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How did nurses cope during the COVID-19
pandemic? Analysis of moral injury, meaning in
life, and PTSD severity.

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Title
Abstract

The COVID-19 pandemic has significantly impacted healthcare providers, exposing them to high-stress environments and challenging moral dilemmas. This study examines the relationship between exposure to potentially morally injurious events (PMIEs), meaning in life, and PTSD severity among nurses during the pandemic. Exposure to PMIEs, defined as events that violate one's moral code or values, were assessed alongside meaning in life and intrusion severity through a longitudinal study involving 164 nurses across European countries. Linear regression analysis was utilized to test the hypothesized mediation model that exposure to PMIEs leads to a decrease in meaning in life, which in turn leads to more intrusion severity. Results indicate a significant association between exposure to PMIEs and intrusion severity, as well as between meaning in life and intrusion severity. However, the hypothesized mediation model was not supported. This may be due to the use of a broad scale to measure meaning in life instead of a meaning in life scale that relates to the PMIEs, or the dependent variables may have their influence separately from each other on intrusion severity. Several limitations were identified, including that we did not control for the levels of intrusions, exposure to PMIEs and meaning in life at the other timepoints. This means, for example, that meaning in life could have also been a result of intrusion severity, instead of a predictor. Future research could focus on gathering richer information by conducting case studies. The clinical setting could consider implementing meaning in life training to mitigate intrusion severity among healthcare providers. Overall, this study highlights the importance of addressing mental health concerns among nurses and advancing our understanding of risk factors and protective factors during times of crisis like the COVID-19 pandemic.

How did nurses cope during the COVID-19 pandemic? Analysis of moral injury, meaning in life and PTSD severity

The COVID-pandemic has had a major impact on society, but in particular on health care providers. The pandemic became a global health crisis with crowded hospitals, lack of equipment and treatment, and record-breaking mortality. Healthcare providers had an increased risk of developing psychological disorders, such as anxiety, depression, and PTSD symptoms (Serrano-Ripoll et al., 2020). As Caillet et al. (2020) stated: ‘The context of the international health crisis brings many risk factors that can affect the psychological well-being of our caregivers, which is why we must pay special attention to them’ (p. 718). The aim of this current study is to do just that, by assessing the relationship between potentially injurious events (PMIEs), meaning in life, and PTSD severity.

Potentially injurious events (PMIEs)

Healthcare providers were at increased risk of experiencing potentially morally injurious events (PMIEs): Healthcare providers are used to making life-and-death decisions as part of their jobs; however, they now needed to make these decisions knowing that they may not have the equipment or supplies to help everyone. PMIEs occur in high-stakes environments and violate one’s values or moral codes (Borges et al., 2020). PMIEs may conclude one’s own actions or inactions, or other’s actions or inactions. For example, in the context of the pandemic, failing to properly screen a patient, resulting in other vulnerable patients’ being exposed to COVID-19, could be a PMIE from one’s own inaction (Borges et al., 2020).

Exposure to PMIEs might develop into more severe and long-lasting ‘moral injury’, which can entail symptoms such as shame, anger, moral or existential conflict, guilt, negative self-beliefs, lack of empathy, and loss of trust in goodness (Molendijk, 2018; Griffen et al., 2019). Moral injury has been associated with very serious psychological and behavioral

outcomes, such as higher suicidal behavior (Ma et al. 2023), increased medical errors (Hall et al., 2022), and PTSD severity (Ma et al., 2023; Bryan et al., 2018).

Many studies examined the prevalence of exposure to PMIEs and resulting moral injury in healthcare providers. For instance, one study assessed levels of moral distress severity among 3,006 healthcare providers in China. Roughly 40% of the participants experienced symptoms severe enough to be functionally impairing (Wang et al., 2022). Another study assessed exposures to PMIEs in healthcare providers in the United States. Respectively 50% of the participants experienced moral injury from other's actions and roughly 20% felt that they transgressed their own moral beliefs by their own actions or inactions (Amsalem et al., 2021). In one study with 595 participants, the prevalence of nurses with clinically significant moral injury during the COVID-19 pandemic in the USA was 38.1% (Rushton et al., 2022).

Exposure to PMIEs in healthcare providers has been studied in correlation to PTSD severity. One study with 4378 participants found that those with high exposure to PMIEs were 2.6 times more likely to screen positive for mental health disorders, such as PTSD (Lamb et al. 2021). This study also found that the prevalence of probable PTSD within this sample is 30.2% (95% CI 28.1-32.5) (Lamb et al., 2021). Coimbra et al. (2023) conducted a meta-analysis study with 19 articles assessing the relationship between moral injury and PTSD symptoms. The relationship was significantly correlated ($r = .41$, 95% CI .35-.46, $p < .0001$) among 22,188 individuals.

Exposure to trauma, such as exposure to PMIEs, is thought to elicit symptoms of PTSD through a dissociation in memory encoding at the time of the traumatic event (Brewin & Burgess, 2014). Two different types of memory representations are encoded at the time of the traumatic event; the sensory details with experienced emotional states and a subset of the sensory input, recoded with spatial and personal context (Brewin & Burgess, 2014). Under

normal circumstances, these two representations are tightly associated, and the sensory representation can be retrieved via the associated contextual representation. This retrieval is usually voluntary, but may also occur involuntarily. Direct involuntary activation and reexperiencing of the sensory representation may occur when it is strongly encoded due to the extreme emotional salience of a traumatic event. Whereas the contextual representation might be weakly encoded or without the tight connection to the sensory representation. A dissociative response to the traumatic event might be the cause of this (Brewin & Burgess, 2014).

