

Métodos: Las(os) enfermeras(os) ($N = 1510$) que trabajan en hospitales y entornos comunitarios fueron reclutadas(os) a través de asociaciones de enfermería en Hong Kong entre el 8 de agosto del 2020 y el 22 de septiembre del 2020. Los participantes fueron invitados a completar una encuesta transversal que midió sus características sociodemográficas, preocupaciones sobre COVID-19 y satisfacción con el trabajo y las medidas de control de pandemias en el lugar de trabajo.

Resultados: Los resultados de regresiones jerárquicas encontraron que aquellos que: no trabajaban a tiempo completo ($\beta = -0.06$), se afiliaban a una religión ($\beta = 0.24$), tenían mayores

preocupaciones y angustia psicológica relacionadas por COVID-19 (β s que oscilan entre 0.12–0.15) y tenían una mayor satisfacción laboral ($\beta = 0.14$), se asociaron con CPT más alto ($ps < .05$). Además, una interacción significativa entre la angustia psicológica y la satisfacción con las pautas de control de la pandemia en el lugar de trabajo, surgió al explicar el CPT ($\beta = 0.08$, $p < .05$), de modo que la satisfacción de la guía sólo se asoció con un CPT más alto entre aquéllos con mayor angustia ($\beta = 0.09$, $p = .03$), pero no en aquéllos con menor angustia ($\beta = -0.05$, $p > .05$).

Conclusiones: Las(os) enfermeras(os) en Hong Kong informaron cambios positivos en medio de la pandemia por COVID-19. Los estudios futuros podrían centrarse en los factores que contribuyen a la CPT para diseñar estrategias eficaces con el fin de mejorar los recursos de las(os) enfermeras(os) para promover resultados psicosociales positivos.

新冠肺炎疫情下的正面經驗: 香港護士創傷後成長的相關因素

背景: 鑑於需要經常接觸接受新型冠狀病毒治療的患者, 護士在疫情期間比起一般大眾更容易出現精神健康問題。即使如此, 不同學術研究皆提出護士們能夠在疫情中找到正面的經歷(亦稱創傷後成長 (Post-traumatic growth, PTG))。其他文獻也同樣指出人們對新型冠狀病毒的顧慮及工作有關的應對資源與他們創傷後成長有一定的關聯。

目的: 這份研究主要調查香港護士們的社會經濟特徵、新型冠狀病毒有關的顧慮、工作有關的因素 (包括對於工作的滿足感、工作場所的疫情應對指引的滿意程度) 與創傷後成長的關聯。

方法: 這份研究於2020年8月8日至9月22日進行。在香港的不同護理組織招募了1510正在醫院和社區環境工作的護士們, 邀請他們完成一份橫斷式問卷, 收集他們關於其社會經濟特徵、對新型冠狀病毒的顧慮、工作滿足感以及工作場所疫情應對措施的資料。

結果: 從層次迴歸分析中可得知, 非全職 ($\beta = -0.06$)、持有宗教信仰 ($\beta = 0.24$)、對於新型冠狀病毒有較高顧慮及精神困擾 (β s介乎 0.12–0.15)和有較高工作滿足感 ($\beta = 0.14$) 的護士傾向感受到較高程度的創傷後成長 ($ps < .05$)。數據也發現, 對於工作疫情防控指引的滿意程度與精神困擾對解釋創傷後成長有顯著交互作用 ($\beta = 0.08$, $p < .05$)。只有在較高的精神困擾的護士當中, 工作疫情防控指引的滿意程度才會與創傷後成長有正向關聯 ($\beta = 0.09$, $p = .03$), 而此現象在精神困擾較低的受訪者中 ($\beta = -0.05$, $p > .05$)未有出現。

總結: 本研究指出香港本地護士在新型冠狀病毒疫情下也感受到創傷後成長。未來的研究可針對創傷後成長的主要因素為相關部門設計改善護士心理健康的措施。

The coronavirus pandemic (COVID-19) has become an international public health emergency, posing continuous threats to lives and healthcare systems worldwide. Since the first reported case on 23 January 2020, Hong Kong has reported 12,302 COVID-19 cases and 213 deaths as of 20 October 2021 (The Government of the Hong Kong Special Administrative Region, 2021). Studies have also found that the COVID-19 and its relevant pandemic control measures bring enormous psychological impacts (e.g. depression and anxiety) on the general populations in Hong Kong (Choi, Hui, & Wan, 2020; Zhao et al., 2020). Compared with pre-pandemic levels, the prevalence of anxiety has risen by 42.3% and depressive symptoms were found to have doubled under the COVID-19 pandemic (Zhao et al., 2020). Those indicate that the COVID-19 pandemic has been highly stressful for people in Hong Kong.

