Current Psychology (2023) 42:14942–14952
https://doi.org/10.1007/s12144-022-02828-2

Measuring mental well-being among frontline nurses during the COVID-19 crisis: Evidence from Saudi Arabia

John Jamir Benzon R. Aruta[1] · Joseph U. Almazan[2] · Majed Sulaiman Alamri[3] · Cris S. Adolfo[4] · Ferdinand Gonzales[5]

Accepted: 27 January 2022 / Published online: 4 February 2022

Abstract
In the days of the COVID-19 pandemic, frontline nurses providing care to different communities face are particularly vulnerable to the mental health threats of the crisis. The objective of this study was to examine the structural validity, convergent validity, and reliability of the Warwick–Edinburgh Mental Well-Being Scale (WEMWBS) in professional nurses amidst the COVID-19 crisis in Saudi Arabia. Data were collected from 413 nurses in Saudi Arabia using a cross-sectional online survey. Consistent with the original version, results of the confirmatory factor analysis revealed a unidimensional structure of the WEMWBS. Support for convergent validity was found as the WEMWBS significantly correlated with measures of burnout and compassion satisfaction. In terms of reliability, all WEMWBS items yielded high internal consistencies suggesting that the 14 items were robust indicators of mental well-being. In response to the challenges of the COVID-19 crisis, the current study offers a psychometrically sound instrument that can be utilized in screening the mental well-being of nurses in the days of a public health crisis. Preserving the positive aspect of mental health among frontline healthcare workers and promoting quality of care for communities requires a contextualized measurement tool that efficiently assesses mental well-being.

Keywords Warwick-Edinburgh mental well-being scale · Mental well-being · Nurses · COVID-19 · Saudi Arabia

Introduction

The COVID-19 pandemic has infected and taken the lives of many people across the world. In this kind of crisis, medical frontline workers, especially nurses, are one of the most vulnerable groups due to the pandemic's threats to their physical and mental health. Emerging studies have shown that the enormous number of COVID-19 patients in medical facilities and hospitals requires extended shift hours among healthcare workers, including nurses, which could last for several days to months (Sagherian et al., 2020; Weissman et al., 2020). Due to the life-threatening danger posed by the COVID-19 in hospital sites and the overwhelming work during the pandemic, nurses experience negative psychological consequences, including burnout, trauma, and post-traumatic growth (Chen et al., 2020) as well as insomnia, over-fatigue, and poor emotional well-being (Sagherian et al., 2020). To protect nurses from the inimical psychological consequences of their duties during the COVID-19 pandemic, it is necessary to identify a psychometrically sound screening tool for assessing their state of their mental well-being. To our knowledge, no valid and reliable tools have been proven to suitably assess the mental well-being of nurses within the context of a global health crisis. In light of this literature gap, the present study aims to examine the psychometric properties, including the structural and convergent validity as well as the internal consistency of the Warwick–Edinburgh Mental Well-Being Scale (WEMWBS, Tennant et al.,

✉ John Jamir Benzon R. Aruta
aruta_johnjamirbenzon@yahoo.com

1 De La Salle University, 2401 Taft Avenue, Malate 1004 Manila, Philippines

2 School of Medicine, Nazarbayev University, Nursultan 010000, Kazakhstan

3 Department of Nursing, College of Applied Medical Sciences, University of Hafr Albatin, Hafr Albatin, Saudi Arabia

4 Department of Nursing, College of Applied Medical Sciences, Majmaah University, Majmaah 11952, Saudi Arabia

5 Medical Surgical Department, College of Nursing, University of Hail, Hail, Saudi Arabia

2007), a well-established measure of well-being, among frontline nurses in Saudi Arabia amid the COVID-19 crisis.

Global COVID-19 Crisis and Mental Health

The COVID-19 pandemic has created massive public health and mental health crises worldwide (Aruta, 2021a; Ballada et al., 2021; Callueng et al., 2020; Galanza et al., 2021; Heymann & Shindo, 2020; Kimhi et al., 2021; Lieberoth et al., 2020; Van Bavel et al., 2020). The COVID-19 infection, which is caused by SARS-CoV-2, can be easily transmitted from person to person, spreading exponentially and easily overwhelming healthcare systems (Shereen et al., 2020). As of June 2021, the World Health Organization (WHO reported that there were > 177 million COVID-19 cases and > 3.84 million deaths across the globe (WHO, 2021a). Corollary to the public health crisis posed by the COVID-19 pandemic, there are also studies that have shown a significant increase in mental health problems globally (Aruta & Montes, 2021; Dorison et al., 2020; Simon & Aruta, 2021; Yamada et al., 2021). For example, recent studies have reported that many people across the world experience depression (Aruta et al., 2021; Cénat et al., 2020), anxiety (Buyukkececi, 2020; Lieberoth et al., 2020), stress (Cénat et al., 2020; Lieberoth et al., 2020), and trauma (Cénat et al., 2020), among others, due to the consequences of the COVID-19 crisis. While there is growing literature on the mental health consequences of the pandemic on the general population in several countries, one critical limitation in the literature is the dearth of studies focusing on the mental health of healthcare workers, especially nurses, who are at the frontlines facing the threat of COVID-19 in their daily job. The present study, therefore, seeks to address this gap by focusing on the positive mental health, specifically the mental well-being, of frontline nurses in Saudi Arabia amid the COVID-19 crisis.

Consequences on Nurses' Mental Health

Healthcare workers are one of the groups considered most at risk from COVID-19 infection due to the nature of their jobs, which requires them to respond directly to infected patients (Ran et al., 2020). A report from the International Council of Nurses (ICN) published in October 2020 indicated that > 1,500 nurses have died from COVID-19 in 44 countries. Additionally, the overwhelming number of cases has demanded that nurses report to duty at extended hours, posing a threat to their physical and mental health (Shaukat et al., 2020). This is particularly true among those who directly provide patient care (Lai et al., 2020). For example, two separate studies conducted in China (Lai et al., 2020; Li et al., 2020) and Singapore (Tan et al., 2020) have shown that nurses experience high psychological distress, depression, and insomnia during the pandemic. A systematic review of studies on healthcare workers' mental health during the COVID-19 pandemic emphasized that nurses experience worse psychological symptoms compared to other healthcare workers, as they are directly responsible for patient care, making them more exposed to the threats of COVID-19 infection and to the suffering of infected patients (Vizheh et al., 2020).

