

**The Influence of Educational Level on The Relationship Between Grief Support, And
Symptoms of PGD, Depression, And PTSD After a Traumatic Loss**

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Abstract

Traumatically bereaved are more likely to have higher symptoms of Prolonged Grief Disorder (PGD), depression, and Post-Traumatic Stress Disorder (PTSD) than non-traumatically bereaved. While prior research has shown that a high educational level and grief support are protective factors against these symptoms, this has not been tested in a traumatically bereaved population yet. In this study, it was examined if the educational level can moderate the relationship between grief support and symptoms of PGD, depression and PTSD. Further, it was tested if grief support can predict the levels of symptoms of PGD, depression, and PTSD. The study included 47 participants from the Netherlands, drawn from a grief-related website. The variables were tested through an online survey with three independent scales (i.e., TGI-SR+, PHQ-9, PCL-5) measuring the levels of symptoms of PGD, depression, and PTSD and demographic variables (i.e., educational level, grief support). The results indicate that the educational level was not associated with grief support and symptoms of PGD, depression, and PTSD. The findings of this study add to the ongoing debate on whether educational level is relevant to consider regarding treatment outcomes. However, more research is needed to explore other underlying factors that could influence the relationship between grief support and symptoms of PGD, depression, and PTSD after a traumatic loss.

Keywords: Prolonged Grief Disorder, Depression, Post Traumatic Stress Disorder, Educational Level, Grief Support, Traumatic Loss

The Influence of Educational Level on The Relationship Between Grief Support, And Symptoms of PGD, Depression, And PTSD After a Traumatic Loss

Every day, approximately 167,000 people worldwide pass away (Ritchie, 2024), leaving an estimated five grieving individuals per deceased (Krull, 2023). The ones left behind mourn their loss and after some time they learn to live with the loss (Shear, 2012). However, around 10% of the bereaved cannot envision a future without their loved ones, and their feelings persist or even increase over time (Jordan & Litz, 2014). This inability to move on and the impairment of the individual's life are two of the characteristics of the prolonged grief disorder (PGD) (APA, 2022). Bereaved persons who experience PGD symptoms have difficulties accepting the death of their loved one. They persistently yearn for the deceased and have associated emotional pain, a sense of meaninglessness and bitterness about the death and have difficulties engaging in new activities. These symptoms have been persistent for at least 12 months after the loss and significantly impair the person's social and daily life (APA, 2022).

There are many possible risk factors that could increase the likelihood for developing PGD after a loss. One of them is a violent or sudden cause of death (e.g., suicide, accident, heart attack) (Prigerson et al., 2021). People grieving a traumatic loss often perceive a lack of recognition or encounter stigmatising social attitudes. This makes it harder for the bereaved to process the loss. This, in turn, can lead to higher chances of experiencing more emotional distress (Heeke et al., 2017). The bereaved are not only left with the grief of losing a loved one but are also left behind with the shock and terror of a traumatic event (Hibberd et al., 2010). A violent death may evoke images of the last moments before the loved one died, which could lead the bereaved to avoid these memories (Baddeley et al., 2015). The bereaved avoid outside stimuli that could bring back the memories of the traumatic loss (Hibberd et al., 2010). Lastly, research suggests that the bereaved from a traumatic loss tend to engage more in ruminative thinking, where they play over scenarios in their head about how they possibly could have prevented the death (Morina, 2011).

After the traumatic loss of a loved one people cannot only develop PGD, but also depression and post-traumatic stress disorder (PTSD). Research has shown a strong link between PGD, depression and PTSD (He et al., 2014). PGD, PTSD, and depression share several overlapping symptoms. PGD and PTSD can both include intrusive thoughts and avoidance behaviour (He et al., 2014; American Psychiatric Association [APA], 2022). Further, symptoms of both PGD and depression are anhedonia and social withdrawal (He et