1.1. Healthcare workers' mental health in the context of COVID-19

Amid the COVID-19 pandemic, there has been growing attention towards the needs of healthcare workers. A recent quantitative study also indicated that 12.9% of healthcare workers in Hong Kong reported probable depression (Lam et al., 2020). Among the healthcare workers, nurses constitute the largest part of the

healthcare workforce in an epidemic (Chau et al., 2021). They usually undertake most of the tasks related to infectious disease containment and involve in much closer contact with patients, and spending longer time with patients than physicians (Hamama-Raz & Minerbi, 2019; Walton, Murray, & Christian, 2020). Qualitative studies have found that local nurses report increased workload caring for patients at the hospitals, concerns about the sufficiency of protective equipment and isolation beds/wards at the workplace, worries about contracting COVID-19 and infecting their family members during the pandemic, plus difficulties in coping with rapidly changing pandemic control protocols (Chau et al., 2021; Cheung, Fong, & Bressington, 2020). Another quantitative study in Hong Kong also found that nurses experienced high work stress during the COVID-19 pandemic (Kwok et al., 2021). Such concerns were also observed from prior research on healthcare workers in Hong Kong coping with the pandemic situations of SARS (Severe Acute Respiratory Syndrome) in 2003 (Chan et al., 2005; Ho, Kwong-Lo, Mak, & Wong, 2005) and H1N1 in 2009 (Wong et al., 2010; Wong, Wong, Lee, Cheung, & Griffiths, 2011). Similarly, nurses in Hong Kong are highly susceptible to distress brought forth by the COVID-19 pandemic situation and their job responsibilities.

1.2. Positive changes associated with adjustments to emerging infectious diseases

Despite the distress experienced, people's positive psychological changes resulting from the COVID-19 pandemic have also been explored. Posttraumatic growth (PTG) is defined as the positive changes that occur as a result of the struggle with highly stressful life events (Tedeschi & Calhoun, 2004), which surpass the level of functioning before the events. Prior research has examined PTG among those having experienced chronic health conditions, natural disasters, and man-made disasters (Zoellner & Maercker, 2006), fewer studies explored that in the context of emerging infectious diseases. Recent studies have suggested that nurses and healthcare professionals in China, Taiwan, and Israel experienced PTG (Chen et al., 2020; Cui et al., 2021; Hamama-Raz et al., 2020). Given that studies targeted at local nurses in Hong Kong are limited, we aimed to examine factors associated with PTG among those nurses during COVID-19.

1.3. Factors associated with PTG amid the outbreak of COVID-19

As postulated by the Stress and Coping model (Lazarus & Folkman, 1984), individuals generally evaluate and appraise the impact of the stressors and their available resources (e.g. interpersonal and external resources) when coping with stressful life events (e.g. global pandemic situations). Those stressors and coping processes have been found to be associated with adjustment outcomes (including PTG) (Prati & Pietrantonio, 2009). Previously, such postulations and the applicability of the Stress and Coping Model in explaining PTG has been supported (Yeung, Lu, Wong, & Huynh, 2016).

Stressors brought from job settings are likely to contribute to people's PTG. Working at hospitals and clinics during COVID-19 pandemic might increase nurses' worries about themselves and their family members being infected due to their jobs, which in turn affect their well-being (Ruiz-Fernández et al., 2020; Walton et al., 2020). It has also been found that individuals who encounter severe threats directed at them, rather than witnessing threat/harm to others, are more likely to report higher PTG (Chopko, Palmieri, & Adams, 2019). Previously, COVID-19-related risk perceptions and worries have been found to be associated with higher PTG among military veterans in the United States (Na, Tsai, Southwick, & Pietrzak, 2021), frontline nurses in China (Cui et al., 2021), and Filipina domestic helpers in Hong Kong (Yeung, Huang, Lau, & Lau, 2021). Therefore, we expected that distress and COVID-19-related worries

could be associated with higher PTG among nurses in Hong Kong.