Meaning in life

Meaning in life has many definitions, but overlapping elements are having a sense that one's life is significant and pursuing worthwhile goals (Bryan et al., 2020). Meaning in life is highly correlated with positive emotional states, such as joy, love, hope, and optimism (Bryan et al., 2018). Barnett et al. (2018) discuss that meaning in life has also been associated with outcome factors such as life satisfaction (Steger et al., 2006), psychological well-being (Melton & Schulenberg, 2008), and resistance to stress (Park & Baumeister, 2017).

On top of these positive outcomes and associations, meaning in life has also been found to be one of the protective factors associated with lower PTSD severity (Bryan et al., 2020). As vice versa, lower meaning in life has been associated with more PTSD severity (Davies et al., 2023). For example, after the 9/11 terrorist attacks, people who found more meaning in life reported less posttraumatic stress symptoms over time ($n = 931$, $r = -.21$, $p < .001$) (Updegraff et al., 2008). Likewise, meaning in life was correlated with less PTSD symptoms in earthquake survivors ($n = 200$, $r = -.28$, $p < .001$) (Feder et al., 2013) and veterans ($n = 114$, $r = -.47$, $p < .001$) (Blackburn & Owens, 2015).

In addition, meaning in life has been found to decline when looking at pre-pandemic and peri-pandemic meaning. It was also shown to relatedly decline with increased PTSD

severity (Seidel et al., 2022). In congestive heart failure patients, meaning in life and violations of beliefs seem to have a reciprocal relationship (George & Park, 2016). Those with a higher meaning in life experience less violations of beliefs when experiencing major life stressors (George & Park, 2016). Kelley et al. (2021) found that, in veterans, meaning in life serves as a mediator in the relationship between moral injury and suicidal ideation. Moral injury was associated with higher suicidal ideation through lower meaning in life (Kelley et al., 2021). In a similar fashion, mediation has been found between violations of beliefs because of traumatic events and PTSD symptoms, with negative beliefs of the world as a mediator (Park et al., 2012).

In conclusion, cognitive appraisals, such as meaning in life and beliefs about traumatic events (such as exposure to PMIEs) seem to play a part in the development of, and/or the maintenance of PTSD symptoms (Park et al., 2012; Kelley et al., 2021; Seidel et al., 2022; George & Park, 2016). With this study we aim to amplify the understanding of exposure to PMIEs, PTSD severity and the role of meaning in life.

Current research

Health care providers are assumed to be at higher risk of exposure to PMIEs. Exposure to PMIEs could potentially act as a meaning violation. A theoretical assumption that can be made is that exposure to PMIEs disrupts assumptions of a fair and just world. We hypothesize that this meaning violation in form of exposure to PMIEs can result in lower meaning in life.

Since meaning in life seems to be a protective factor for PTSD severity (Bryan et al., 2020), if meaning in life is lowered, it could lead to more PTSD severity. We will limit PTSD severity to intrusion severity, to avoid potential overlap between the syndrome Moral Injury and PTSD symptoms. Moral Injury and PTSD are distinguishable profiles (Bryan et al., 2018). Intrusions such as nightmares and flashbacks are unique characteristics of PTSD

(Bryan et al., 2018). However, depressive symptoms, feelings of guilt, shame, and anger overlap (Bryan et al., 2018).

Taken this information into consideration, the hypothesis of this current study is that exposure to PMIEs lead to less meaning in life, which in turn leads to greater intrusion severity.

Method

This study used convenience sampling; many institutions such as hospitals were reached out to and asked if they would be able to enroll their institution in the study. In order to avoid having to have contact data, the institutions were asked to contact their own staff themselves. The staff received an email from their institution that described the study and included a link to the online questionnaire via Qualtrics. If the staff decided to participate in the study and gave informed consent, they provided their email-address so they could be contacted directly for the next two timepoints.

Design

The study is a comparative field research, using an online questionnaire. It is longitudinal with three measuring points. The first measuring point, T0, started in May 2020. The second measuring point, T1, started approximately three months after T0 and T2 started approximately six months after T0. The aim of the study is to research the relationship between exposure to PMIEs, meaning in life, and intrusion severity. A mediation model is used, with the hypothesis that exposure to PMIEs leads to less meaning in life, which in turn leads to more intrusion severity.

Procedure

After the informed consent, participants got access to the questionnaire. The questionnaire has been compiled by Judith Daniels, from the Rijksuniversiteit Groningen. The questionnaire was online, the program Qualtrics was used.

The participants were asked to make a personal code, in order to link the data from T0, T1, and T2. The personal code consisted of the participant's work email address, the initial of their father's first name, the initial of their father's last name, the initial of their mother's first name, and the initial of their mother's maiden last name. Subsequently, demographic and general information was asked; their age, gender, work as a nurse, and the effects of COVID-

19 at work. Then, numerous variables were measured; PTSD, depression, anxiety, alexithymia, dissociation, burnout, positive affect, meaning in life, and moral injury. For this study, only intrusion severity, meaning in life and exposure to PMIEs are relevant. Other variables were measured for different research purposes, outside of this article. Some more general health questions were asked, for instance about sleep quality. T0 consisted of 100 questions. T1 and T2 were identical to T0, except for the demographic questions regarding age and gender; these were left out.