However, one noticeable gap in the emerging literature on healthcare workers' mental health during the COVID-19 pandemic is the ubiquitous focus on the negative aspects of mental health (i.e., psychopathological symptoms, such as depression, anxiety, and trauma, among others). Meanwhile, there is a paucity of studies centered on the positive aspects of nurses' mental health, such as well-being, satisfaction, and happiness, among others, during the COVID-19 pandemic. The bidimensional model of mental health (Westerhoff & Keyes, 2010) argues that it is necessary to view mental health not only by the presence of psychopathology (i.e., negative mental health) but also by the flourishing of well-being (i.e., positive mental health). The present study, therefore, aims to address this gap by focusing on the psychometric aspect of mental well-being, a known indicator of positive mental health, among frontline nurses in Saudi Arabia amid the COVID-19 crisis.

The Context in Saudi Arabia

Saudi Arabia is one of the countries in the Middle East most affected by the COVID-19 outbreak (Zaghloul et al., 2019). As of January 2021, the confirmed COVID-19 cases in Saudi Arabia have reached > 360,000, with at least 6,000 COVID-19 deaths (WHO, 2021b). Due to the pandemic, the Saudi government has taken unprecedented measures to control COVID-19 transmission (Al Amir, 2020), including the closure of nonessential spaces, businesses, and public transportation (Bhatia, 2020). To control the widespread COVID-19 contagion in the country and to avoid overwhelming the healthcare system, the Ministry of Health of Saudi Arabia has implemented strict health protocols requiring citizens to adhere to minimum health standards, including physical distancing, wearing of masks, and staying at home (Adly et al., 2020; Bhatia, 2020). As the COVID-19 pandemic caused enormous complications to the system (Johns Hopkins University & Medicine, 2021), it necessitates the implementation of comprehensive and vital management strategies during the outbreak, especially in the treatment of critically ill patients. The country's Ministry of Health (2021) has the primary role of providing healthcare services, including preventive and early diagnosis, treatment, and rehabilitation activities. Additionally, the Saudi Center for Disease Prevention and Control (SCDC) (2020) also helps in providing consistent education and training to the general public and

healthcare workers, respectively, regarding COVID-19 infection prevention and control.

As a consequence of the increasing number of COVID-19 patients in the country, nurses working in hospitals experience an overwhelming workload, which may have detrimental consequences for their mental health. At the peak of the COVID-19 crisis, healthcare facilities were short-staffed, and most were asked to pull longer work duties ranging from 8–16 h or more. The excessive workload, accompanied by a high-pressure and tense working environment, may lead to lapses in concentration and judgment, medication errors, and suboptimal patient care (Alharbi et al., 2020). A recent study showed that healthcare workers in Saudi Arabia, including nurses, reported symptoms of depression and anxiety during the COVID-19 outbreak in the country (AlAteeq et al., 2020).

Additionally, nurses in Saudi Arabia reported fear of work infection and transmitting the virus to their families, lack of knowledge about the infection, and personal protective equipment shortage (Alenazi et al. 2020), which may lead to greater stress and paranoia as they attempt to fulfill their duties. Therefore, the presence of valid and reliable tools that can assess the mental health of nurses as they face the demands of their work during the COVID-19 crisis is an imperative research pursuit. This may allow for inferences on how health organizations and hospitals could prepare interventions in preserving positive mental health among nursing professionals, thus leading to a greater quality of patient care. In relation to this, the present study attempts to address this need by examining the psychometric properties of the WEMWBS among frontline nurses at the peak of the COVID-19 crisis in Saudi Arabia.

Measurement of the WEMWBS

The WEMWBS has been widely used in research and clinical practice to assess the positive aspects of mental health, specifically the well-being status at the individual and population levels. Several validation studies in many countries and varying contexts have shown that the WEMWBS is a valid unidimensional and reliable instrument in measuring well-being. For example, studies using a general population in the UK (Bass et al., 2016; Lloyd, & Devine, 2012), adolescents in Ireland (Ringdal et al., 2018), Norwegian and Swedish hotel managers (Haver et al., 2015), and Pakistani and Chinese minorities living in the UK (Taggart et al., 2013), all supported the unidimensional factor structure and demonstrated the strong reliability of the WEMWBS.

In the health profession, the unidimensional structure of the WEMWBS has been validated among healthcare providers in Pakistan (Waqas et al., 2015), veterinary professionals in the UK (Bartram et al., 2013), and nursing students in China (Dong et al., 2016) and Slovenia (Cilar et al., 2020). However, one critical gap in the literature is the lack of studies that established the psychometric validity of well-being measures, such as the WEMWBS, specifically for nursing professionals working as medical frontline workers during a global health crisis. We aim to address this gap by examining the psychometric properties of the WEMWBS among frontline nurses in Saudi Arabia amid the COVID-19 outbreak.

The Present Study

The overall aim of the present study was to establish a psychometrically sound measure of well-being that can be employed to assess the positive mental health of nursing professionals in Saudi Arabia amid the COVID-19 pandemic. In particular, we examined structural validity by performing a confirmatory factor analysis (CFA) and confirmed convergent validity by establishing the correlations of the WEMWBS with established measures of compassion satisfaction and burnout. Finally, we established reliability by assessing the internal consistency of the WEMWBS items.