al., 2012; APA, 2022). Lastly, depression and PTSD share several symptoms, for example fatigue and feelings of guilt (APA, 2013). However, while these symptoms may seem similar, they manifest differently. For example, both grief and depression can lead to social withdrawal, but the reasons for it are different (Shear, 2022). Grief turns someone inward, but the desire for social connection stays. In contrast, depression often brings isolation and detachment from others. (Shear, 2022). This different manifestation can also be observed in overlapping PGD, and PTSD symptoms. While both, PGD and PTSD can both include intrusive thoughts and avoidance behaviour, the feelings that accompany these behaviours are typically different. PTSD often involves negative emotions like fear, threat, or disgust. Contrary, PGD includes a strong yearning for the deceased which may lead to seeking out reminders to feel closed to the lost loved one. Bereaved with PGD experience memories with both negative and positive emotions (Killikelly et al., 2019). Despite, these overlaps research has shown that PGD, depression, and PTSD are all distinct diagnoses (Boelen et al., 2010). Given these overlaps, investigating all three conditions is important, as they are distinct diagnoses.

A possible protective factor for bereaved after a traumatic loss is grief support (e.g. exposure therapy, support groups, cognitive-behavioural therapy (CBT)). Grief support can help mitigate the development and severity of grief symptoms (Newsom et al., 2017). Furthermore, it can provide the bereaved with coping mechanisms and tools to get through the process of grieving (Bryant et al., 2014; Newsom et al., 2017). A study found that grief support leads to reduced symptoms of PGD, depression and PTSD in the bereaved (Spuij et al., 2013). However, while effective support can be beneficial, external factors such as the educational level of the bereaved person, as noted by Szuhany et al. (2021), may also play a significant role.

While a higher educational level has been found to be a protective factor for symptoms of PGD (Boelen et al., 2019), PTSD (Carmassi et al., 2018), and depression (Bjelland et al., 2008), there has been an ongoing debate on whether the educational level has an influence over treatment outcomes (Smith & Ehlers, 2021). Boelen et al. (2018) argue that a higher education could be beneficial for the cognitive processing of the loss. Furthermore, they suggest that a higher education is also associated with more social resources, which could support the bereaved through the loss. Rieppi et al. (2002) further explain that lower educational levels are associated with poorer behavioural treatment outcomes. Thompsen-Brenner et al. (2013) claim that, for example, CBT is less effective for people with lower

education. Barawai et al. (2020) support this statement by saying that this can be explained through lower literacy skills needed for homework, and self-help treatment methods often used in trauma-focused CBT. They furthermore claim that people with a lower education often have less understanding of the content of the intervention, which makes it difficult for the bereaved to fully engage in the therapy. However, one could claim that in this case the therapies should be adjusted accordingly to the patient. Smith & Ehlers (2021), on the other hand, suggest that it is rather cognitive variables (i.e. coping strategies) that influence treatment outcomes, instead of background variables like educational level. Notably, prior research has not yet focused on traumatically bereaved. Therefore, it is difficult to predict what role education play in this specific population.

To summarise, PGD is likely comorbid with depression and PTSD (He et al., 2014). All three of these diagnoses have a common risk factor which is a low educational level (Boelen et al., 2019; Carmassi et al., 2018; Bjelland et al., 2008), and a common protective factor which is grief support (Newsom et al., 2017). There is an ongoing debate on whether the educational level of the bereaved influences the outcomes of grief support (Rieppi et al., 2002; Boelen et al., 2019; Cusack et al., 2019; Barawi et al., 2020; Marx et al., 2021). Evidence that could explain this discrepancy is limited for traumatically bereaved. Therefore, the current study explores the relationship between educational level, received grief support and the level of symptoms of PGD, depression, and PTSD in a traumatically bereaved sample.

This paper aimed to investigate if the relationship between grief support and symptoms of PGD, depression and PTSD following a traumatic loss is influenced by the educational level of the bereaved. Two hypotheses were tested:

- i. Grief support negatively predicts psychopathology symptoms (i.e., PGD, depression, PTSD)
- ii. Education level moderates the relationship between grief support and psychopathology symptoms

Methods

Participants & Procedure

This cross-sectional study is part of a bigger project that examines symptoms of grief after a traumatic loss. Overall, 47 participants met the inclusion criteria, while five had to be excluded. Inclusion criteria included being over 18 years old, owning a smartphone, having a sufficient understanding of Dutch, and having experienced the loss of a loved one at least

twelve months prior due to a potentially traumatic cause (e.g., accident, suicide, homicide). Exclusion criteria include exhibiting high suicidality or having been diagnosed with a psychotic disorder. The participants were between the ages of 29 and 76 years with a mean age of 52 (SD = 10.39). Seven of the participants identified as male (14.89%), 40 as female (85.11%), and 0 as non-binary (0%). The participants have indicated before on the “rouwmeter” website that they would like to participate in grief-related studies. The participants had the chance to win a 50 euro voucher through a lottery. The study complies with ethical standards and was approved by the University of Twente Ethics committee (ID 240186).