Measuring instruments

Exposure to PMIEs

Exposure to PMIEs was measured at T0 with three items (*Moral Injury Events Scale*, Nash et al., 2013). Participants rated the items on a 6-point Likert-scale, ranging from 1 = strongly agree to 6 = strongly disagree. The items three items were: 'I saw things that were morally wrong', 'I acted in ways that violated my own moral code or values', and 'I violated my own morals by failing to do something that I felt I should have done'. A sum score was computed, and internal consistency of the scale was acceptable ($\alpha = .77$, $M = 4.33$, $SD = 1.42$).

Meaning in life

Meaning in life was measured at T1 with five items (*Sources of Meaning*, Steger, 2013). Participants rated the items on a 5-point Likert-scale from how often something applied in the last month, ranging from 1 = not at all to 5 = very much. The items were: 'I think that there is meaning in what I do', 'I have a task in life', 'I feel part of a bigger whole', 'I lead a fulfilled life', and 'I think my life has a deeper meaning'. A sum score was computed and internal consistency of the scale was good ($\alpha = .84$, $M = 3.77$, $SD = .87$).

Intrusion severity

Intrusion severity was measured at T2 with five items (*PCL-5*, Weathers et al., 2018). The participants rated how much they were bothered by these intrusions over the last month. A 5- point Likert scale was used (ranging from 1 = not at all, to 5 = extremely). The five items were: ‘Repeated disturbing, and unwanted memories of specific experiences related to the corona pandemic?’, ‘Repeated, disturbing dreams related to specific experiences related to the corona pandemic?’, ‘Suddenly feeling or acting as if a specific experience related to the corona pandemic were actually happening again (as if you were actually back there reliving it)?’, ‘Feeling very upset when something reminded you of specific experiences related to the corona pandemic?’, and ‘Having strong physical reactions when something reminded you of specific experiences related to the corona pandemic (for example, heart pounding, trouble breathing, sweating)?’. A sum score was computed and internal consistency of the scale was good ($\alpha = .87$, $M = 1.68$ $SD = .72$).

Data analysis

To analyze the data, and to test the mediation model, linear multiple regression will be used, using the program SPSS 27.

First, assumptions for linear multiple regression were checked (see Appendix 1). The assumption of normality of residuals, independency, linearity, homoscedasticity, and multicollinearity were checked. The assumptions weren’t severely violated, and no serious outliers were detected. The dependent variable has consequently not been transformed.

The data had already been collected when we started this study. Thus, to see whether the sample size is sufficient to test the hypothesis, a post hoc power analysis has been conducted. The power analysis has been conducted with G*power (one-sided, $df = 161$, α err prob = .05, $n = 164$), and resulted in a power of .99.

The final sample included 164 participants. Out of the original sample ($N = 887$), $n = 723$ participants were excluded from the data analysis. Since it was important that all the

relevant items for the variables were completed at each relevant timepoint, participants with missing values were excluded. 68.7% answered none of the items of the PCL-5 at T2 (n = 610). Among the remaining participants, 39.7% answered none of the items from the meaning in life scale at T1 (n = 110). Lastly, 1.8% answered none of the items of the exposure to PMIEs scale at T0 (n = 3). There were no participants that skipped a single item of the relevant scales.

Results

Descriptive statistics

The unfiltered sample ($n = 723$) did not significantly differ in gender (83.2% female, 16.7% male, 0.2% other, $t = .13$, $df = 163$, $p = .900$). from the subsample (85.4% female, 14.6% male). The unfiltered sample also did not differ significantly in age mean ($M = 43.3$, $SD = 11.4$, range = 21 to 73, $t = 1.96$, $df = 163$, $p = .052$) from the subsample ($M = 44.9$, $SD = 10.1$, range = 23 to 65). The unfiltered sample worked approximately 19.9 years as a nurse, varying from 0 to 48 years ($SD = 12.2$). This did not significantly differ from the subsample, where the participants on average had 21.7 years of experience ($SD = 11.3$), ranging from 0 to 43 years ($t = 1.90$, $df = 163$, $p = .059$). The original sample, on average, treated 32.5 ($SD = 35.8$) COVID-19 patients at the beginning of the pandemic, ranging from 0 to 100, at T0, which did not significantly differ from the subsample ($M = 26.4$, $SD = 31.9$, $t = -2.41$, $df = 163$, $p = .017$).

Descriptive statistics for study variables

The descriptive statistics for exposure to PMIEs at T0, meaning in life at T1, and intrusion severity at T2 can be reviewed at Table 1.

Table 1.

