COVID-19

Acute Stress among Nurses in Sweden during the COVID-19 Pandemic

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A B S T R A C T

Sweden was hit hard in the beginning of the COVID-19 pandemic with deaths per capita among the highest in Europe. The pandemic was a stressful time especially for healthcare workers caring for COVID-19 patients. Various studies have evaluated whether nurses caring for these patients had higher levels of acute stress, but typically with measures that either used older DSM-IV criteria for Acute Stress Disorder (ASD) or general measures of acute stress. We recruited an online sample (N = 101) of nurses in Sweden from COVID-19 specialized units (ICU), Emergency (ER), and other units (Other), and asked them to answer questionnaires retrospectively to the peak of infections in Sweden. We aimed to evaluate: 1) the psychometric properties of the translation of the Stanford Acute Stress Reaction Questionnaire-II (SASRQ-II, which follows DSM-5 criteria for ASD) into Swedish, 2) whether nurses in COVID-19 units had experienced more acute stress than nurses in other units, and 3) the extent of potential acute stress disorder. The SASRQ-II evidenced good construct, convergent and divergent validity, and good reliability. It showed that ICU nurses reported significantly more acute stress than the other two groups, a difference that could not be accounted for by demographic or other variables. A retrospective diagnosis of ASD using the SASRQ-II suggested that 60% of nurses might have fulfilled ASD criteria, but no differences across groups were found.

In early 2020 the world was shaken by the spread of COVID-19, classified as a pandemic by the WHO in March 2020 (Folkhälsomyndigheten, 2021). Sweden was hit hard in the beginning of the pandemic with deaths per capita among the highest in Europe (Kudo et al., 2021). The pandemic was a stressful time for many, especially healthcare workers caring for COVID-19 patients. Their working conditions included contact with infected people and thus risk of contagion and death (Pramsten, 2021; Westin, 2020), as well as a growing workload as the number of people treated in Intensive Care Units rose (Vallgårda, 2021). Healthcare workers engaged in this type of care during the first wave of the pandemic could be argued to have experienced a traumatic event. For instance, post-traumatic symptoms (PTS) have been common among healthcare workers during the pandemic (Marvaldi et al., 2021), on top of the general increases in anxiety and depression as responses to the pandemic (Van den Cruyce, 2021). Most people who experience traumatic events do not suffer from long term effects on their well-being, resilience being the most common response to single-event traumas (Galatzer-Levy et al., 2018), nonetheless for others the reactions become dysfunctional and can lead to acute or long-term disorders such as acute stress disorder (ASD) and/or post-traumatic stress disorder (PTSD) (Cardeña & Carlson, 2011).

Several studies have explored the predictors, prevalence, and effect of acute stress among healthcare workers during the COVID-19 pandemic, many using the Stanford Acute Stress Reaction Questionnaire (SASRQ). A meta-analysis of 57 studies on acute stress (N = 48,042) using the Stanford Acute Stress Reaction Questionnaire (SASRQ), the Depression and Anxiety and Stress Scale (DASS-21, Lovibond & Lovibond, 1995), or the Perceived Stress Scale (PSS, Cohen et al., 1983) found a pooled prevalence of 40%, without distinguishing between different types of health workers (Aymerich et al., 2022).

The prevalence of acute stress has varied somewhat according to country and region. Liu and collaborators (2021) studied acute stress in Chinese nurses based in Wuhan who worked with COVID-19 patients, so-called frontline healthcare workers, and reported that 14% reported clinical levels of acute stress. Another study of Wuhan-based healthcare workers found that 30% had clinically relevant levels of acute stress (Zhu et al., 2020), and research with female healthcare workers in Wuhan found a 32% prevalence (Li et al., 2020). Zhang et al. (2020) studied healthcare workers in Wuhan during the outbreak of the pandemic and found that local workers experienced higher levels of acute stress than those from other regions, and argued that the local workers had been more exposed to a prolonged