People's coping resources in work settings could be associated with their PTG. Such resources can be intrapersonal (e.g. satisfaction with job) and institutional (e.g. pandemic control guidelines). It has been suggested that individuals who are satisfied with work are more likely to find meaning in work, which could facilitate PTG (Hamama-Raz et al., 2020). Other studies found that satisfaction with work was associated with PTG among professionals working with trauma victims (Ogińska-Bulik, Gurowiec, Michalska, & Kędra, 2021). Workplace arrangements also matter in employees' well-being during the pandemic. For example, implementation of pandemic-related accommodating measures (e.g. introduction of reliable information resources, preventive measures to reduce risk of infection at workplace) were associated with lower psychological distress and better job performance among a heterogeneous sample of Japanese employees from multiple industries (Sasaki, Kuroda, Tsuno, & Kawakami, 2020). The contributions of such factors to Hong Kong nurses' PTG during COVID-19 have yet to be examined. Based on the aforementioned studies, we expected that nurses' satisfaction with work and the workplace pandemic control guidelines might be associated with PTG among nurses in Hong Kong.

1.4. Coping resources and PTG: Does distress play a role as moderator?

The Stress and Coping model (Lazarus & Folkman, 1984) also suggests that the person-environment relationship is dynamic and mutually reciprocal, such that people's perception of the impact of the events and its relationship with coping resources/strategies could affect people's well-being (including PTG). Prior studies have suggested that the contributions of certain coping variables to people's well-being might differ according to people's stress perceptions. For example, in the context of chronic illnesses, among Chinese husbands of breast cancer survivors (Yeung, Zhang, Li, Lu, & Lu, 2020), positive reframing was only associated with higher PTG among those with higher caregiving burden, but not those with lower caregiving burden. Similarly, among siblings of patients with schizophrenia, Avcioğlu and colleagues also found that the positive association between social support (as a coping resource) and subjective well-being was stronger at higher levels of stress appraisal for caregiving (Avcioğlu, Karanci, & Soygun, 2019). Theorists have suggested that individuals might need to perceive the stressors as sufficiently threatening in order to challenge their worldview, elicit subsequent coping processes, and facilitate PTG (Creamer, Burgess, &

Pattison, 1992; Janoff-Bulman, 1989). It implies that some coping variables might facilitate PTG even more in the presence of higher distress. To the best of our knowledge, there are only limited studies exploring the moderating relationship between coping processes and stress perceptions in PTG among healthcare workers. This study attempted to examine if two coping resources (work satisfaction, satisfaction with workplace pandemic control guidelines) would interact with current distress in explaining PTG, such that the beneficial role of such coping resources in PTG would be stronger among nurses with higher level of current distress.

1.5. Purpose and hypotheses

This study examined the psychosocial correlates of PTG among nurses in Hong Kong amid the COVID-19 pandemic. Based on the studies discussed above, we hypothesized that higher levels of COVID-19 worries and work-related resources (work satisfaction, satisfaction with pandemic control guidelines in the workplace) were associated with higher PTG. Moreover, we hypothesized that distress would moderate between the associations between work satisfaction/workplace pandemic control guidelines satisfaction and PTG, such that the positive associations between work satisfaction/workplace pandemic control guidelines satisfaction and PTG were stronger among people with higher distress.

2. Method

2.1. Participants and recruitment strategies

The nurses working in either public or private service provision and in any inpatient, outpatient or outreach service in the community setting were eligible to participate in this study. Those who were working as administrators, in academic institutions, or in other positions that did not provide direct care to patients and those who were retired were excluded from the study sample. All registered members of the Association of Hong Kong Nursing Staff ($n = 16,500$), the labour union of nurses in Hong Kong, were approached and invited to this study using their email contacts. This is one of the feasible ways to approach a representative population of nurses in Hong Kong (Wang et al., 2020). The self-administered questionnaire was distributed to the nurses in an internet-based link along with an invitation email. An information sheet about the study was included at the beginning of the questionnaire, followed by an electronic consent form. The participants who agreed to join the study filled in the questionnaire on their own electronic devices. A reminder for participation in the survey was sent

two weeks after the first invitation email. Responses from 1,566 participants were collected via the online platform. Among them, 56 did not fulfill the eligibility criteria (e.g. not being a nurse, being retired, or being a nursing student). The remaining 1,150 responses were retained in the analyses to represent working nurses (i.e. those working full-time or part-time in health care settings). The sample characteristics were also compared with local statistics of the nurse population to explore the potential selection bias. Although the response rate was low (1,510/16,500), the sociodemographic characteristics of this sample were highly matched to the nurse population in Hong Kong according to the latest statistics from Department of Health (Department of Health, 2016). After completing the questionnaire, participants received HKD\$50 (approximately USD\$6.43) for compensation of their time. The study was conducted between 8 August–22 September 2020 (when there were 5,059 diagnosed cases and 105 individuals dead from COVID-19 in Hong Kong) (The Government of the Hong Kong Special Administrative Region, 2021). The study protocol was approved by the Research Ethics Committee (CUHK-NTEC CREC) at the first author's institution (Protocol no. CRE-2020.073).