Descriptive statistics for the dependent variable 'intrusion severity', the mediator 'meaning in life', and the independent variable 'exposure to PMIEs'.

| | N | Range | Min | Max | M | SD |
|-----------------|-----|-------|------|------|------|------|
| PMIEs | 164 | 5.00 | 1.00 | 6.00 | 4.36 | 1.48 |
| Meaning in life | 164 | 4.00 | 1.00 | 5.00 | 3.74 | .85 |
| Intrusions | 164 | 3.40 | 1.00 | 4.40 | 1.70 | .72 |
| Valid N | 164 | | | | | |

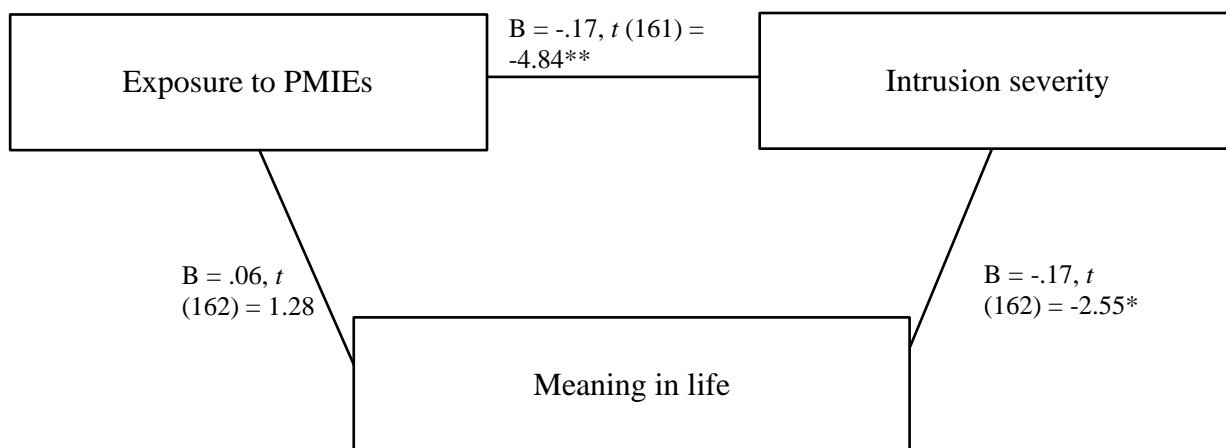
Mediation model

To test for mediation, linear regression was initially used. First, a significant relationship between exposure to PMIEs as the independent variable and intrusion as dependent variable should be confirmed, in order to test for mediation. Exposure to PMIEs is a significant predictor of intrusions ($B = -.17, t(161) = -4.84, p < .001$). This represents a positive association between frequency of events and intrusions as the scale to assess PMIEs is inverted (higher scores represent lower frequency).

Second, a significant relationship between exposure to PMIEs and the mediator, meaning in life, is a prerequisite to be able to test for mediation. This relationship, however, is not significant ($B = .06, t(162) = 1.28, p = .20$). As a consequence, the hypothesized mediation model cannot be supported by the data (see Figure 1 for visual clarification).

Figure 1.

Mediation model for the dependent variable 'intrusion severity, the mediator 'meaning in life' and the independent variable 'exposure to PMIEs'.



*Regression is significant at the 0.05 level (two-tailed).

**Regression is significant at the 0.01 level (two-tailed).

Discussion

In this study, we focused on exposure to PMIEs, meaning in life and intrusion severity. The hypothesized mediation model presumed that exposure to PMIEs leads to a decrease in meaning in life, which in turn leads to an increase in intrusion severity.

The hypothesized model, however, is not supported by the data. Although exposure to PMIEs and low levels of meaning in life both predict an increase in intrusion severity, the mediation model is not supported. The results show that exposure to PMIEs is not significantly related to meaning in life.

In veterans, a significant association between morally injurious events and meaning making of possible traumas was found (Currier et al., 2015). The veterans experienced morally injurious events during deployment in Iraq and/or Afghanistan. Meaning was measured in terms of meaning making of their traumatic experiences. Meaning making was measured via items such as ‘Since this event, I feel like I’m in a crisis of faith’, and ‘My previous goals and hopes for the future don’t make sense anymore since this event’ (Integration of Stressful Life Events Scale, ISLES; Holland et al., 2010). These items relate directly to the morally injurious event, whereas the items used in the current study were broader and more general. The association between exposure to PMIEs and meaning in life may have been found if the construct of meaning in life was measured with a different instrument.

On top of that, the veteran sample consisted of 88.3% male (Currier et al., 2015), whereas our study consisted of 85.4% female. Veterans, as well as a largely male sample might be too different from the mostly female nurses, which could be a possible explanation for the differences in results. Corona et al. (2019) found significant effects of global meaning in life moderating the relationship between moral injury and suicide ideation. Their sample consisted of 93% veteran males. However, Kelley et al. (2021) studied a mediation model of

moral injury leading to more suicidal ideation, with meaning in life as the mediator, in veterans with 49.8% female participants. They found that meaning in life serves as a kind of buffer or amplifier; moral injury was associated with higher suicidal ideation via lower meaning in life (Kelley et al., 2021). So, the difference may not lie in gender, but perhaps in profession or the types of morally injurious events experienced.