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and severe stress during the first outbreak. A study, from another region of China, on frontline healthcare workers showed that 38% of the sample reported clinical levels of acute stress (Wang et al., 2021), whereas in research carried out during a rapid growth stage of the pandemic in China, 33% manifested high levels of stress (Zhou et al., 2021). Zhang, Ji, et al. (2021) found high scores on the SASRQ sub-scales in a sample of Chinese, non-Wuhan-based, healthcare workers with 49% experiencing dissociation, 27% trauma re-experiencing, 23% avoidance symptoms, 42% hyperarousal, and 32% maladaptive behaviors. Sung et al. (2021) found that 33 % of a sample of Taiwanese healthcare workers suffered from acute stress and that health workers in acute and critical care divisions had higher levels of acute stress than those who worked in other places. Counterintuitively, Liao et al. (2020) reported that nurses who did not work directly with COVID-19 patients during the peak of the first wave of the pandemic in China scored higher on the SASRQ than those who worked with them and those who had volunteered to go to Wuhan to work with those patients. The authors hypothesized that all healthcare workers were subject to a high risk of infection but the ones who worked with COVID-19 patients had higher levels of social support. Overall, about one third of healthcare workers in China evinced symptoms of severe stress.

With respect to other countries, 25% of Italian healthcare workers from various sites reported severe levels of posttraumatic stress; levels were higher in the regions where the outbreak of COVID-19 was more severe and in healthcare workers from emergency departments compared to those in intensive care or other medical units (Carmassi et al., 2021). Another Italian study of healthcare workers did not find a significant difference in SASRQ (incorrectly called Stanford Acute Stress Reaction Index) scores between primary and secondary care staff; however, the study used a small sample and the primary care staff in the sample were doctors while the secondary care staff sample consisted of other professions (Di Filippo et al., 2021).

Two studies on healthcare workers in New York found the prevalence of clinical levels of acute stress to be 57% (Shechter et al., 2020) and 55% (Shechter et al., 2021), both of them using a PTSD measure. The same research group (Diaz et al., 2022) reported that 59% of frontline healthcare workers in a large New York sample had elevated levels of acute stress during the first month of the pandemic.

A study evaluating a sample of Spanish healthcare workers during the first wave of the pandemic found that 33% scored in accordance with an ASD diagnosis on an ad-hoc questionnaire based on DSM-5 criteria (Echeverria et al., 2021). Mira et al. (2020) reported that 24 % of their sample of Spanish healthcare workers experienced a medium-high emotional load and 5 % extreme acute stress; they found higher scores of acute stress during a later stage of the first outbreak of the pandemic, when the number of deaths had already peaked and the general psychological state was assumed to be fatigue; and higher acute stress scores in healthcare workers working in territories with a higher death toll. Gonzalo et al. (2021) found clinical levels of acute stress in 27% of a sample of Spanish healthcare workers who worked during COVID-19.

In a Jordanian study, clinical levels of acute stress were reported by 64% of a sample of nurses (Sharour & Dardas, 2020), whereas 4% of postgraduate trainees in Pakistan at the outbreak of COVID-19 experienced clinical levels of acute stress (Imran et al., 2020). Overall, the studies highlight that a high percentage (probably around a third at least) of healthcare workers across the globe were afflicted with acute stress reactions, with the prevalence varying across different countries and regions, as well as potential exposure to COVID-19.

The following have been found to be acute stress risk factors for healthcare workers during the COVID-19 pandemic: female gender (Di Filippo et al., 2021; Gonzalo et al., 2021; Imran et al., 2020; Zhang et al., 2020; Zhu et al., 2020), particularly with pre-existing anxiety (Miguel-Puga et al., 2021); having a history of mental disorders (Zhu et al., 2020); working with patients infected with the virus (Imran et al., 2020; Zhang, Ji, et al., 2021); having visited recently Wuhan (Zhang, Ji et al., 2021); insufficient access to protective material (Gonzalo et al., 2021; Sangrà et al., 2022); perceived risk (Gonzalo et al., 2021; Zhang, Ji et al., 2021; Zhu et al., 2020); maladaptive coping strategies (Liu et al., 2021); knowing someone infected with the virus (Di Filippo et al., 2021; Zhu et al., 2020); being infected oneself (Sangrà et al., 2022); expected duration of the pandemic (Zhang, Ji et al., 2021); burnout (Miguel-Puga et al., 2021; Sung et al., 2021); having high levels of moral courage (Echeverria et al., 2021); being divorced or widowed (Zhang, Ji et al., 2021); being a single child, working longer hours, having colleagues affected by COVID-19 (Sanghera et al., 2020); and physical inactivity (Zhang, Ji et al., 2021). Relatedly, probable PTSD among 28% of USA COVID-19 healthcare workers was related to female gender, low team cohesion, stigma, and higher media exposure (Hennein et al., 2021).