2.2. Measures

2.2.1. Posttraumatic growth

The Posttraumatic Growth Inventory–Short Form (PTGI-SF) (Cann et al., 2010) was used to measure the participants' positive changes since the COVID-19 experience. On a 6-point Likert scale (0 as *did not experience this change*, 5 as *change to a very great degree*), a higher mean score of all item responses indicated higher PTG (e.g. 'I changed my priorities about what is important in life'). Evidence of reliability of the PTGI-SF was found among nurses in China and Taiwan during the COVID-19 pandemic (Chen et al., 2020). Regarding validity, PTGI-SF was associated with subjective well-being among nurses coping with the COVID-19 pandemic in Australia (Aggar et al., 2021). The Cronbach's alpha for this sample was .89.

2.2.2. COVID-19 specific worries and current psychological distress

Two items were specifically developed to measure participants' COVID-19 specific worries (i.e. 'I worry that I would get infected with COVID-19 from work', 'I worry that my family members would get infected with COVID-19 because of my work'). On a 5-point scale (1 as *not at all true*, 5 as *always true*), higher item scores represented higher COVID-19-related worries. One item from the Chinese version of the EQ-5D-5L (Wong et al., 2019) was also selected to measure participants' current psychological distress (i.e. 'I am

anxious or depressed'). On a 5-point scale (1 as *not at all*, 2 as *slightly*, 3 as *moderately*, 4 as *severely*, 5 as *extremely*), a higher item score indicated higher psychological distress.

2.2.3. Satisfaction with workplace pandemic control guidelines

Five items were developed to measure participants' satisfaction with pandemic control guidelines at their workplace. Participants were asked to rate their level of satisfaction towards five different aspects of pandemic control guidelines at their workplace (i.e. comprehensiveness, clarity, timeliness, transparency, and efficacy), on a 5-point scale (1 as *strongly unsatisfied*, 5 as *strongly satisfied*). A higher mean score of the item responses represented a higher level of satisfaction. The Cronbach's alpha was .94.

2.2.4. Work satisfaction

One item was used to measure participants' work satisfaction during the COVID-19 pandemic ('how much do you feel satisfied with your current job?'), on a 5-point scale (1 as *strongly unsatisfied*, 5 as *strongly satisfied*). A higher score indicated a higher level of work satisfaction. Prior research has supported the validity of this single item measure in predicting health outcomes among employees in different countries (Dolbier, Webster, McCalister, Mallon, & Steinhardt, 2005; Nakata, Irie, & Takahashi, 2013).

2.2.5. Sociodemographic and work-related variables

Socio-demographic variables (e.g. age, years in the profession, marital status, religious affiliation, working in a team specifically caring for COVID-19 patients) were measured.

2.3. Analytic plan

Descriptive statistics and Pearson correlations among the major variables were computed. Reliabilities of the scales were indicated by their corresponding Cronbach's alphas. Hierarchical regressions were conducted to examine the associations between the independent variables and PTG. The sequence of entering independent variables followed the suggestions from prior studies on PTG in the contexts of chronic illnesses and other traumatic events (Yeung et al., 2016, 2020, 2021). In the first block, background variables showing significant associations with PTG in bivariate correlations were entered. In the second and third blocks, COVID-19-related worries and current distress, plus work-related resources variables were respectively entered in the model. In the last block, two interaction terms between coping resources (work satisfaction, satisfaction with workplace pandemic control guidelines) and distress were entered. To

compute the interaction terms, the mean-centred scores of coping resources and distress were multiplied. All continuous independent variables were centred prior to the analyses. For statistically significant interactions, simple slopes analyses were conducted to examine how the main effects of coping resources on PTG varied at different levels of distress. The analyses were conducted using SPSS 26.0.