Our healthcare sample was comparable to other healthcare samples, for instance comparing to the study by Amsalem et al. (2021) (age mean = 34.8, SD = 11.5, 74% female), Ma et al. (2023) (age mean = 35.8, SD = 8.3, 75.4% female, 12.8 years of experience), and Lamb et al. (2021) (age mean = 41, SD = 12.0, 75% female) to the current demographic statistics (age mean = 44.9, SD = 10.1, 85.4% female, 21.7 years of experience). The mean score, however, of intrusion severity is quite low ($M = 1.7$, $SD = .72$) in comparison to the prevalence of PTSD severity found in some studies (e.g., Amsalem et al., 2021; Wang et al., 2021), with one meta-analysis of 55 studies finding a prevalence of PTSD of 29.1% (Hernández et al., 2023). In the meta-analysis, only studies conducted in relation to the COVID-19 pandemic were included. It is difficult to compare these findings, since we used a subscale of PTSD and thus cannot conclude on the prevalence of PTSD like the other studies. The distribution of scores shows that 75% of the participants had a score lower than 2 on the intrusion severity scale, and only 4.5% scoring 3 or higher (with '3' meaning participants were generally moderately bothered by aspects of intrusions). One single participant scored 4.4 on the scale, being quite a bit to extremely bothered by aspects of intrusions.

As far as one can compare levels of exposure to PMIEs and moral injury, the mean score of our study seems to be low relating to other studies, with a mean score of 4.36 ($SD = 1.48$) scale is inverted, i.e., meaning on average participants experienced few PMIEs). 66.5% of the participants scored a 4 or higher on the scale, 10.4% of the participants scored a 2 or lower (meaning they generally agreed with the exposure to PMIE items, and reported having

experienced PMIEs). For instance, one study reported a prevalence of 66% of moral injury among nurses (e.g., Wang et al., 2021). Another study, which used a 10-item scale to measure moral injury (*MISS-HF*, Mantri et al., 2020) reported a mean score of 7.16 indicating moderate to high moral injury (Berdida et al., 2023). So, the prevalence of exposure to PMIEs and intrusion severity were relatively low comparing to other studies, which could have had an influence on the results. Perhaps the means were too low to detect small effects.

Although no evidence was found to support the mediation model, exposure to PMIEs and meaning in life did, separately, significantly predict intrusion severity. This suggests that even with relatively low mean levels of exposure to PMIEs and intrusion severity, the variables still have their effect. Perhaps exposure to PMIEs and meaning in life are not related constructs, but have their effects on intrusion severity in a non-related manner. Bryan et al. (2020) found that happiness was a significant moderator for the relationship between trauma exposure and PTSD symptom severity. Bryan et al. (2020) also tested this model with meaning in life as a moderator, but did not find significant results. The experience of happiness may restrict access to trauma-related memories and negative emotions, which may lead to experiencing less PTSD symptom severity (Bryan et al., 2020). Whereas meaning in life may just have an effect on PTSD symptom severity, with no moderating nor mediating association with exposure to PMIEs.

The effect of meaning in life on PTSD severity may be explained by the theory by Ehlers and Clark (2000), which elaborates several maladaptive behavioral strategies and cognitive processing styles that could maintain or worsen PTSD symptom severity. A maladaptive behavioral strategy related to meaning in life is to give up or avoid once important activities, such as socializing, hobbies or sports. This prevents a change in their appraisals about themselves; they may think that the trauma made them a different person or that the trauma ruined their lives (Ehlers & Clark, 2000). Individuals may also feel frozen in

time, where they feel unable to start a new life or to resume their old life (Ehlers & Clark, 2000). These factors can contribute to a feeling of loss of meaning. Ehlers & Clark (2000) give a rationale for treatment, where one element is to ‘reclaim one’s life’ (p. 337); to get a sense of meaning and well-being, a feeling that one is moving forward in his/her life.

Several studies found a relationship between moral injury and PTSD severity (e.g., Tao et al., 2023; Wang et al., 2021; Amsalem et al., 2021). According to the theory by Ehlers & Clark (2000) and the study by Brewin and Burgess (2014), exposure to trauma, such as PMIEs, can result in intrusions because of the maladaptive way of processing the traumatic event which results in a feeling of serious current threat. When the perception of the threat is activated, intrusions and other symptoms such as anxiety and emotional responses follow. The perceived threat elicits a series of cognitive and behavioral responses, intended to reduce the perceived threat, but rather cause and maintain the PTSD (Ehlers & Clark, 2000).

One study found a positive association between exposure to PMIEs and PTSD severity, with symptoms of moral injury as a mediator, and self-criticism as a moderator of this mediation (Zerach & Levi-Belz, 2022). Self-criticism seems to be a psychological risk factor for exposure to PMIEs to become moral injury, and for moral injury to result in more PTSD severity (Zerach & Levi-Belz, 2022).

Individuals who identified as religious or spiritual seem to be at lower risk of developing moral injury symptoms in the healthcare setting than those who are not (Mantri et al., 2021). Perhaps spirituality mediates the relationship between exposure to PMIEs and PTSD severity, since it seems to be a protective factor of symptoms arising from exposure to multiple PMIEs. It could also work as a coping mechanism and a way of giving meaning to life. Future research could test this hypothesis and incorporate religion and spirituality as a mediator between exposure to PMIEs and PTSD severity.

Strengths and Limitations

Overall, the current study tried to tackle a lot of limitations; it is longitudinal, participants came from various European countries, and the power was good. A disadvantage on a longitudinal self-report study is the high number of dropouts. However, no significant demographical differences were found between the informed consent sample and the subsample. To tackle this dropout problem in the future, future research could use case studies. Since exposure to PMIEs is still quite a young subject within the healthcare setting, and crises like the COVID-19 pandemic might happen again, richer information could be very useful.