The data collection started on the 2nd of April 2024 and ended on the 2nd of May 2024. The study includes a survey (T1), two weeks of experience sampling method (ESM) and a second survey (T2). The T1 survey was accessed through Qualtrics.com. Therefore, a technical device with internet access (e.g., smartphone, laptop, tablet) was required. The study included the consent form, the demographics including age, gender, educational level, and the received grief support, and three independent scales, namely the Traumatic Grief Inventory-Self Report Plus (TGI-SR+) (Lenferink et al., 2022), the Patient Health Questionnaire 9 (PHQ-9) (Kroenke et al., 1999), and the PTSD Checklist (PCL-5) (Weathers et al., 2013). In order to answer the research question of the current study only the information of T1 was used.

Measures

Grief Support & Educational level

This study focuses on earlier received grief support. The variable grief support was dichotomized and categorised into two groups: 0 = has not received support and 1 = has received support. To examine the influence of educational level, this variable was dichotomized and categorised into two groups: 0 = lower education and 1 = higher education. Higher education contains receiving a degree from university or university of applied sciences (HBO, WO). Lower education includes elementary school, high school, and secondary vocational school (MBO).

TGI-SR+

The TGI-SR+ is a self-report questionnaire of 22 items assessing symptoms of PGD. The participants are asked to rate their PGD symptoms in the last month on a Likert scale 1 (*Never*) to 5 (*Always*). For evaluating the PGD symptoms the sum score is calculated. If the

score is higher than or equal to 71 it indicates probable caseness of PGD (Lenferink et al., 2022). The TGI-SR+ plus has shown good internal reliability with Cronbach's alpha of .94 and a good concurrent validity (Ashouri & Yousefi, 2023). The Cronbach's alpha of the current study is .92.

PHQ-9

The PHQ-9 is a brief questionnaire containing nine items, assessing depression symptoms over the past two weeks using a Likert scale 0 (*Not at all*) to 3 (*Nearly every day*). There are five levels of depression symptom severity: minimal (0-4 points), mild (5-9 points), moderate (10-14 points), moderately severe (15-19 points), and severe (20 or greater). Studies show that the PHQ-9 has good external and construct validity (Kroenke et al., 2001). Furthermore, the PHQ-9 also shows high reliability with a Cronbach's alpha of .84 (Sun et al., 2022). The Cronbach's alpha of the current study is .84.

PCL-5

The PCL-5 is a self-report measure of PTSD symptoms. The PCL-5 includes 20 items corresponding to the PTSD symptom criteria in the DSM-5 (Weathers et al., 2013). The questionnaire includes a Likert scale 0 (*Not at all*) to 5 (*Extremely*), where the participants must evaluate their PTSD symptoms in the last month. If the sum score of the questionnaire was above the cut-off score of 32 it indicates probable caseness of PTSD (Weathers et al., 2013). The PCL-5 displays a high internal consistency ($\alpha = .95$) and a good convergent and discriminant validity (Blevins et al., 2015). The Cronbach's alpha of the current study is .93.

Data Analysis

For the data analysis the statistic program RStudio 2022.121. was used. Participants that met the exclusion criteria, namely suicidal ideation and previously diagnosed psychotic disorders, were excluded from further analyses. Next, the sum scores for the scales were named and computed, which generated three new variables. The dependent variables are symptoms of PGD, depression and PTSD. The independent variable is the received grief support, and the moderator is the educational level. Then, descriptive statistics were calculated for demographic characteristics and the dependent variables (i.e., mean, frequency, standard deviation, Cronbach's alpha). Afterwards, the correlations between the variables were calculated. For the correlation between the dependent variables the Pearson's correlation was used, and for the independent variables a point biserial correlation was used.

In the next step, the statistical assumptions were tested for each dependent variable (i.e., homoscedastic, normality, linearity). The statistical assumptions of independence, and multicollinearity were met through the study design and therefore not further investigated. The IV and the moderator are both categorical variables, hence the statistical assumptions of independence was already met. The statistical assumption of multicollinearity did not need to be tested, as it explores correlation between continuous predictors, which were not present in this study.