Method

Participants

This study set the target effect size as 0.30 and then set α as 0.05 and statistical power (1-β) as 0.99. We entered these parameters into G*Power 3.1.9, which recommended $N = 168$. Exceeding the recommended sample size, the present study involved 413 nursing professionals working in Saudi Arabia, with ages ranging from 21 to 55 years (Mean age = 33.54 years, SD age = 5.85 years). There were 61.26% females and 38.74% males. More than half were married (65.38%), slightly more than a quarter were single (28.09%), and the rest reported being separated (6.53%). In terms of educational attainment, most participants were bachelor's degree holders (92.25%), while the rests were master's degree (7.02%) and doctoral degree (0.73%) holders. The participants came from different areas of practice, including the emergency department (26.39%), intensive care unit (13.56%), medical department (11.38%), outpatient department (9.44%), nursing administration unit (8.48%), general ward (6.54%), obstetrics department (6.05%), surgical department (5.81%), pediatric ward (5.57%), operating room (3.15%), artificial kidney unit (2.91%), and private wards (0.72%). Most of the participants (96.13%) worked in government hospitals. The average number of years of working in their current workplace was 8.61 years (SD = 5.96).

Instruments

Mental Well-Being

The original English version of the WEMWBS (Tennant et al., 2007) was employed to assess the participants' mental well-being. It has 14 items (*"I've been feeling optimistic about the future"*) rated on a 6-point scale ranging from 1 = *none of the time* to 6 = *all of the time*. Using college students and general population in the UK, the original study yielded a unidimensional structure of the WEMWBS and a reliability coefficient $\alpha = 0.70$ and above (Tennant et al., 2007). Recent evidence showed high reliability coefficients among Filipino adolescents ($\alpha = 0.93$) (Aruta, 2021b). We discuss the details of psychometric properties of WEMWBS in the results section of this paper.

Compassion Satisfaction and Burnout

The present study utilized the compassion satisfaction (CS, *"I get satisfaction from being able to help people"*) and burnout (BO, *"I feel trapped by my job as a helper"*) subscales of the Professional Quality of Life scale (ProQOL) proposed by Stamm (2009) to measure nurses' satisfaction with doing their job well and their feelings of hopelessness and struggles in performing their work tasks, respectively. Using a 5-poing scale (1 = *never* to 5 = *very often*), participants indicated their levels of burnout and compassion satisfaction. A previous research has used the CS subscale to assess compassion satisfaction among mental healthcare professionals in Canada, yielding a high reliability of $\alpha = 0.87$ (Ray et al., 2013). Past studies utilized the BO subscale to measure burnout among child welfare workers in the US (Salloum et al., 2015) and professional nurses in Portugal (Duarte et al., 2016), both showing reliability coefficients of $\alpha = 0.74$.

Procedures

Using direct translation process, all materials were translated from English to Arabic, the official language in Saudi Arabia. The translated version was validated by native speakers of Arabic who are competent users of the English language. The final materials were then transformed into an online survey. The nurses were recruited using snowball sampling, and the online version of the survey was provided to them through email. Nurses who received the invitation were requested to share the online survey with their fellow frontline nurses. All the participants were informed about the anonymity of their information, the confidentiality of their responses, and their right to non-participation. Informed consent was secured from all the participants and were requested to complete the survey. Those who did not consent to participate were instructed to discontinue answering the online survey. This study received ethical approval from (BLINDED FOR REVIEW).

Data Analysis

To address the objectives of the study, we implemented two phases of data analysis using JASP statistical software (JASP Team, 2016). For each phase, preliminary analyses determining the descriptive statistics and normality distribution of the variables (i.e., the WEMWBS items in Phase 1 and convergent variables in Phase 2) were employed.

In Phase 1, we examined the structural validity of the WEMWBS through CFA. A single-factor model as a unidimensional model of mental well-being was examined by analyzing all 14 items of the WEMWBS as one factor. To evaluate the goodness of data–model fit, we utilized the comparative fit index (CFI) and Tucker-Lewis index (TLI) values between 0.90 and 0.95. In addition, we utilized the root mean square residual (SRMR) and standardized root mean square error approximation (RMSEA) values of < 0.08 as criteria for an adequate model fit. TLI and CFI values > 0.95 and SRMR and RMSEA values < 0.05 were used as criteria for a good model fit (Kenny, 2012; Kline, 2011). Moreover, factor loadings of $\lambda \geq 0.50$ were considered strong (Renshaw, 2018). Following CFA, descriptive statistics, and normality distribution, we computed the reliability of the WEMWBS. Reliability was estimated in terms of McDonald's omega (ω) and Cronbach's alpha (α) at the observed level. A coefficient of ≥ 0.70 indicated strong reliability.

In Phase 2, we explored the correlations of the WEMWBS with existing measures of compassion satisfaction and burnout to examine support for the convergent validity. We used *Pearson's r* to determine the correlations between the WEMWBS and the abovementioned relevant variables.

Results

CFA of the WEMWBS

Preliminary analyses suggested that the WEMWBS met the normality assumption, with kurtosis and skewness values within | 2 |. Therefore, we conducted CFA with maximum likelihood estimator (Muthen & Muthen, 1998–2012). We examined the WEMWBS items as a single-factor representing a unidimensional model of mental well-being to determine model fit. Findings from the CFA indicated good model fit ($\chi 2 = 1866.628$, $df = 66$, $p < 0.001$; CFI = 0.982, TLI = 0.977, RMSEA [90% confidence interval, CI] = 0.039 [0.028–0.050], SRMR = 0.038), with strong factor loadings for all items, ranging from $\lambda = 0.40$ to $\lambda = 0.75$, as shown in Table 1. We note that we decided to add covariance between

Table 1 CFA standardized factor loadings (λ)

Items	λ	*SE*	*z*	*p*	LLCI—ULCI
1. I've been feeling optimistic about the future	.64	.05	13.55	< .001	.55 – .73
2. I've been feeling useful	.54	.04	13.23	< .001	.46 – .61
3. I've been feeling relaxed	.57	.04	13.41	< .001	.48 – .65
4. I've been feeling interested in other people	.54	.04	13.51	< .001	.46 – .61
5. I've had energy to spare	.42	.03	13.39	< .001	.36 – .49
6. I've been dealing with problems well	.40	.03	13.28	< .001	.35 – .46
7. I've been thinking clearly	.40	.03	13.20	< .001	.34 – .45
8. I've been feeling good about myself	.46	.04	13.06	< .001	.39 – .53
9. I've been feeling close to other people	.45	.03	13.33	< .001	.38 – .52
10. I've been feeling confident	.41	.03	13.34	< .001	.35 – .47
11. I've been able to make up my own mind about things	.75	.06	13.64	< .001	.64 – .85
12. I've been feeling loved	.46	.03	13.27	< .001	.39 – .52
13. I've been interested in new things	.47	.04	13.16	< .001	.40 – .54
14. I've been feeling cheerful	.41	.03	13.02	< .001	.34 – .47

the residuals of items 2 and 4 to improve model fit. As the contents of these items were similar, additional parameters were considered appropriate and then added to the model.