Acute stress has also been associated with lower quality of life (Zhang, Ji et al., 2021), worse quality of sleep and anxiety (Diaz et al., 2022; Di Filippo et al., 2021; Xiao et al., 2020), functional impairment (Carmassi et al., 2021), having worked for more than 10 years (Zhu et al., 2020), pondering resigning due to the pandemic (Zhu et al., 2020), and psychological distress (Shahrour & Dardas, 2020; Wang et al., 2021). Moreover, several studies indicated that nurses reported more post traumatic and acute stress symptoms than other types of healthcare workers (Carmassi et al. 2021; García-Fernández et al., 2020; Sangrà et al., 2022; Shechter et al., 2020).

In contrast, social support and self-efficacy (Di Filippo et al., 2021; Liu et al., 2021; Xiao et al., 2020), a strong sense of purpose in life (Echeverria et al., 2021), and physical exercise (Li et al., 2020; Sangrà et al., 2022) were protective factors in some studies. Those who screened positive for acute stress used more coping behaviors and were more interested in wellness resources than those who screened negative (Shechter et al., 2020).

Students in caring professions have also been affected by the pandemic. Zhang, Qi, and collaborators (2021) studied acute stress and career planning among students in health professions; 12% in the sample had high SASRQ scores, particularly if they had been exposed to suspected COVID-19 patients, experienced symptoms, had family members who experienced symptoms, had gotten their news of the virus through unofficial media and had a lower awareness of the pandemic. Acute stress seemed to be connected to career planning: the students with lower scores on the SASRQ were more confident of their career-goals while those who scored higher were more likely to believe they would leave the profession after graduation (Zhang, Qi et al., 2021). In Wang et al. (2020), acute stress correlated negatively with a positive professional identity, with the dissociation scale being strongly connected to a negative professional identity (Wang et al., 2020). Overall, strongly identifying professionally as a healthcare worker was a protective factor among health students.

Considering that ASD has been a common response to the COVID-19 crisis among healthcare workers and is associated with significant distress and a risk factor for later PTSD, a validated and up-to-date questionnaire would be useful for clinical and research purposes. Thus, the present study had as main goals to evaluate:1) the psychometric properties of the translation of the SASRQ-II into Swedish, 2) the extent of probable acute stress in nurses during a high period of infection in Sweden, and 3) whether nurses in COVID-19 units had endured more acute stress than nurses in other units.

Method

Translation of the SASRQ-II into Swedish

To the best of our knowledge, there is no questionnaire in Swedish to measure acute stress in adults that follows DSM-V criteria for Acute Stress Disorder (a translation into Swedish of the SASRQ using

DSM-IV criteria was used in Kjellenberg et al., 2014). The original version of the SASRQ was developed to cover DSM-IV diagnostic criteria for Acute Stress Disorder (APA, 2000) and showed good psychometric properties shortly after its development (Cardeña et al., 2000), supported by a recent review of research since 2000 (Lötvall et al., 2022). The SASRQ-II is a revision of the instrument according to DM-5 ASD diagnostic criteria (APA, 2013), which added the category of *Negative Mood* and decreased the importance of dissociative items. The SASRQ-II was developed by the authors of the original SASRQ and can be obtained free of charge from the corresponding author (for a description, see Measures).

The SASRQ-II was translated into Swedish by the authors of this paper. A university student, fluent in both languages, did a back-translation, which was then compared to the original English version by one of the authors of the measure, fluent in both English and Swedish. Small changes were made until a close equivalence was obtained. This version was then sent to five Swedish-speaking experts in dissociation and trauma requesting input. Of the two experts that responded, one considered the translation "perfect" and the other had two very small phrasing suggestions.