Hypothesis 1 was tested by a linear regression, and hypotheses 2 was explored through a multiple linear regression.

Results

Descriptive Statistics

The descriptive statistics for the variables, symptoms of PGD, depression, and PTSD, as well as for the variables grief support, and educational level are shown in table 1. 28 of the 47 participants had a higher education, while 19 had a lower education. Moreover, 31 of the participants had received grief support in the past. The average scored high on the variable symptoms of PGD. 25 participants were higher or equal to the cut-off score and therefore indicating probable caseness of PGD. The average scored high on the variable symptoms of depression. 20 participants had a score higher or equal to 20, indicating a depression symptom level of severe. The average scored high on the variable symptoms of PTSD. 40 participants had a score higher or equal to the cut-off score, indicating probable caseness of PTSD.

Table 1

Descriptive statistics (n=47)

| | Mean | SD (%) | Frequency (%) | Probable Caseness (%) |
|------------------|-------|--------|---------------|-----------------------|
| PGD | 72.4 | 20.74 | - | 53.19 |
| Depression | 21.13 | 28.36 | - | 42.55 |
| PTSD | 49 | 31.8 | - | 85.11 |
| Grief Support | - | - | 65.96 | - |
| No Grief Support | - | - | 34.04 | - |
| Higher Education | - | - | 59.57 | - |
| Lower Education | - | - | 40.43 | - |

The correlations for the variables, symptoms of PGD, depression, and PTSD, as well as for the variables grief support, and educational level are shown in table 2. The symptoms of PGD, depression and PTSD were all positively correlated. Grief support was weakly negatively correlated with symptoms of PGD, and PTSD. In contrast to that is symptoms of depression, which was weakly positively correlated with grief support. Therefore, received grief support was associated with lower levels of symptoms of PGD, and PTSD. However, received grief support was also associated with higher level of symptoms of depression. Educational level was weakly positively correlated with symptoms of PGD, depression and PTSD. Thus, a higher education level was associated with higher levels of symptoms of PGD, depression, and PTSD.

Table 2

Correlations (n=47)

| | PGD | Depression | PTSD | Grief Support | Education |
|---------------|-----|------------|------|---------------|-----------|
| PGD | 1 | .72* | .87* | -.04** | .20** |
| Depression | - | 1 | .74* | .04** | .07** |
| PTSD | - | - | 1 | -.06** | .09** |
| Grief Support | - | - | - | 1 | -.41** |
| Education | - | - | - | - | 1 |

* *Pearson correlation is significant at the 0.05 level.*

** *Point-Biserial correlation is significant at the 0.05 level.*

Statistical Assumptions

Moreover, the statistical assumptions were tested. In order to test for the assumption of normality a Shapiro-Wilk test was used. It could be observed that the variables symptoms PGD ($W = .99, p = .810$), and symptoms of PTSD ($W = .97, p = .180$) were both normally distributed. In contrast to that, symptoms of depression were not normally distributed ($W = .93, p = .006$). Additionally, the Fligner-Killeen test was conducted to test the assumption of equal variance. The three variables symptoms of PGD ($p = .29$), depression ($p = .69$), and PTSD ($p = .49$) have met this assumption. Lastly, the assumption of linearity was tested by creating plots of the residuals. Figure 1 shows the residual plot of symptoms of PGD. Figure 2

shows the residual plot of symptoms of depression, and Figure 3 shows the residual plot of symptoms of PTSD. In all three cases the assumption of linearity was met.