Still, the results should be interpreted with consideration for several limitations. First, the participants may not represent the population accurately. Although in the Netherlands, approximately 85% of nurses are female (Centraal Bureau voor de Statistiek, 2016), it may still not be representative for other countries and/or cultures. Besides that, meaning in life may have been constructed too general. If meaning in life had been questioned in relation to the PMIEs, it may have been significantly associated, and mediation could consequently have been tested for (as in Currier et al., 2015).

Another limitation to consider is the self-selection bias. Although no significant differences have been found between the original sample and the subsample, and thus no self-selection, self-selection bias may still exist within the participants that clicked the link but did not fill in the questionnaire or those who did not provide informed consent.

More importantly, we did not control for the levels of intrusions or meaning in life at T0, or for exposure to PMIEs at T2. The level of intrusion severity might have been the same for T0 and T2. Because of this, we cannot be sure if meaning in life at T1 is a predictor of intrusion severity, or a result. The same can be said for exposure to PMIEs. Perhaps the work conditions did not change overtime, or maybe they got worse at T1 or T2. If the work

conditions got worse overtime, this may have predicted the intrusion severity at T2 better than the exposure to PMIEs level at T0.

We chose to analyze the data based on group levels instead of difference scores. If exposure to PMIEs at T0 leads to more intrusion severity, one would assume this severity becomes less overtime. Based on this assumption, using a difference score would not be the best choice. We can, however, show that the risk of experiencing intrusions is increased in the months after one experienced PMIEs. To truly establish a causal relationship between exposure to PMIEs, meaning in life and intrusion severity, future research should focus on experimental designs. Alternatively, future research could focus on situational causes of PMIEs and intrusions, to see whether they refer to the same events.

Conclusion

The results of the current study implicate the potential harm of exposure to PMIEs, as well as the possible benefits of meaning in life. Future research could focus on other possible mechanisms for exposure to PMIEs and intrusion severity. Bryan et al. (2020) presented an interesting study where happiness was found to be a moderator between trauma exposure and PTSD symptom severity in military personnel. This model could be replicated with a healthcare sample. As for the clinical field, it may be useful to implement meaning in life training in healthcare providers who suffer from intrusions, since it has been found to be a significant predictor for intrusion severity. When meaning in life is increased, intrusion severity may decrease.

To summarize, the current study found a significant relationship between exposure to PMIEs and intrusion severity, as well as a significant relationship between meaning in life and intrusion severity. The hypothesized mediation model is not supported by the results, which may be due to the manner in which meaning in life was presented in the questionnaire or meaning in life and exposure to PMIEs may have separate effects on intrusion severity.

Nevertheless, the results implicate the potential harm of exposure to PMIEs and the possible benefits of meaning in life. Since the Covid-19 pandemic had such a major impact on the health care providers, it is crucial to pay more attention to their mental health and well-being. Research should aim to do so, by increasing our knowledge on these risk factors and possible buffers for mental health problems.