Participants

Our sample consisted of 101 nurses, 24 of which worked in COVID-19 Intensive Care Units (ICU), 35 in Emergency Rescue Units (ER), and 41 in other units. Participation in the study was anonymous and voluntary, the data were confidential, and informed consent was secured. Contact information of the researchers was given, as well as a link with information about stress related mental health issues with an encouragement to contact healthcare providers if the respondents were concerned. Those who suffered from any severe mental illness within the last 6 months were asked not to participate in the study. Moreover, the retrospective aspect of the study minimized the risk of distress and we chose to study nurses since they were likely to have access to professional support through their work. Responding to questions about a stressful event does not seem to be harmful and can be perceived as important and meaningful to the participants (e.g., Gomez et al., 2018). This study was reviewed internally within the psychology department and the Swedish Ethical Review Authority also assessed it and concluded that it did not have to be reviewed and only recommended a few small changes to the translation, which were implemented.

Measures

Impact of Event Scale-Revised (IES-R)

The Impact of Event Scale-Revised is a self-administered 22-item questionnaire that measures PTS symptoms with a Likert-type scale of 0 = not at all to 4 = extremely, and a score range from $0 - 88$ (Weiss & Marmar, 1997). The Swedish translation identifies well people suffering from PTSD and has high internal reliability (α = .94) (Sveen et al., 2010).

Irrational procrastination scale

The Irrational Procrastination Scale measures procrastination with 9 items scored from 1 = very seldom or not true of me, to 5 = very often or true of me, has a range of $9 - 45$, and was validated in Sweden (Rozental et al., 2014).

Perceived risk

Two questions about perceived risk regarding COVID-19 were used in this study: "My work has put me at risk of being infected with COVID-19" and "I believe I would get seriously ill if I was infected with COVID-19," with a range of scores per item of 1-5.

Perceived social support

Two questions inspired by the Multidimensional Scale of Perceived Social Support (Zimet et al., 2010) were used in this study: "If I need it, I have someone I can talk to about my problems" and "If I need it, I have someone I can ask for support and help," with a range of scores of 1-5 per item.

The Stanford Acute Stress Reaction Questionnaire II (SASRQ-II)

The SASRQ-II is a self-administered questionnaire that addresses all DSM-5 diagnostic criteria for Acute Stress Disorder (APA, 2013), unlike other measures of general stress. It has three parts: The first is an instruction to describe the event, in what capacity one experienced it, and estimate how upsetting it was. In this study, the first question was replaced by a sentence describing the first COVID-outbreak in April 2020, asking the participants to think back to their experiences during that time. The second part of the instrument contains 30 statements with answers on a 6-point scale, 0 = "not experienced," to 5 = "very often experienced." The final part of the instrument has four questions concerning duration of symptoms, degree of functional impairment, and whether one suffers from any mental illness. In this study, Cronbach's alphas showed excellent reliability: *a* = .97 for the whole scale, and good to excellent reliabilities for the subscales: Intrusion (*a* = .89), Negative mood (*a* = .83), Dissociation (*a* = .87), Arousal (*a* = .83), Functional Impairment (*a* = .81), and Avoidance (*a* = .75). The range of scores is 0-150.

Design and procedure

The current study used a cross-sectional design, with a retrospective inquiry about stress responses during the acute outbreak of COVID-19 in Sweden during April 2020, when the number of people admitted to intensive care units for COVID-19 was at its peak (Folkhälsomyndigheten, 2021). Recruitment of participants was done through convenience sampling over Facebook. The IT-system Sunet Survey was used to register responses to the questionnaires. A link to them was published in two closed Facebook groups, one targeting certified nurses from all areas of the profession, with approximately 35,000 members at the time of the study. The other group includes nurses working in the ICU and had about 600 members at the time of the study. An invitation to complete the survey was published in the two Facebook groups between the 9th of September and the 3rd of October, 2021. We approached the administrators of each group and asked them to publish information on our study and a link to the survey. After approximately two weeks participation waned and the administrators were asked to re-publish the study. A week after this there were no further responses and the survey was closed.