Figure 1

Residual Plot of Symptoms of PGD

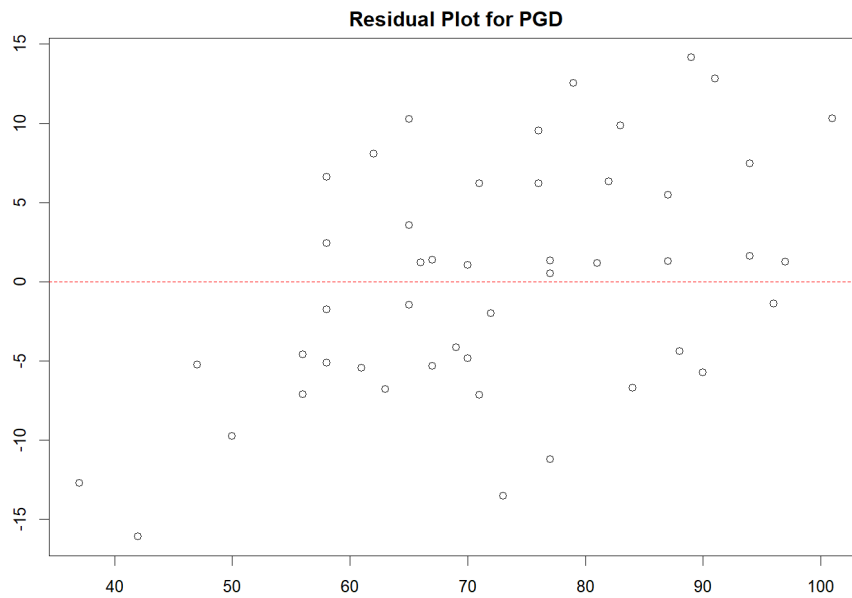


Figure 2

Residual Plot of Symptoms of Depression

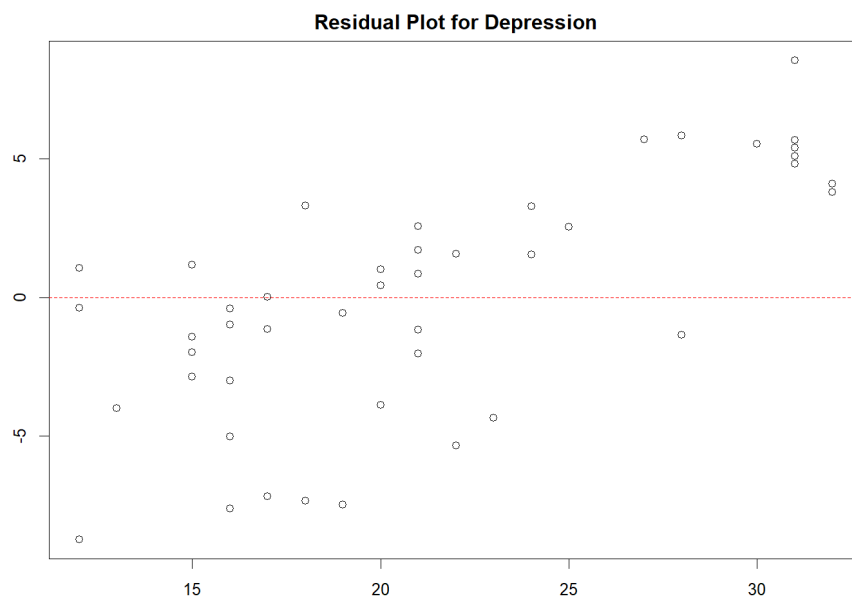
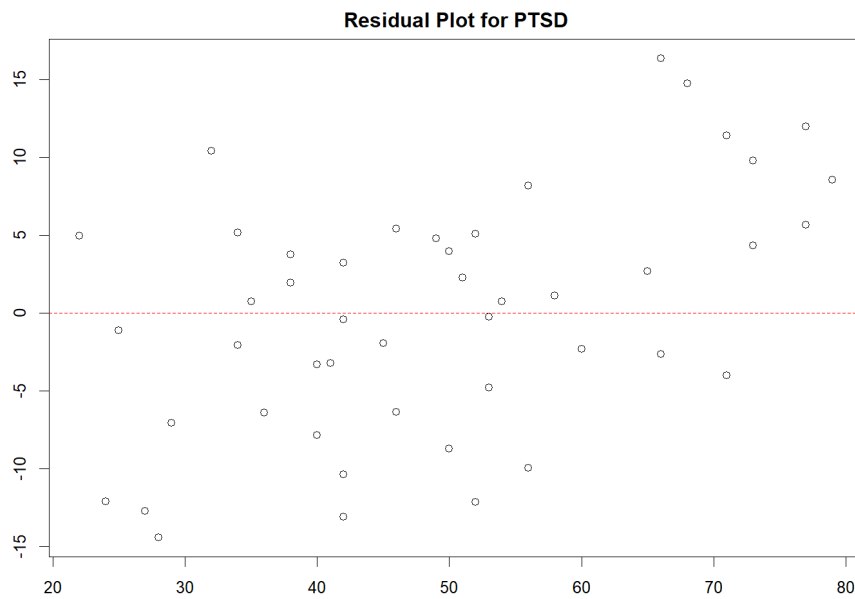