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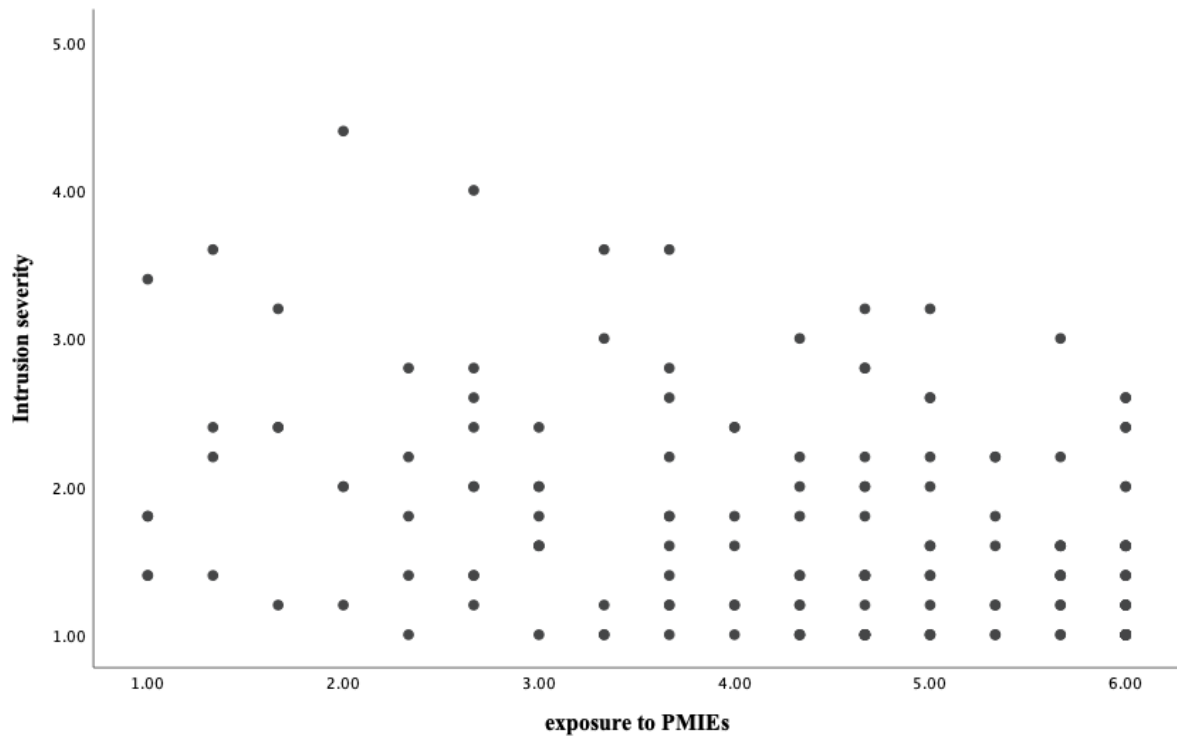
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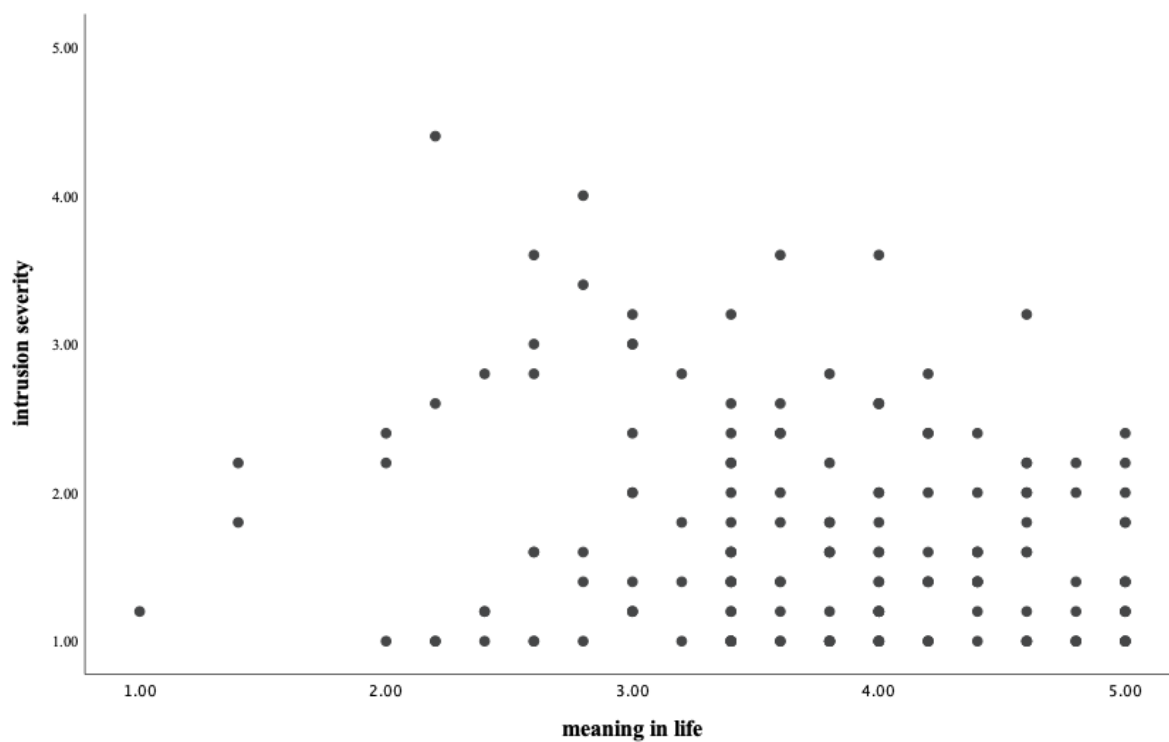
Appendix

A1.

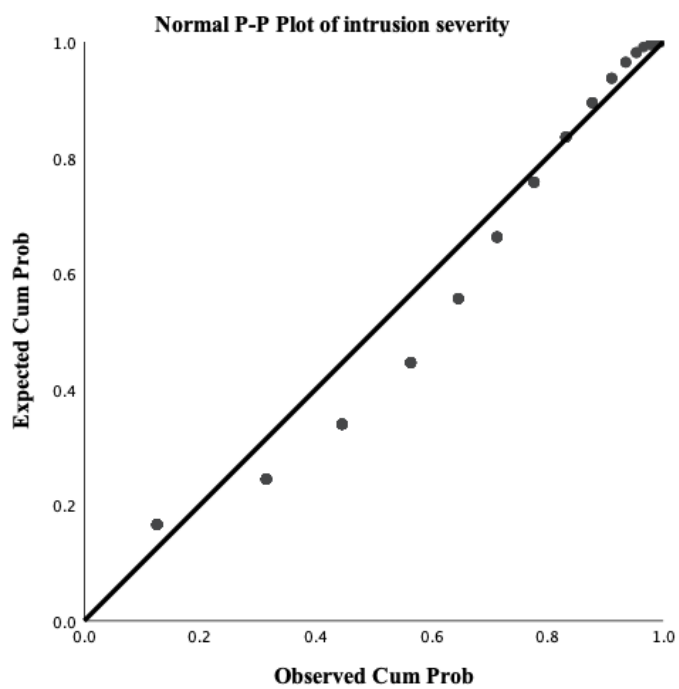
Scatterplot intrusion severity and exposure to PMIEs.