Analyses

Analyses were carried out with SPSS version 27. Little's missing completely at random test was conducted to explore the nature of the missingness in the sample. The data was tested for normality, skewness, kurtosis, and equality of variances. ANOVAS (for normally distributed variables) and Kruskal-Wallis One Way ANOVAS (for non-normally distributed variables) were selected to determine whether there were differences between the groups on age and other variables, whereas chi-squares were used to analyze differences for frequencies. Pearson's correlations evaluated the associations across variables, and Fisher's *z* transformation was used to compare correlations. Cronbach's alphas were calculated on the SASRQ-II to assess reliability. An exploratory factor analysis (EFA) was performed to investigate how well the subscales fit the data. The Kaiser-Meyer-Olkin measure of sampling adequacy and Bartlett's test of sphericity were performed to test the assumptions for the EFA. A parallel analysis was performed to learn the appropriate number of factors. Principal Axis Factoring was chosen as the extraction method since the

Table 1
Descriptive Data Stratified by Workplace (n = 100)

	Total %	ICU %	ER %	Other %
Gender				
Male	9	17	9	5
Female	90	83	91	95
Age group				
20-29	23	4	37	22
30-39	43	42	37	49
40-49	22	33	14	22
50-59	12	21	11	7
Working hours				
100 %	81	75	80	88
75 %	13	21	11	10
50 %	5	4	9	2
COVID-19 infection				
Yes	28	17	34	29
No	71	83	66	71

scores on the SASRQ-II were not normally distributed. Because psychological constructs can be assumed to correlate we used the Oblimin rotation. Significance was set a-priori as $p < .05$.

Results

Participants

A total of 101 nurses took part in the study, the great majority identified as women, a plurality was between 30-39 years of age, most worked full-time in April 2020, and slightly more than a quarter had been infected at some point with COVID-19 (see Table 1). One participant did not answer any questions about demographics and was excluded from all analyses except the correlational analysis between the questionnaires. Henceforth the groups of nurses in the study will be referred to as ICU, ER, and Other.

The mean number of days the participants reported finding the event distressing, from 0-5 (5 indicating "five or more") was 3.35 (*SD* = 2.07). The mean number of days participants reported experiencing functional impairment, from 0-5 (5 indicating "five or more") was 3.36 (*SD* = 1.94). Four participants claimed to have been intoxicated or having symptoms of withdrawal. One of them reported this for zero days, two for three days, and one for five days of the referred period. Four other participants reported having been diagnosed with a medical condition: one sleep disorder, two depression and one burnout. Given the low frequency of these responses they were not analyzed further.

Validity of the SASRQ-II

With respect to convergent and discriminant validity, the correlation of the SASRQ-II and the IES-R was large, $r = .92$, $p < .001$. In contrast, the one between the Irrational Procrastination Scale, which was not expected to be large, was significant $r = .37$, $p < .001$, but significantly smaller, $z = 8.4$, $p < .001$. In addition, there was a strong correlation between the SASRQ-II and the question "How disturbing to you was this event?," $r = .52$, $p < .001$. We also performed an exploratory factor analysis (EFA), with the Kaiser-Meyer-Olkin test indicating that the sampling was adequate with a value of .92, and all communalities above .5. The EFA suggested a five-factor solution, with eigenvalues above 1. The five-factor solution explained 68.5 % of the variance (see Table 2).