Figure 3

Residual Plot of Symptoms of PTSD



Analysis of Psychopathology Symptoms, Educational Level, And Grief Support

The first linear regression tested the direct effect of grief support on symptoms of PGD. The results (Adjusted $R^2 = -.02$, $F(1, 45) = .07$, $p = .90$) were not statistically significant. Secondly, the direct effect of grief support on symptoms of depression was tested. Also, these results (Adjusted $R^2 = -.02$, $F(1, 45) = .06$, $p = .80$) were not statistically significant. Lastly, the direct effect of grief support on symptoms of PTSD was tested. The results (Adjusted $R^2 = -.02$, $F(1, 45) = .16$, $p = .67$) were not statistically significant.

The first multiple linear regression tested the interaction effect of educational level on the relationship between grief support and symptoms of PGD. The results (Adjusted $R^2 = -.06$, $F(3, 43) = .15$, $p = .93$) were not statistically significant. Secondly, the interaction effect of educational level on the relationship between grief support and depression was tested. The results (Adjusted $R^2 = -.02$, $F(3, 43) = .66$, $p = .580$) were not statistically significant. Lastly, interaction effect of educational level on the relationship between grief support and PTSD was explored. The results (Adjusted $R^2 = -.05$, $F(3, 43) = .33$, $p = .800$) were also not statistically significant.

Explorative Analysis

An exploratory analysis was conducted to examine any underlying patterns that might explain the weak correlation between education and symptoms of PGD, depression, and PTSD found above. A regression analysis was conducted to explore the relationship between educational level and symptoms of PGD, depression, and PTSD. The educational level was the independent variable, while symptoms of PGD, depression, and PTSD were the dependent

variables. The first linear regression between educational level and symptoms of PGD was not significant (Adjusted $R^2 = -.02$, $F(1, 45) = .21$, $p = .65$). The second linear regression between educational level and symptoms of depression was also non-significant (Adjusted $R^2 = .02$, $F(1, 45) = 1.91$, $p = .17$). The third linear regression between educational level and symptoms of PTSD was also insignificant (Adjusted $R^2 = -.01$, $F(1, 43) = .37$, $p = .55$).

Discussion

The current study examined whether educational level moderates the relationship between grief support and symptoms of PGD, depression, and PTSD after a traumatic loss. Additionally, an exploratory analysis of the direct relationship between educational level and symptoms of PGD, depression, and PTSD was explored. However, contrary to expectations, the results did not support the belief that educational level moderates the relationship between grief support and symptoms of PGD, depression, or PTSD. Furthermore, in this study, no evidence was found that either grief support nor educational level influences symptoms of PGD, depression, and PTSD.

The first hypothesis was not supported by the findings. This is contrary to previous studies, that have found grief support to be a protective factor against developing symptoms of PGD, depression, and PTSD (Bryant et al., 2014; Newsom et al., 2017; Flach et al., 2022). One possible reason for this difference could be the large number of probable caseness of PTSD in this study. Research has shown that high levels of symptoms of PTSD can disrupt the grieving process and cause higher levels of symptoms of PGD and depression (Wen et al., 2022). However, research that has used a sample of traumatically bereaved has shown the opposite. Lenferink et al. (2019) suggest that the levels of symptoms of PGD predict the levels of PTSD and can be a long-term predictor for symptoms of depression. But symptoms of depression, and PTSD cannot predict symptoms of PGD. Thus, the relationship between grief support and symptoms of PGD, depression, and PTSD may be more complex than previously thought, as there is an interplay between symptoms of PGD, depression, and PTSD.