2.4. Power analysis

Expecting a small-to-medium effect size ($f^2 = 0.05$) in the association between the independent variables and PTG in the hierarchical regression analysis, we needed at least 499 participants to achieve a statistical power of .95 at $p = .05$ (G*Power 3.1.2). With our sample size ($N = 1,510$), we should be able to detect the expected effect size with sufficient statistical power.

3. Results

3.1. Participants' characteristics

Most of the participants were aged between 30 to 39 (36.8%) and married (50.7%). On average, they had been working in the profession for around 8.9 years ($SD = 8.60$). About one-fifth of the participants were specifically in the team taking care of the diagnosed or suspected cases of patients with COVID-19 (18.5%) (Table 1).

3.2. Correlations between stress/coping variables and PTG

Correlation analysis results showed that those who were older, married, had children, had a religious affiliation, worked non-full-time were more likely to report higher PTG (r s ranged from 0.05, $p < .05$ to 0.24, $p < .001$). Higher levels of worries about contracting

Table 1. Demographic and work-related characteristics of the participants ($N = 1,510$).

Frequency (%)	
Age	
18–25	381 (25.2%)
26–35	555 (36.8%)
36–45	354 (23.4%)
46–55	210 (13.9%)
Above 55	10 (0.7%)
Marital status	
Single	692 (45.8%)
Married	765 (50.7%)
Separated/Divorced/ Widowed	53 (3.5%)
Having a religious affiliation	552 (36.6%)
Years in the profession	
<1 year	82 (5.4%)
1–3 years	315 (20.9%)
3–5 years	226 (15.0%)
5–10 years	383 (25.3%)
11–20 years	248 (16.4%)
More than 20 years	256 (17.0%)
Working in the team caring for COVID-19 patients	280 (18.5%)

COVID-19 from work, worries about family members becoming infected with COVID-19, psychological distress, and work satisfaction were also correlated with higher PTG (r s ranged from 0.05, $p < .05$ to 0.17, $p < .001$) (Table 2). Contrary to the hypotheses, satisfaction with workplace pandemic control guidelines was not correlated with PTG ($r = 0.01$, $p > .05$).

3.3. Hierarchical regression analysis

Given that the stress and coping variables were moderately correlated, the independent variables were checked for multicollinearity in the regression analysis. We did not find any variables reporting a variance inflation factor (VIF) ≥ 4 , suggesting the absence of multicollinearity. In Block 1, the background variables explained 6.5% of variance in PTG ($p < .05$). Specifically, those working non-full-time ($\beta = -0.07$, $p < .05$) and having a religious affiliation ($\beta = -0.23$, $p < .001$) were significantly

associated with PTG. In Block 2, higher levels of worries about contracting COVID-19 from work ($\beta = 0.08$, $p < .05$), worries about family members contracting COVID-19 due to their work ($\beta = 0.12$, $p < .01$), and psychological distress ($\beta = 0.09$, $p < .001$) were significantly associated with PTG. Those variables explained an additional 5% variance in PTG ($p < .001$). In Block 3, higher work satisfaction was associated with higher PTG ($\beta = 0.15$, $p < .001$). In Block 4, a significant two-way interaction emerged between satisfaction with workplace pandemic control measures and distress when explaining PTG ($\beta = 0.08$, $p < .05$), contributing to an additional 0.6% of variance. Simple slopes analysis results indicated that the association between satisfaction with workplace pandemic control guidelines and PTG was only significant among those with higher distress ($\beta = 0.11$, $p < .01$), but not among those with lower distress ($\beta = -0.03$, $p > .05$) (Figure 1). With all the independent

Table 2. Descriptive statistics and correlations among major variables ($N = 1510$).

	1	2	3	4	5	6	7	8	9	10	11	12
1. Posttraumatic growth	—											
2. Age [†]	.07**	—										
3. Marital Status [†]	.06*	.41***	—									
4. Having children [†]	.09**	.43***	.66***	—								
5. Having a religious affiliation [†]	.24***	.19***	.10***	.13***	—							
6. Years in profession	.05	.65***	.27***	.31***	.13***	—						
7. Working mode [†]	-.07**	-.13***	-.05*	-.11***	-.00	.04	—					
8. Worry about infecting COVID-19	.16***	-.29***	-.11***	-.11***	-.066*	-.23***	.01	—				
9. Worry about family members infecting COVID-19	.17***	-.27***	-.11***	-.11***	-.06*	-.21***	.03	.80***	—			
10. Psychological distress	.15***	-.07**	-.07**	-.08**	.01	-.05*	-.02	.30***	.28***	—		
11. Work satisfaction	.05*	.23***	.15***	-.15***	.03	.15**	-.03	-.36***	-.35***	-.34***	—	
12. Satisfaction with workplace pandemic control guidelines	.01	.31***	.18***	.22***	.07*	.20***	-.05*	-.40***	-.39***	-.25***	.53***	—
Mean	2.19	2.28	0.51	1.63	1.62	8.91	0.95	3.15	3.48	1.68	3.33	3.14
Standard deviation	0.97	1.01	0.50	0.48	0.49	8.60	0.23	0.89	1.02	0.77	0.87	0.89