The EFA's first factor accounted for almost half of the variance, including 4 items from the Intrusion subscale (6, 19, 2, 7; for the item phrasing see Appendix 1); two from Avoidance: (11, 5); two from Arousal; (12, 1) and one from Negative Mood (20). It can be considered a general posttraumatic symptom factor. The second factor primarily relates negatively to functional impairment, including 3 items

Table 2
EFA Solution

Factor	Eigenvalue	% of Variance	Cumulative %	# items
1	14.96	50	50	9
2	2.03	7	57	9
3	1.31	4	61	3
4	1.20	4	65	2
5	1.05	3.5	68.5	3

Table 3
EFA Factors

Item	F 1	F 2	F 3	F 4	F 5
Item 6	.82				
Item 19	.75				
Item 11	.69				
Item 2	.66				
Item 7	.54				
Item 12	.53				
Item 20	.51				
Item 5	.50				
Item 1	.48				
Item 30		-.93			
Item 21		-.82			
Item 24		-.77			
Item 22		-.72			
Item 27		-.695			
Item 25		-65			
Item 26		-.61			
Item 9		-.56			
Item 28		-.49			
Item 4			.81		
Item 3			.67		
Item 16			.47		
Item 13				.77	
Item 18				.44	
Item 17					.85
Item 8					.51
Item 14					.47

from the Functional Impairment subscale: (25, 26, 9); two from Negative Mood: (30, 22); two from Arousal (21, 24); and two from Dissociation: (27, 28). The third factor involves dissociation items (4, 3, 16); and the fourth has two derealization items (13, 18). The fifth factor does not have a clearly discernible theme, with items from the Functional Impairment (17), Avoidance (14), and Arousal subscales (8). Four items did not load onto any factor (see Table 3).

Differences across groups

Little's test suggested that data were likely missing at random, $p = .80$. The SASRQ-II and IES-R had only five missing answers, so their missing values were replaced with the mean for the answer on the particular item. Shapiro-Wilk's test showed that the variables age, gender, social support, working hours, and whether one had been infected with the virus were not normally distributed ($p < .05$); the variable perceived risk had a normal distribution. With respect to demographics, the groups did not differ in Gender, $\chi^2 = 2.58$, $p = .28$, frequency of COVID-19 infection, $\chi^2 = 2.25$, $p = .33$, or full time vs. part time work, $\chi^2 = 3.32$, $p = .51$. They differed in age, $H(2)=9.28$, $p = .01$ (see Table 1), but because age did not correlate with the SASRQ-II, $r = -.10$, $p = .31$, it was not used in further analyses. There were no significant differences for Social Support, ($p = .42$), Perceived Risk ($p = .19$), Work Hours ($p = .41$), or COVID-19 infection ($p = .33$) (see Table 4).

The distributions of the SASRQ-II across groups were not normal so a Kruskal-Wallis test was carried out, revealing a significant small difference across groups, $H(2) = 7.61$, $p = .02$, $\eta2 = .06$. Pairwise comparisons showed a difference between the ICU (*M* = 83.21, *SD* = 26.49) and Other (*M* = 60.14, *SD* = 36.82, $p = .01$) and ER

Table 4
Means and Standard Deviation of the Scales Stratified by Workplace.

	Total	ICU	ER	Other	F/H	η^2
	M (SD)	M (SD)	M (SD)	M (SD)		
Perceived Risk	6.86 (1.79)	6.42 (2.12)	7.26 (1.65)	6.78 (1.65)	F (2,97) = 1.67	.03
Social Support	7.15 (2.31)	7.17 (2.28)	7.54 (2.21)	6.80 (2.41)	H (2) = 1.75	.003
SASRQ-II	67.99 (33.28)	83.21 (26.49)	65.74 (30.14)	60.15 (36.82)	H (2) = 7.61*	.06
IES-R	38.73 (20.72)	47.75 (17.40)	37.20 (19.31)	34.76 (22.45)	F (2,97) = 3.27*	.06
IPS	25.45 (7.25)	26.25 (7.69)	26.46 (7.86)	24.12 (6.35)	F (2,97) = 1.18	.02

* $p<0.05$.

($M = 65.74$, $SD = 30.14$, $p = .03$) groups, but not between the ER and the Other groups, $p = .58$.