Descriptive Statistics and Reliability of the WEMWBS and Relevant Measures

Table 2 presents the descriptive statistics of the WEMWBS. Skewness and kurtosis values suggested an approximately normal distribution for the overall WEMWBS. In terms of reliability, both Cronbach's alpha coefficient ($\alpha = 0.93$) and McDonald's omega values ($\omega = 0.93$) were strong, indicating the high internal consistency of the WEMWBS items. As shown in Table 3, the individual item reliability of items deleted remained consistently between 0.925 and 0.928 for Cronbach's alpha and between 0.925 and 0.929 for McDonald's omega, suggesting that all the items of the WEMWBS were equally consistent measures of mental well-being. Additionally, the nurses' scores in the CS ($\alpha = 0.90$, $\omega = 0.90$) and BO ($\alpha = 0.83$, $\omega = 0.83$) subscales of ProQOL yielded high overall reliability.

Correlation of the WEMWBS with Relevant Measures

We determined the initial convergent validity evidence of the WEMWBS by examining the bivariate correlations between the latent factor of this scale and the relevant observed variables. As presented in Table 1, the WEMWBS yielded a significant and strong positive association with compassion satisfaction ($r = 0.73$, $p < 0.001$) and a significant but weak negative correlation with burnout ($r = -0.23$, $p < 0.001$), thus indicating convergent validity. Given that the single-factor model of the WEMWBS has acceptable results for both fit indices and factor loadings, with strong reliabilities and significant correlations with relevant measures, we established that the single-factor solution for the WEMWBS is a valid and reliable measurement tool of mental well-being among frontline nurses in Saudi Arabia during a global health crisis.

Discussion

In the days of the COVID-19 pandemic, frontline nurses providing care face are particularly vulnerable to the mental health threats of the crisis. In addition, maintaining their mental well-being helps promote work efficiency and the quality of patient care. The main goal of the present study was to examine the psychometric properties of the WEMWBS among nurses working in Saudi Arabia during the COVID-19 pandemic. Specifically, we investigated the structural and convergent validities as well as the reliability of the WEMWBS. Overall, our findings showed that the WEMWBS is a psychometrically robust instrument for

Table 2 Descriptive statistics, correlations, and reliability coefficients of the measures

Measures	α	ω	Mean	SD	Skewness	Kurtosis	1	2
1. Mental well-being	.93	.93	4.00	.72	-.46	-.51		
2. Compassion satisfaction	.90	.90	40.40	6.92	-.59	-.25	.73***	
3. Burnout	.83	.83	27.53	4.69	-.78	1.05	-.23***	-.26***

***$p < .001$

Table 3 Item statistics and inter-item correlations

Items	Mean(*SD*)	Skewness	Kurtosis	α if item deleted	ω if item deleted	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. I've been feeling optimistic about the future	4.03(*1.06*)	-1.01	.48	.928	.928	—													
2. I've been feeling useful	3.88(*1.05*)	-.72	-.12	.925	.926	.53***	—												
3. I've been feeling relaxed	3.87(*1.04*)	-.77	.09	.926	.927	.46***	.56***	—											
4. I've been feeling interested in other people	3.85(*0.99*)	-.63	-.02	.927	.927	.45***	.64***	.56***	—										
5. I've had energy to spare	4.08(*0.90*)	-.60	-.59	.926	.927	.40***	.53***	.52***	.46***	—									
6. I've been dealing with problems well	4.07(*0.91*)	-.69	-.04	.926	.926	.52***	.46***	.44***	.42***	.53***	—								
7. I've been thinking clearly	4.13(*0.90*)	-.89	.42	.926	.926	.40***	.49***	.49***	.40***	.51***	.59***	—							
8. I've been feeling good about myself	3.97(*1.01*)	-.77	-.04	.925	.925	.48***	.48***	.54***	.43***	.51***	.58***	.63***	—						
9. I've been feeling close to other people	4.14(*0.93*)	-.92	.38	.926	.927	.41***	.46***	.47***	.42***	.55***	.54***	.56***	.53***	—					
10. I've been feeling confident	4.04(*0.90*)	-.61	-.28	.926	.927	.46***	.45***	.52***	.42***	.50***	.54***	.54***	.53***	.58***	—				

Table 3 (continued)

Items	Mean(*SD*)	Skewness	Kurtosis	α if item deleted	ω if item deleted	1	2	3	4	5	6	7	8	9	10	11	12	13	14
11. I've been able to make up my own mind about things	3.87(*1.12*)	-.80	-.10	.929	.929	.36***	.51***	.44***	.43***	.40***	.41***	.46***	.49***	.43***	.41***	—			
12. I've been feeling loved	4.05(*0.97*)	-.86	.22	.926	.926	.46***	.48***	.48***	.49***	.50***	.52***	.47***	.52***	.44***	.52***	.49***	—		
13. I've been interested in new things	3.97(*1.00*)	-.78	.05	.925	.925	.47***	.48***	.45***	.53***	.47***	.45***	.57***	.54***	.51***	.51***	.54***	.55***	—	
14. I've been feeling cheerful	4.12(*0.96*)	-1.06	.79	.925	.925	.62***	.58***	.46***	.50***	.48***	.52***	.47***	.53***	.51***	.47***	.48***	.59***	.61***	—

***$p < .001$

evaluating the frontline nurses' mental well-being amid the COVID-19 outbreak.