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

[†]Age: 18–29 (1), 30–39 (2), 40–49 (3), 50–59 (4), 60–69 (5); Marital status: Married (1), Single/separated/widowed (0); Having children: Yes (1), No (0); Having a religious affiliation: Yes (1), No (0); Working mode: Full-time (1), part-time: (0).

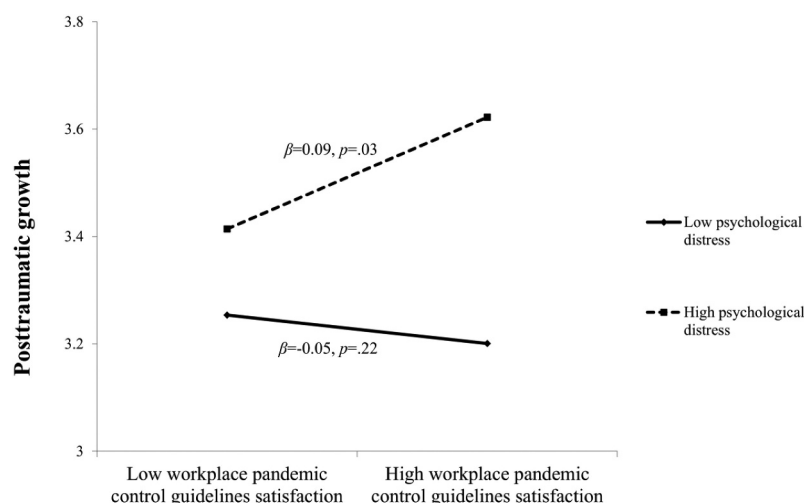


Figure 1. Satisfaction with workplace pandemic control guidelines was associated with PTG among nurses having higher level of psychological distress, but not those having lower level of psychological distress.

Table 3. Hierarchical regression analyses for explaining with posttraumatic growth ($N = 1,510$).

	Posttraumatic growth	
	β	ΔR^2
Step 1 – Background variables		.065***
Age	-.01	
Marital status (Married: 1, Single/separated/widowed: 0)	.01	
Having a religious affiliation (Yes: 1, No: 0)	.23***	
Having children (Yes: 1, No: 0)	-.06	
Years in profession	.01	
Working mode (Full-time: 1, Part-time: 0)	-.07*	
Step 2 – COVID-19 worries and distress		.051***
Age	.04	
Marital status	.00	
Having a religious affiliation	.23***	
Having children	-.06	
Years in profession	.02	
Working mode	-.06*	
Worry about infecting COVID-19	.08*	
Worry about family members infecting COVID-19	.12**	
Psychological distress	.09***	
Step 3 – Satisfaction with work and work settings		.020***
Age	.02	
Marital status	.01	
Having a religious affiliation	.23***	
Having children	-.05	
Years in profession	.03	
Working mode	-.06*	
Worry about infecting COVID-19	-.11**	
Worry about family members infecting COVID-19	.14**	
Psychological distress	.14***	
Work satisfaction	.15***	
Satisfaction with workplace pandemic control guidelines	.03	
Step 4 – Interaction terms		.006***
Age	.02	
Marital status	.01	
Having a religious affiliation	.24***	
Having children	-.05	
Years in profession	.03	
Working mode	-.06*	
Worry about infecting COVID-19	.12**	
Worry about family members infecting COVID-19	.13**	
Psychological distress	.15***	
Work satisfaction	.14***	
Satisfaction with workplace pandemic control guidelines	.02	
Distress \times work satisfaction	-.00	
Distress \times satisfaction with workplace pandemic control guidelines	.08*	
Total R^2		0.142

* $p \leq .05$, ** $p \leq .01$, *** $p \leq .001$.

variables, the overall model explained 14.2% of variances in PTG (Table 3).