The data from the IES-R for all three groups were normal and the groups varied significantly, $F(2,97) = 3.27$, $p = .04$, $\eta^2 = .06$. Tukey post hoc pairwise comparison indicated a significant difference between the ICU ($M = 47.75$, $SD = 17.40$) and the Other ($M = 34.76$, $SD = 22.45$, groups), $p = .04$, $d = 0.65$, but not between the ICU and ER ($M = 37.20$, $SD = 19.31$), $p = .13$, $d = 0.57$, or between the ER and the Other, $p = .86$, $d = 0.12$ groups. There was no overall significant difference for the question "How disturbing to you was this event?," $H(2) = 4.84$, $p = .09$, $\eta2 = .03$, but independent t tests showed a significant difference between ER ($M = 7.63$, $SD = 1.85$) and Other ($M = 6.56$, $SD = 2.28$), $t(74) = 2.22$, $p = .03$, but not between ICU ($M = 7.46$, $SD = 1.84$) and Other, $t(63) = 1.64$, $p = .11$, or ER and ICU, $t(57) = -.35$, $p = .73$.

Potential ASD diagnosis

The SASRQ-II counts a symptom as present when scores are 3 (i. e., at least "sometimes experienced") or higher on an item. The diagnosis of ASD requires 9 or more symptoms from the five subcategories. In addition, the symptoms need to cause functional impairment in daily life and persist for more than three days. In this exploratory analysis we used the criteria of having a score of at least 3 in 9 items measuring ASD symptoms and 3 items measuring functional impairment from the second part of SASRQ-II, and experiencing them for at least 3 days as measured by the third part of the questionnaire. Using these criteria, 60% of the total sample, 67% of ICU nurses, 60% of ER nurses and 54% of nurses working in other areas had scores suggestive of Acute Stress Disorder retrospectively. The range of scores suggesting an ASD diagnosis for the whole group was 57-130 ($M = 86.28$, $SD = 17.01$), for ICU nurses 71-126 ($M = 92.38$, $SD = 14.92$), for ER nurses $60 - 114$ ($M = 82.67$, $SD = 16.45$), and for the other nurses $57 - 130$ ($M = 85.55$, $SD = 18.38$). There was no relation between type of nurse and potential diagnosis $\chi^2 = 1.08$, $p = .58$.

Discussion

The results show that the translation into Swedish of the SASRQ-II has good psychometric properties, although the EFA showed that the factors only partially overlapped the subcategories, which is not surprising given that the latter were derived from the DSM-5 diagnostic criteria rather than empirically. It may very well be that these subcategories are interconnected and so it may be hard to differentiate between them. People might experience the symptoms simultaneously or as a consequence of the other symptoms. For instance, the first factor from the EFA mainly contains items from the subscale intrusion and some items from the subscales arousal and avoidance, and these symptoms may trigger one another. Intrusion may be connected to arousal and the unpleasant experience of these symptoms may increase avoidance (cf. Horowitz, 2011). The items on the second factor had negative factor loadings and are from the subscales functional impairment, negative mood, dissociation, and arousal, and may be conceptualized as relating to daily functioning. Items such as "I had difficulty concentrating" and "My mind went blank" can

disrupt functioning, even though they refer more directly to the subscales Arousal and Dissociation. The third and fourth factors contained items from the dissociation subscale, which strengthens the evidence that dissociative symptoms cannot be subsumed under other categories such as arousal or avoidance (for a network analysis in support of this contention see Cardeña et al., 2021).

The convergent and discriminant validity of the SASRQ-II is supported by its large correlation with the IES-R and significantly smaller one with the IPS. That there was still a correlation with the IPS is concordant with studies showing that procrastination relates to anxiety and depression (Constantin et al., 2018; Kim et al., 2020; Rozental et al., 2014), and procrastination could be a consequence of or a contributing factor to psychological distress in general and thus relate to general acute stress.