Validity Findings of the WEMWBS

CFA results showed support for a stable, unidimensional solution of the WEMWBS, thereby replicating the original study based on samples from the UK (Tennant et al., 2007). All 14 items loaded substantially as a unidimensional factor, indicating that all the items were valid in assessing the latent factor of mental well-being. The single-factor model verified in the WEMWBS provides support for the conceptualization of mental well-being forwarded by Tennent and colleagues (Tennant et al., 2007) as a unidimensional construct. Significant past studies have focused on examining the structural validity of the WEMWBS in a general context (e.g., Bass et al., 2016; Lloyd, & Devine, 2012; Ringdal et al., 2018). Other studies that confirmed the unidimensional structure of the WEMWBS were conducted among adolescents in Ireland (Ringdal et al., 2018) and adults in Norway and Sweden (Haver et al., 2015). In addition, studies among healthcare professionals in different countries, including medical workers in Pakistan (Waqas et al., 2015), veterinarians in the UK (Bartram et al., 2013), and nursing students in China (Dong et al., 2016) and Slovenia (Cilar et al., 2020), provided support for the unidimensional structure of the WEMWBS.

Our findings lend support for the convergent validity of the WEMWBS by showing significant correlations with relevant measures of compassion satisfaction and burnout. The present findings also showed the strong internal consistency of the WEMWBS items. This particular finding is consistent with previous research demonstrating the internal consistency of the WEMWBS items among individuals in the nursing field. For example, the WEMWBS yielded overall reliabilities of $\alpha = 0.94$ and $\alpha = 0.91$ among nursing students in China (Dong et al., 2016) and Slovenia (Cilar et al., 2020), respectively.

Taken together, our study's findings provide a significant contribution to the mental health literature by validating the WEMWBS among nurses in Saudi Arabia during a global crisis, such as the COVID-19 pandemic. This is important, given that nurses constantly face the physical and mental health risks of performing their duties during the pandemic. Our findings suggest that the WEMWBS can be employed as an efficient and psychometrically stable measure to assess the mental well-being of professional nurses during a global health crisis and other highly stressful contexts.

Implications

Our findings provide relevant practical insights that could improve nursing practice and the quality of care. First, improving the quality of care for patients during a global health crisis may require paying attention to the mental well-being of nurses as healthcare providers, and the first step in doing so is to utilize a valid and reliable screening tool. The current study indicates that the WEMWBS can be employed as a tool that is psychometrically sound in specifically assessing the mental well-being of frontline nurses in Saudi Arabia in the days of the COVID-19 crisis. Second, hospital administrations may benefit from better work outcomes from healthcare workers by establishing a regular mental health check-up, especially during the high-pressure work environment brought about by the COVID-19 crisis. Third, our findings are particularly relevant to mental health nurses, as they show that regular evaluations of negative mental health and the positive aspects of mental health among this group of healthcare workers are imperative. A recent review of relevant literature pointed out that the well-being status of mental health providers could influence patient treatment engagement and outcomes (Yang & Hayes, 2020).

Fourth, healthcare systems may consider significantly increasing the number of healthcare professionals, especially nurses, as excessive work hours can make them vulnerable to detrimental mental health consequences. Our convergent validity findings indicated that burnout during the COVID-19 crisis was associated with lower levels of mental well-being among nurses. Finally, hospital administrations may implement mental health skills training to alleviate the negative aspects of mental health (e.g., depression, anxiety, trauma, and stress) and to promote positive mental health aspects (e.g., well-being, satisfaction with work, and general life satisfaction). Mental health skills training may include engagement in self-care activities and mental health first aid, among others, which could equip nurses and other healthcare professionals in managing the psychological consequences of their work and invigorating their well-being status.

Presently, there are no available mental well-being measures that are valid and reliable within the context of frontline nurses amid the COVID-19 crisis in Saudi Arabia. Hence, we examined the structural validity, convergent validity, and internal consistency of the Warwick–Edinburgh Mental Well-being Scale (WEMWBS) among frontline at the peak of the COVID-19 pandemic. This study provides a psychometrically robust measure that can be used as a screening instrument for assessing nurses' mental well-being status during a global health crisis. A contextualized and accurate assessment of nurses' mental well-being may contribute to the preservation of the mental health of nurses, and to promoting quality of care and health safety in the communities.

Limitations and Future Directions

Despite its contributions, this study has several limitations. First, the current research focused on validating the WEMWBS among nursing professionals. Future studies may

consider assessing the psychometric properties of WEMWBS in other healthcare professionals (e.g., doctors) as they may also be at-risk of the inimical psychological consequences of fulfilling their duties during the COVID-19 crisis. Second, our study was conducted among frontline nurses during the COVID-19 outbreak in Saudi Arabia. Future research may implement the study in more developing countries. Given the more challenging healthcare system in developing countries, it is of great importance to establish a mental health screening tool that could assess the psychological consequences of working during the COVID-19 pandemic among nurses in such a context. Third, our study only focused on the positive aspect of mental health (i.e., mental well-being). Studies in the future may consider establishing valid screening tools for the negative aspect of mental health (e.g., depression and trauma) of nurses and other healthcare professionals. This is important given recent recognition in the literature that mental health should not only focus on the pathological aspect but also its flourishing aspect and vice versa (Westerhoff & Keyes, 2010).

Conclusions

We found that the WEMWBS is a psychometrically useful tool in assessing the mental well-being of frontline nurses amid the COVID-19 crisis in Saudi Arabia. Therefore, we recommend utilizing the WEMWBS in evaluating the positive mental health aspect of nursing professionals during public health crises. Nevertheless, the instrument needs further validation in a wider population of healthcare professionals across countries with varying levels of healthcare system capacity.

Acknowledgements The authors would like to thank the nurses in Saudi Arabia who dedicated their valuable time to participate in the study.