The correlations between the variables symptoms of PGD, depression, and PTSD, as well as for the variables grief support in the current study, can provide further insight when it comes to the interaction between them. The symptoms of PGD, depression, and PTSD were all weakly positively correlated to each other, indicating that higher levels of one can lead to higher levels of the other. This further underlines the interaction between symptoms of PGD,

depression, and PTSD. Additionally, there was a weak negative correlation between grief support and symptoms of PGD, and PTSD. This suggests that grief support can lower the levels of symptoms of PGD and PTSD. On the other hand, there is a positive relationship between depression and grief support, indicating that grief support could lead to higher levels of depression. These findings underline the complexity of symptoms after a traumatic loss. Future research should explore these interactions in a traumatically bereaved population further to understand the interplay between different factors.

Another possible reason that could explain the discrepancy between the current findings and past literature on the impact of grief support on symptoms of PGD, depression, and PTSD, could be that the effectiveness of grief support also depends on personal circumstances and the type of grief support that is provided (Schut & Stroebe, 2005). The current sample's traumatic bereavement should be considered as it might have influenced the results. After losing a loved one in a traumatic way, the bereaved does not only have to deal with grief symptoms and mourning for their loss, but they also have to deal with the trauma accompanying the death (Barlé et al., 2017). Research suggests that traumatically bereaved do not only have to deal with trying to accept the death of their loved one but also with the loss of their basic beliefs that the world is controllable and predictable (Barle et al., 2017). So, for grief support to be effective for the traumatically bereaved it does not only need to include support for the grief but also for the experienced trauma.

The second hypothesis was rejected, despite prior research indicating an impact of educational level on the effectiveness of mental health treatments (Rieppi et al., 2002; Boelen et al., 2018). This discussion has been fuelled by Marx et al. (2021) who claim that it is intelligence and personal circumstances that have an impact on treatment outcomes rather than purely the educational level. Moreover, research suggests that the socioeconomic status of an individual may have a significant impact on the bereaved mental health as outside stressors, such as financial strain (Huang & Wang, 2023). This could heighten the levels of symptoms of PGD, depression, and PTSD and undermine the effects of grief support. This can also be seen in the findings of the explorative analysis, which suggest that educational level cannot predict symptoms of PGD, depression, and PTSD. Therefore, other factors than educational level should be investigated as they seem to be important when trying to predict symptoms of PGD, depression, and PTSD.

Limitations And Future Recommendations

In the current study some limitations could be identified. One of the limitations is the sample size of this study. A small sample size can hinder the generalizability of the findings and may lead to type II errors, i.e. false negatives. A small sample size may limit the representation of the studied population, which lowers the study's external validity (Andrade, 2020). Future research should include a larger sample to enhance the generalizability of the results. Another limitation is that there was no measurement of the effectiveness of the received grief support. This information could have been used to explore the discrepancy between this study and past literature.

Therefore, future research should include a form of testing the effectiveness of grief support. One way to do this would be to add a question about the satisfaction of the received grief support. Studies have shown a negative correlation between satisfaction with grief support provided by health care services and the level of PGD and depression symptoms (Flach et al., 2022). This means that bereaved who get satisfying grief support experience fewer symptoms of PGD and depression. Moreover, future research should include more information about the type of grief support that was provided, as the kind of support could have a different outcome on the symptoms of PGD, depression, and PTSD

Additionally, future research should include the socioeconomic status (SES) of the bereaved. The SES could have a significant impact on the outcomes of grief support, as SES can affect access to resources and coping mechanisms, which in turn can impact mental health outcomes (Gallo & Matthews, 2003). Future research should consider exploring the impact of SES on the relationship between grief support, and symptoms of PGD, depression, and PTSD.

Conclusion

The present study aimed to narrow the gap in the existing literature on the relationship between educational level, grief support, and symptoms of PGD, depression, and PTSD in a traumatically bereaved population. No significant relationship was found between grief support and symptoms of PGD, depression, and PTSD, nor was a relationship between educational level and psychopathology symptoms. Also, no interaction effect of educational level on the relationship between grief support and psychopathology symptoms could be identified. However, symptoms of PGD, depression, and PTSD were found to be closely correlated. A strength of this study is the focus on the traumatically bereaved, a group underrepresented in previous research. By focusing on this specific group, it is possible to gather a deeper understanding of the unique challenges traumatically bereaved must endure,

which can significantly differ from those who have experienced a non-traumatic loss. The large number of probable caseness of PGD, depression, and PTSD underline the psychological distress that the participants are experiencing, which ensures the relevance of further research.