4. Discussion

This study examined the psychosocial correlates of PTG among nurses in Hong Kong amid the COVID-19 pandemic. Using the same measurement scale (PTGI-SF), our sample reported a similar mean score in PTG with dental practitioners in Israel, France, and Canada (Uzil et al., 2021), psychotherapists in the United States (Aafjes-van Doorn, Bekes, Luo, Prout, & Hoffman, 2021), and nurses working in the Australian acute care sector (Aggar et al., 2021) during the COVID-19 pandemic. However, the score was lower than those reported in Chinese and Taiwanese nurses coping with the COVID-19 pandemic (Chen et al., 2020) and healthcare professionals in Spain (Moreno-Jimenez et al., 2021). Those findings imply

that Hong Kong's relative success in combating COVID-19 (indicated by its lower COVID-19 incidence and death rates) may not have led nurses to experience more PTG in comparison to their health professionals in other countries. The discrepancies in the levels of PTG might be also attributed to the different time frames of the surveys, specific health service contexts, pandemic control measures in particular countries/regions, and individual's subjective appraisals about COVID-19-related stressors. More systematic investigations on the relative importance of those factors in contributing to healthcare workers' PTG are warranted.

Consistent with prior studies, being affiliated with a religion was associated with PTG (Kucharska, 2020). It has been suggested that religious beliefs may provide a framework to facilitate more positive reappraisal of threatening situations (e.g. less threat appraisal, more challenge appraisal), thereby revealing positive

outcomes through sufferings (Shaw, Joseph, & Linley, 2005). One question that emerges in PTG research and in our own work is the possibility that some PTGI items (e.g. the Spiritual Change subscale) may overlap with variables like the affiliation of a religion. Among the PTGI subscales, we did find the Spiritual Change subscale reported the highest correlation with religious affiliation in our supplementary analysis. However, we also found that having a religious affiliation was significantly associated with the composite of PTG without the 'Spiritual change' subscale. It seemed to support that having a religious affiliation could also be associated with higher PTG in areas beyond the spirituality aspect.

Age, years in the profession, marital status of the nurses were not significantly associated with their PTG (Hamama-Raz et al., 2020; Jurišová, 2016; Peng et al., 2021), implying that those variables did not significantly differ in the tendency to experience PTG. On the contrary, having full-time employment was associated with lower PTG. It is important to note that full-time and part-time nurses did not report significantly different level of distress, perhaps part-time employed individuals could have more time to process their nursing duties and stress experience, which might facilitate PTG. Additional resources might be necessary to facilitate growth among full-time nurses.

4.1. COVID-19-related worries and current distress in association with PTG

We also found that current distress, worries about contracting COVID-19 from the workplace, and worries about family members' contracting COVID-19 due to their work significantly contributed to PTG among our participants. Those findings are in line with prior studies indicating that higher COVID-19-associated worries was associated with higher PTG among military veterans in the United States (Na et al., 2021) and nurses in China (Cui et al., 2021). Theorists have suggested that stressors should be perceived as sufficiently threatening to challenge people's worldviews and elicit coping processes (Tedeschi & Calhoun, 2004). Our findings imply that stressors from COVID-19 and work caregiving can serve as a catalyst for PTG. For growth experience in response to an ongoing pandemic (e.g. stressors from work/social life changes), people's stressor profile may be likely to vary over the course of the events. We should be aware of the potential differences in the growth experience indicated by most existing studies on PTG which usually examined people's experience after the traumatic events (Prati & Pietrantonio, 2009). To examine how different ongoing stressors may facilitate positive changes, researchers are recommended to measure people's stressor exposure and health

outcomes at different stages during the events, using longitudinal designs.

4.2 Work satisfaction in association with nurses' PTG in the COVID-19 pandemic

Consistent with prior studies (Arnold, Calhoun, Tedeschi, & Cann, 2005; Ogińska-Bulik et al., 2021), we found that work satisfaction uniquely contributed to higher PTG among nurses in Hong Kong. Nurses' work involves professionally caring for victims of different types of traumas (including accidents and life-threatening diseases e.g. COVID-19). Individuals who are satisfied with work are more likely to find meaning in the nature of work, which could facilitate PTG (Hamama-Raz et al., 2020). However, from our findings, there was no significant interaction between work satisfaction and distress in explaining PTG. It might imply that the association between work satisfaction and PTG did not differ across individuals' distress levels.