Data Availability The authors will provide the data upon reasonable request by any party.

Declarations

Conflict of Interest The authors declared no conflict of interest associated with the study.

Ethics Approval Ethical approval for the study was provided by the Ministry of Health of Saudi Arabia (H-05-FT-083).

References

Adly, H. M., AlJahdali, I. A., Garout, M. A., Khafagy, A. A., Saati, A. A., & Saleh, S. A. (2020). Correlation of COVID-19 pandemic with healthcare system response and prevention measures in Saudi Arabia. *International Journal of Environmental Research and Public Health*, *17*(18), 6666. https://doi.org/10.3390/ijerph17186666.

Alenazi, T., BinDhim, N., Alenazi, M., Tamim, H., Almagrabi, R., & Aljohani, S…, Alqahtanik,S. (2020). Prevalence and predictors of anxiety among healthcare workers in Saudi Arabia during the COVID-19 pandemic. *Journal of Infection And Public Health*, 13(11), 1645-1651. https://doi.org/10.1016/j.jiph.2020.09.001

Al Amir, K. (2020). COVID-19: Saudi Arabia expects 200,000 cases if measures not followed.

AlAteeq, D. A., Aljhani, S., Althiyabi, I., & Majzoub, S. (2020). Mental health among healthcare providers during coronavirus disease (COVID-19) outbreak in Saudi Arabia. *Journal of Infection and Public Health*, *13*(10), 1432-1437. https://doi.org/10.1016/j.jiph.2020.08.013

Alharbi, J., Jackson, D., & Usher, K. (2020). Compassion fatigue in critical care nurses and its impact on nurse-sensitive indicators in Saudi Arabian hospitals. *Australian Critical Care*, *33*(6), 553-559. https://doi.org/10.1016/j.aucc.2020.02.002

Aruta, J.J.B.R. (2021a). Socio-ecological determinants of distress in Filipino adults during COVID-19 crisis. *Current Psychology.* https://doi.org/10.1007/s12144-020-01322-x

Aruta, J. J. B. R. (2021b). The quest to mental well-being: Nature connectedness, materialism and the mediating role of meaning in life in the Philippine context. *Current Psychology*, https://doi.org/10.1007/s12144-021-01523-y.

Aruta, J. J. B. R., Callueng, C., Antazo, B. G., & Ballada, C. J. A. (2021). The mediating role of psychological distress on the link between socio-ecological factors and quality of life of Filipino adults during COVID-19 crisis. *Journal of Community Psychology,* https://doi.org/10.1002/jcop.22668.

Aruta, J. J. B. R., & Montes, L. (2021). The two sides of the COVID-19 pandemic: The importance of a balanced perspective in addressing mental health problems. *Asia-Pacific Journal of Public Health*, https://doi.org/10.1177/10105395211051847.

Ballada, C. J. A., Aruta, J. J. B. R., Callueng, C. M., Antazo, B. G., Kimhi, S., Reinert, M., ... & Verdu, F. C. (2021). Bouncing back from COVID-19: Individual and ecological factors influence national resilience in adults from Israel, the Philippines, and Brazil. *Journal of Community & Applied Social Psychology,* https://doi.org/10.1002/casp.2569.

Bartram, D. J., Sinclair, J. M., & Baldwin, D. S. (2013). Further validation of the Warwick-Edinburgh Mental Well-being Scale (WEMWBS) in the UK veterinary profession: Rasch analysis. *Quality of Life Research*, *22*(2), 379-391. https://doi.org/10.1007/s11136-012-0144-4

Bass, M., Dawkin, M., Muncer, S., Vigurs, S., & Bostock, J. (2016). Validation of Warwick-Edinburgh mental well-being scale (WEMWBS) in a population of people using secondary care mental health services. *Journal of Mental Health*, *25*(4), 323-329. https://doi.org/10.3109/09638237.2015.1124401

Bhatia, N.(2020). Closures extended to curb Covid-19 in region | MEED. (2020). In *Middle East Economic Digest*. Retrieved 10 January 2021, from https://www.meed.com/closures-extended-to-curb-covid-19-in-mena.

Buyukkececi, Z. (2020). Cross-country differences in anxiety and behavioral response to the Covid-19 pandemic. *European Societies*, https://doi.org/10.1080/14616696.2020.1828975.

Callueng, C., Aruta, J. J. B. R., Antazo, B. G., & Briones-Diato, A. (2020). Measurement and antecedents of national resilience in Filipino adults during coronavirus crisis. *Journal of Community Psychology*, *48*(8), 2608-2624. https://doi.org/10.1002/jcop.22438

Cénat, J. M., Blais-Rochette, C., Kokou-Kpolou, C. K., Noorishad, P. G., Mukunzi, J. N., McIntee, S. E., ... & Labelle, P. (2020). Prevalence of symptoms of depression, anxiety, insomnia, posttraumatic stress disorder, and psychological distress among populations

affected by the COVID-19 pandemic: A systematic review and meta-analysis. *Psychiatry Research*, 113599. https://doi.org/10.1016/j.psychres.2020.113599

Chen, R., Sun, C., Chen, J. J., Jen, H. J., Kang, X. L., Kao, C. C., & Chou, K. R. (2020). A large-scale survey on trauma, burnout, and posttraumatic growth among nurses during the COVID-19 pandemic. *International Journal of Mental Health Nursing*. https://doi.org/10.1111/inm.12796

Cilar, L., Pajnkihar, M., & Štiglic, G. (2020). Validation of the Warwick-Edinburgh Mental Well-being Scale among nursing students in Slovenia. *Journal of Nursing Management*, *28*(6), 1335-1346. https://doi.org/10.1111/jonm.13087

Dong, A., Chen, X., Zhu, L., Shi, L., Cai, Y., Shi, B., ... & Guo, W. (2016). Translation and validation of a Chinese version of the Warwick–Edinburgh Mental Well-being Scale with undergraduate nursing trainees. *Journal of Psychiatric and Mental Health Nursing*, *23*(9-10), 554-560. https://doi.org/10.1111/jpm.12344