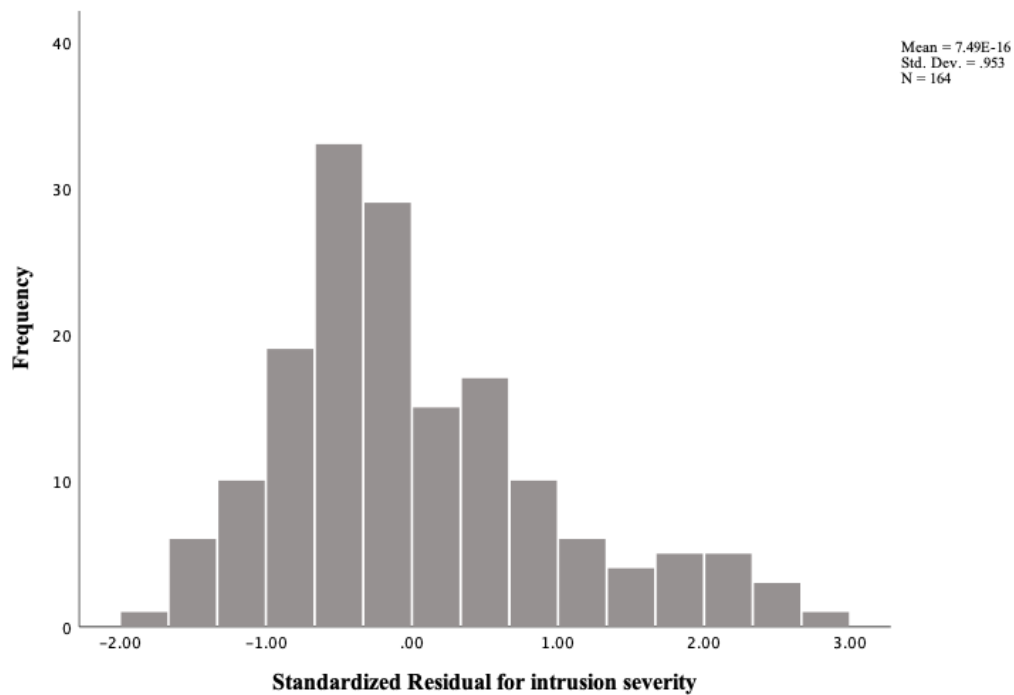
A2.

Scatterplot intrusion severity and meaning in life.

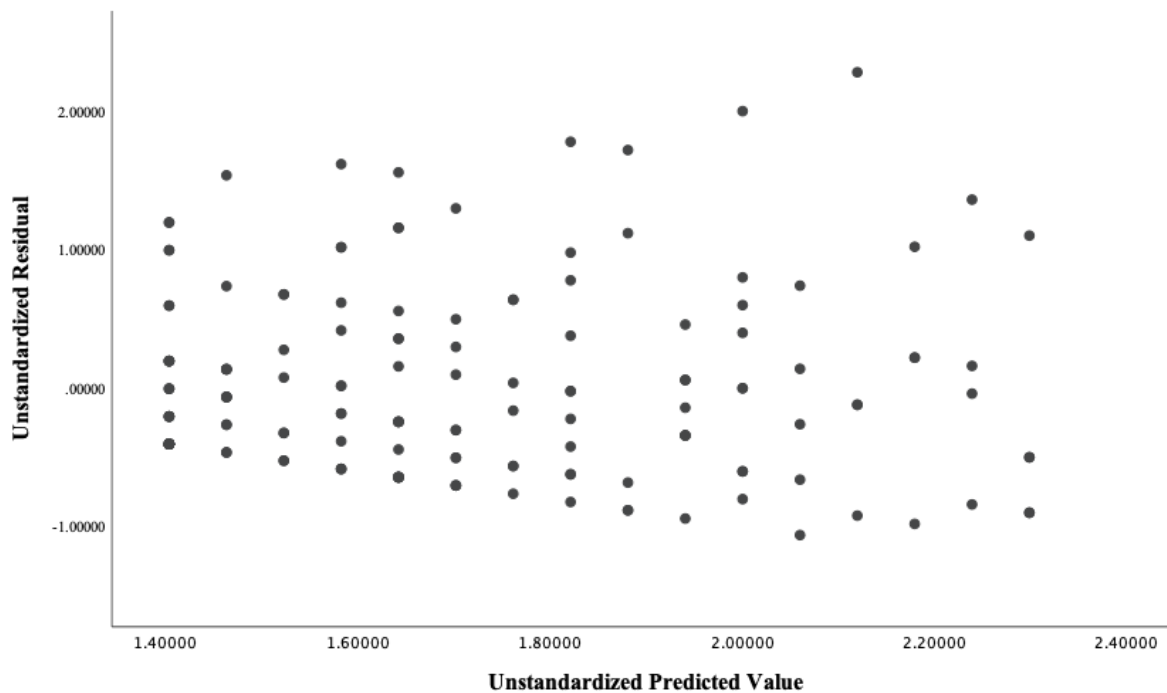
A3.

Normal P-P plot of intrusion severity.

A4.

Histogram residuals intrusion severity.

A5.

Scatterplot residuals intrusion severity and exposure to PMIEs

A5.

Scatterplot residuals intrusion severity and meaning in life