4.3. Workplace pandemic control guidelines satisfaction and PTG: Moderating role of current distress

Among the independent variables, satisfaction with workplace pandemic control guidelines did not emerge as an independent contributor of PTG. However, we found a significant interaction between satisfaction with workplace pandemic control guidelines and distress in explaining PTG, such that the positive association between workplace pandemic control guidelines and PTG was only significant among those with higher distress. As mentioned above, theorists suggest that PTG is most likely to emerge from stressors or sufferings that threaten people's personal worldview (Creamer et al., 1992). It is unique for us to reveal that the beneficial role of satisfaction with workplace pandemic control guidelines in PTG seems to be apparent only among nurses experiencing higher levels of distress. These findings imply that the protective role of coping resource/strategies in people's well-being might differ at varied levels of stress perceptions towards the negative events.

4.4. Limitations

This study had several limitations. First, this study used a cross-sectional design so that the tested relationships were not causal. To better understand the potential causal relationships among the variables, future studies could examine how the independent variables at different time points could predict PTG using longitudinal designs. Second, we recruited nurses through nursing associations in Hong Kong using non-random sampling, where self-selected bias

might be apparent. Comparable to response rates in some prior studies targeted at healthcare workers conducted online during the COVID-19 pandemic (e.g. Alenazi et al., 2020; Ammar et al., 2020), our response rate was low at 9.2% (1,510/16,500). Despite the low response rate, characteristics of this sample were highly matched to the nurse population in Hong Kong according to the latest statistics (Department of Health, 2016). Readers should note that the findings might not be fully generalizable to the nurses and healthcare professionals in other countries with different medical systems. Third, the model only explained a moderate proportion of variance in PTG, implying that other factors might be at play. For example, other intrapersonal coping resources (e.g. sense of coherence) (Ragger, Hiebler-Ragger, Herzog, Kapfhammer, & Unterrainer, 2019), exposure to prior stressful events (Chi et al., 2020) have been found to be associated with higher PTG among healthcare workers. Considering these variables may increase the explanatory power of model. Fourth, some measures (e.g. COVID-19 distress, work-related stress) were newly developed for the context of COVID-19 and have yet to be fully validated in this population. However, specifically- developed items have been commonly used as predictors of mental health outcomes among different Asian populations during the COVID-19 pandemic (Choi et al., 2020; Lin, Hu, Alias, & Wong, 2020; Yeung et al., 2021). Even though our self-developed scales reported satisfactory psychometric properties, validating our findings by measuring similar concepts (e.g. stress-related growth, work engagement) (Boals & Schuler, 2018; Fong & Ng, 2012) with other standardized scales is worthwhile.

4.5. Implications

By examining the socio-demographic and work-related factors associated with PTG among nurses in Hong Kong amid the COVID-19 pandemic, this study found that COVID-19 worries and work satisfaction were prominent contributors to PTG among those nurses. This study was also unique in the literature to reveal that satisfaction with workplace pandemic control guidelines contributed to PTG resulting from the COVID-19 pandemic only among those with higher distress. Practically, our findings implied that increasing work satisfaction might be important in enhancing PTG among nurses amid the COVID-19 pandemic. Among those with higher psychological distress, it is also important to provide better pandemic control guidelines to facilitate PTG. Interventions that facilitate people's adjustments to work-related adversities in the context of COVID-19 should be designed. A recent study found that providing psychological

interventions during the pandemic is beneficial to PTG among Chinese healthcare workers (Cui et al., 2021). Outside the context of COVID-19, a positive psychology intervention (including psychoeducation, emotional management training, and group sharing sessions) has been found to be useful in promoting PTG among Chinese healthcare workers who have experienced a range of traumatic events (Xu et al., 2016). It will be meaningful to see if such intervention could also facilitate PTG among healthcare professionals exposed to the COVID-19 pandemic.

5. Conclusion

This study examined the factors associated with PTG among nurses in Hong Kong during the COVID-19 pandemic. Given that the psychological health and safety of nurses are crucial to providing quality care for the general population, instituting effective treatment strategies to improve psychological adjustments for nurses will be essential. We hope that our findings could help tailor intervention strategies to maximize nurses' PTG during this difficult time.

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Data availability statement

The datasets are available from the corresponding author on reasonable request. The data are not publicly available due to their containing information that could compromise the privacy of research participants (e.g. working department,

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