Dorison, C. A., Lerner, J. S., Heller, B. H., Rothman, A. J., Kawachi, I. I., Wang, K., ... & Coles, N. A. (2020). A global test of message framing on behavioural intentions, policy support, information seeking, and experienced anxiety during the COVID-19 pandemic. https://doi.org/10.23668/psycharchives.3013

Duarte, J., Pinto-Gouveia, J., & Cruz, B. (2016). Relationships between nurses' empathy, self-compassion and dimensions of professional quality of life: A cross-sectional study. *International Journal of Nursing Studies*, *60*, 1-11. https://doi.org/10.1016/j.ijnurstu.2016.02.015

Galanza, M. A. M. C., Aruta, J. J. B. R., Mateo, N. J., Resurreccion, R. R., & Bernardo, A. B. (2021). Mental health of Filipino university students during the COVID-19 pandemic: The distinct associations of fear of COVID-19 and financial difficulties. *Educational and Developmental Psychologist*. https://doi.org/10.1080/20590776.2021.1999168

Haver, A., Akerjordet, K., Caputi, P., Furunes, T., & Magee, C. (2015). Measuring mental well-being: A validation of the short Warwick–Edinburgh mental well-being scale in Norwegian and Swedish. Scandinavian journal of public health, 43(7), 721-727. https://doi.org/10.1177/1403494815588862

Heymann, D. L., & Shindo, N. (2020). COVID-19: what is next for public health?. *The Lancet*, *395*(10224), 542-545. https://doi.org/10.1016/S0140-6736(20)30374-3

International Council of Nurses (ICN).(2020) ICN confirms 1,500 nurses have died from COVID 19 in 44 countries and estimates that healthcare workers COVID 19 fatalities worldwide could be more than 20,000. Retrieved from https://www.icn.ch/news/icn-confirms-1500-nurses-have-died-covid-19-44-countries-and-estimates-healthcare-worker-covid

JASP Team. (2016). JASP (Version 0.7.5.6) [Computer software]. Retrieved from https:// jasp-stats.org/

Johns Hopkins University & Medicine (2021). Saudi Arabia - COVID-19 Overview. Retrieved from https://coronavirus.jhu.edu/region/saudi-arabia

Kimhi, S., Eshel, Y., Adini, B., Aruta, J. J. B. R., Antazo, B. G., Briones-Diato, A., ... & Marciano, H. (2021). Distress and resilience in days of COVID-19: International study of samples from Israel, Brazil, and the Philippines. *Cross-Cultural Research*, *55*(5), 415-437. https://doi.org/10.1177/10693971211026806.

Lai, J., Ma, S., Wang, Y., Cai, Z., Hu, J., & Wei, N…& Hu, S. (2020). Factors associated with mental health outcomes among healthcare workers exposed to coronavirus disease 2019. *JAMA Network Open*, *3*(3), e203976. doi: https://doi.org/10.1001/jamanetworkopen.2020.3976.

Li, Z., Ge, J., Yang, M., Feng, J., Qiao, M., … Yang, C. (2020). Vicarious traumatization in the general public, members, and non-members of medical teams aiding in COVID-19 control. *Brain, behavior, and immunity*, *88*, 916–919. https://doi.org/10.1016/j.bbi.2020.03.007

Kenny, D. A. (2012). Measuring model fit. Retrieved from http://davidakenny.net/cm/fit.htm

Gulfnews.com. (2020). Available online: https://gulfnews.com/world/gulf/saudi/covid-19-saudi-arabia-ex pects-200000-cases-if-measures-not-followed-1.1586263454490 (accessed on 9 April 2020).

Kline, R. B. (2011). Convergence of structural equation modeling and multilevel modeling. In M. Williams (Ed.), Handbook of methodological innovation. Thousand Oaks, CA: Sage.

Lieberoth, Andreas, Shiang-Li Lin, Marta Kowal,...Stavraula Chrona. (2020). Stress and worry in the 2020 coronavirus pandemic: Relationships to trust and compliance with preventive measures across 45 Countries. Registered Report accepted at the *Royal Society for Open Science*, final paper currently under-review.

Lloyd, K., & Devine, P. (2012). Psychometric properties of the Warwick–Edinburgh Mental Well-Being Scale (WEMWBS) in Northern Ireland. *Journal of Mental Health*, *21*(3), 257-263. https://doi.org/10.3109/09638237.2012.670883

Ministry of Health – Kingdom of Saudi Arabia (2021). Retrieved 10 January 2021, from https://www.moh.gov.sa/en/Pages/default.aspx

Muthén, L. K., & Muthén, B. O. (1998–2012). *Mplus user's guide* (7th ed.). Los Angeles, CA Muthén & Muthén.

Ran, L., Chen, X., Wang, Y., Wu, W., Zhang, L., & Tan, X. (2020). Risk factors of healthcare workers with coronavirus disease 2019: a retrospective cohort study in a designated hospital of Wuhan in China. *Clinical Infectious Diseases*, 71(16), 2218-2221. https://doi.org/10.1093/cid/ciaa287

Renshaw, T. L. (2018). Psychometrics of the revised College Students Subjective Wellbeing Questionnaire. *Canadian Journal of School Psychology*, *33* (2), 136-149. https://doi.org/10.1177/0829573516678704

Ringdal, R., Bradley Eilertsen, M. E., Bjørnsen, H. N., Espnes, G. A., & Moksnes, U. K. (2018). Validation of two versions of the Warwick-Edinburgh mental well-being scale among Norwegian adolescents. *Scandinavian Journal of Public Health*, *46*(7), 718-725. https://doi.org/10.1177/1403494817735391

Robinson, O.C., Lopez, F.G., Ramos, K., & Nartova-Bochaver, S. (2013). Authenticity, social context, and well-being in the United States, England, and Russia: A three country. *Cross-Cultural Psychology, 44*(4), 719-737. https://doi.org/10.1177/0022022112465672.