As predicted, nurses who had worked in the COVID-related ICU scored higher on the SASRQ-II than nurses in the other units, which reinforces the validity of the SASRQ-II by showing that it can distinguish between presumably different levels of exposure to a stressor. This variation between the groups was also seen in the IES-R scores, supporting the notion that the nurses working in the ICU were particularly affected by the stress of the pandemic outbreak, although no significant difference was found between the ICU-group and the ER-group in this instrument. This is in line with previous research with the original version of the SASRQ, in which the instrument discriminated between different stress levels (Lötvall et al., 2022). Several studies with the original version of the SASRQ showed that healthcare workers were highly affected by the pandemic (Gonzalo et al., 2021; Liu et al., 2021; Shahrour & Dardas, 2020; Zhang et al., 2021) and that working directly with covid-19 patients led to higher levels of stress (Imran et al., 2020; Zhang et al., 2021). An earlier, prospective study with Taiwanese nurses in SARS specialized versus other units did not find a significant difference in PTS rates (33% versus 19%: Su et al., 2007), but this might be explained by the small N of that study and consequent low statistical power. The results of our study revealed a moderate correlation between the SASRQ-II scores and how disturbing the participants found the event, which further supports the premise that the SASRQ-II is a valid measure of acute stress. An exploratory analysis of potential ASD diagnoses based on SASRQ scores (which would have had to be corroborated by a full clinical evaluation at the time) showed no differences across the groups, but it bears pointing out that a majority of nurses might have potentially gotten an ASD at the time and that a larger N might have revealed intra-group differences.

Strength and limitations

One of the strengths of this study was the introduction of a valid and reliable way to measure adult acute stress in Swedish. Another was the finding of differences across different types of nursing environments, rather than lumping all health workers in a group. Nonetheless, the study had limitations including the use of convenience sampling through Facebook groups, in which there may be a bias in the nurses who use these groups and choose to participate in studies like ours. Second, the sample in the study was relatively small and the sizes of the group unequal. Despite this, the results show that

there was enough power to detect the hypothesized difference. Furthermore, for ethical reasons participants who had had psychological problems during the last 6 months were asked not to participate, which likely restricted the range of responses.

Also, the sample size poses a problem for the EFA since 100 respondent have been proposed as the minimum for performing a factor analysis, being advisable to use bigger samples, especially when exploring many items (Kyriazos, 2018). Second, a sample of 101 nurses need not be representative of the Swedish population of nurses, which affects the generalizability of the results. Third, the study used a retrospective design in which participants were asked to think back to April 2020, which poses the problem of whether their recollections of that period are accurate. The COVID-19 pandemic was stretched out over more than a year and the nurses in this study may have experienced prolonged stress and several peaks in their workloads. Thus, there is a risk of mixing up different experiences, although this factor might have affected the whole sample equally. A final limitation is that we have no knowledge of where the nurses in the "Other group" worked, which means that we do not really know what we are comparing the ICU and ER group against. Some nurses might have been minimally affected by the pandemic whereas others might have been working in more stressful places such as elderly homes in which many people were infected and died. However, we prioritized the ethical aspect of strengthening anonymity and chose not to collect more information about the workplaces of the participants or their specific ages. Despite these limitations, the results were consistent with our hypotheses and with most previous research in other countries.

Future research

It is important to evaluate the Swedish translation of the SASRQ-II with different types of stressful events and samples with larger *N*s. Although providing an ASD diagnosis was not the focus of this study, the results suggest how distressing the covid-19 pandemic was for nurses. Future longitudinal research on how healthcare workers have been affected by the COVID-19 pandemic (and other crises) would help address the potential negative psychological effects of difficult working conditions. Instruments like the SASRQ-II help identify stressed health workers, so they may be offered targeted interventions to decrease their work-related stress in the short- and long-term (e.g., Jáuregui Renaud et al., 2022. It will be important for further validation of the measure to compare it with clinician's judgments of an ASD diagnosis. A study with the previous version of the SASRQ (McKibben et al, 2008) found that a cut-off score of 40 maximized PTSD predictive sensitivity and specificity, and a similar analysis with the SASRQ-II is called for. Finally, longitudinal studies that consider the interaction of different variables (e.g., acute reactions to stress and coping strategies; Cardeña et al., 2021 under review) will provide a broader view the direct and interactive effect of acute reactions.

Clinical impact statement: This article shows that the translation into Swedish of the Stanford Acute Stress Questionnaire II has good psychometric properties, so it may be used for evaluation and clinical work. Nurses more directly exposed to COVID-19 are more likely to experience acute stress than those in other units.

Declaration of Competing Interest

We have no known conflict of interest to disclose.

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