Salloum, A., Kondrat, D. C., Johnco, C., & Olson, K. R. (2015). The role of self-care on compassion satisfaction, burnout and secondary trauma among child welfare workers. *Children and Youth Services Review*, *49*, 54-61. https://doi.org/10.1016/j.childyouth.2014.12.023

Saudi Center for Disease Prevention and Control (SCDC). (Covid-19) (2020) Disease interactive dashboard. Available online: https://covid19.cdc.gov.sa/daily-updates/ (accessed on 25 March 2020).

Sagherian, K., Steege, L. M., Cobb, S. J., & Cho, H. (2020). Insomnia, fatigue and psychosocial well-being during COVID-19 pandemic: A cross-sectional survey of hospital nursing staff in the United States. *Journal of Clinical Nursing*. https://doi.org/10.1111/jocn.15566

Shaukat, N., Ali, D. M., & Razzak, J. (2020). Physical and mental health impacts of COVID-19 on healthcare workers: A scoping review. *International Journal of Emergency Medicine, 13*, 40. https://doi.org/10.1186/s12245-020-00299-5

Shereen, M., Khan, S., Kazmi, A., Bashir, N., & Siddique, R. (2020). COVID-19 infection: Origin, transmission, and characteristics of human coronaviruses. *Journal of Advanced Research, 24*, 91–98. https://doi.org/10.1016/j.jare.2020.03.005

Simon, P. D. & Aruta, J. J. B. R. (2021). Addressing pandemic fatigue in the Philippines: Recommendations and proposed

solutions. *Asia-Pacific Journal of Public Health,* https://doi.org/10.1177/10105395211053919.

Soysa, C. K., & Wilcomb, C. J. (2013). Mindfulness, self-compassion, self-efficacy, and gender as predictors of depression, anxiety, stress, and well-being. *Mindfulness, 6*, 1–10. https://doi.org/10.1007/s12671-013-0247-1

Taggart, F., Friede, T., Weich, S., Clarke, A., Johnson, M., & Stewart-Brown, S. (2013). Cross cultural evaluation of the Warwick-Edinburgh mental well-being scale (WEMWBS) –a mixed methods study. *Health and Quality of Life Outcomes, 11*(1), 27. https://doi.org/10.1186/1477-7525-11-27

Tan, B., Chew, N., Lee, G., Jing, M., Goh, Y., Yeo, L., Zhang, K., … Sharma, V. K. (2020). Psychological impact of the COVID-19 pandemic on healthcare workers in Singapore. *Annals of internal medicine*, *173*(4), 317–320. https://doi.org/10.7326/M20-1083.

Tennant, R., Hiller, L., Fishwick, R., Platt, S....Stewart-Brown, S. (2007). The Warwick Edinburgh Mental Well-Being Scale (WEMWBS): Development and UK validation. *Health and Quality of Life Outcomes, 5*(63). https://doi.org/10.1186/1477-7525-563.

Ray, S. L., Wong, C., White, D., & Heaslip, K. (2013). Compassion satisfaction, compassion fatigue, work life conditions, and burnout among frontline mental health care professionals. *Traumatology, 19*(4), 255–267. https://doi.org/10.1177/1534765612471144

Stamm, B. H. (2009). The concise ProQOL manual. The concise manual for the professional quality of life scale. Retrieved from http://www.proqol.org/uploads/ProQOL_Concise_2ndEd_12-2010.pdf

Waqas, A., Ahmad, W., Haddad, M., Taggart, F. M., Muhammad, Z., Bukhari, M. H., ... & Rizvi, Z. A. (2015). Measuring the well-being of health care professionals in the Punjab: A psychometric evaluation of the Warwick–Edinburgh mental well-being scale in a Pakistani population. *PeerJ*, *3*, e1264. https://doi.org/10.7717/peerj.1264.

Weissman, G. E., Crane-Droesch, A., Chivers, C., Luong, T., Hanish, A., Levy, M. Z., ... & Brennan, P. J. (2020). Locally informed simulation to predict hospital capacity needs during the COVID-19 pandemic. *Annals of Internal Medicine*, https://doi.org/10.7326/M20-1260.

Van Bavel, J., & Boggio, P. et al. (2020). National identity predicts public health support during a global pandemic. https://doi.org/10.21203/rs.3.rs-67323/v1

Vizheh, M., Qorbani, M., Arzaghi, S. M., Muhidin, S., Javanmard, Z., & Esmaeili, M. (2020). The mental health of healthcare workers in the COVID-19 pandemic: A systematic review. *Journal of Diabetes and Metabolic Disorders*, 1–12. https://doi.org/10.1007/s40200-020-00643-9.

Westerhoff, G. J., & Keyes, C. L. M. (2010). Mental illness and mental health: The two continual model across the lifespan. *Journal of Adult Development, 17*, 110–119. https://doi.org/10.1007/s10804-009-9082-y

World Health Organization (2021a). *WHO coronavirus disease (COVID-19) dashboard*. Retrieved from: https://covid19.who.int/

World Health Organization (2021b). *WHO coronavirus disease (COVID-19) dashboard*. Retrieved from: https://covid19.who.int/region/emro/country/sa

Yamada, Y., Ćepulić, DB., Coll-Martín, T.,...Lieberoth, A. (2021). COVIDiSTRESS Global Survey dataset on psychological and behavioural consequences of the COVID-19 outbreak. *Nature Scientific Data, 8*, 3. https://doi.org/10.1038/s41597-020-00784-9.

Yang, Y., & Hayes, J. A. (2020). Causes and consequences of burnout among mental health professionals: A practice-oriented review of recent empirical literature. *Psychotherapy, 57*(3), 426–436. https://doi.org/10.1037/pst0000317

Zaghloul, M., Saquib, J., AlMazrou, A., & Saquib, N. (2019). Mental Health Status of Expatriate Nurses in Northcentral Saudi Arabia. *Journal of Immigrant and Minority Health, 21*(6), 1233–1240. https://doi.org/10.1007/s10903-018-00853-7