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Appendix

R-Code

#Bachelor thesis

#cleaning dataset

```
library(foreign)
```

```
library(haven)
```

```
library(tidyverse)
```

```
library(psych)
```

```
library(broom)
```

```
library(ltm)
```

```
library(car)
```

```
library(polycor)
```

```
dontuse <- read_sav("C:/Users/Lena Weber/Downloads/ESM3_T1.sav")
```

#deleting unused information

```
dontuse1 <- subset(dontuse, select = -c(StartDate, EndDate, Progress, Finished, Responseld,  
  RecordedDate, Home_country, kinship, kinship_8_TEXT, age_deceased, DoD, cause,  
  cause_5_TEXT, A_un_expected, currentsupport, historysupport, Consent_1, Consent_2))
```

#deleting people that have suicidal ideas and/or psychotic disorder

```
datacleaning1.2 <- dontuse1 %>%
```

```
  filter(suicidal1.1 != 2 | is.na(suicidal1.1), na.rm = TRUE) %>%
```

```
  filter(Ex.psychotic != 1)
```

#code used to see the coding

```
unique(dontuse$suicidal1.1)
```

```
unique(dontuse$Ex.psychotic)
```

```
unique(dontuse$historysupport)
```

```
unique(dontuse$griefsupport)
```

#Psychopathology symptoms

```

symptoms<- subset(datacleaning1.2, select = -c(Gender, Education, Ex.psychotic, griefsupport,
      suicidal1.1, Brooding_1_1, Brooding_1_2, Brooding_1_3, Brooding_1_4, Brooding_1_5))

PHQ <- c("PHQ_1_1", "PHQ_1_2", "PHQ_1_3", "PHQ_1_4", "PHQ_1_5", "PHQ_1_6", "PHQ_1_7",
      "PHQ_1_8", "PHQ_1_9")

TGI <- c("TGI_1", "TGI_2", "TGI_3", "TGI_4", "TGI_5", "TGI_6", "TGI_7", "TGI_8", "TGI_9", "TGI_10"
      , "TGI_11", "TGI_12", "TGI_13", "TGI_14", "TGI_15", "TGI_16", "TGI_17", "TGI_18", "TGI_19"
      , "TGI_20", "TGI_21", "TGI_22")

PTSD <- c("PTSD_1", "PTSD_2", "PTSD_3", "PTSD_4", "PTSD_5", "PTSD_6", "PTSD_7", "PTSD_8",
      "PTSD_9", "PTSD_10", "PTSD_11", "PTSD_12", "PTSD_13", "PTSD_14", "PTSD_15",
      "PTSD_16", "PTSD_17" , "PTSD_18", "PTSD_19")

```

#Sum PHQ

```

symptoms$SumPHQ <- rowSums(symptoms[, PHQ], na.rm = TRUE)

sumscores <- symptoms[, "SumPHQ", drop = FALSE]

head(symptoms[ , c(PHQ, "SumPHQ")])

```

#Sum TGI

```

symptoms$SumTGI <- rowSums(symptoms[, TGI], na.rm = TRUE)

sumscores <- symptoms[, "SumTGI", drop = FALSE]

```

#Sum PTSD

```

symptoms$SumPTSD <- rowSums(symptoms[, PTSD], na.rm = TRUE)

sumscores <- symptoms[, "SumPTSD", drop = FALSE]

```

#creating a dataset with sumscores

```

sumscores <- cbind(symptoms$SumPHQ, symptoms$SumTGI, symptoms$SumPTSD)

colnames(sumscores) <- c("SumPHQ", "SumTGI", "SumPTSD")

```

Calculate mean and standard deviation of SumPHQ

```

mean_sumphq <- mean(sumscores[, "SumPHQ"], na.rm = TRUE)

```

```
sd_sumphq <- sd(sumscores[, "SumPHQ"], na.rm = TRUE)
```

```
# Calculate the standard deviation as a percentage
```

```
sd_percentage_phq <- (sd_sumphq / mean_sumphq) * 100
```

```
sd_percentage_phq
```

```
mean_sumphq
```

```
sd_sumphq
```

```
# Calculate mean and standard deviation of SumTGI
```

```
mean_sumtgi <- mean(sumscores[, "SumTGI"], na.rm = TRUE)
```

```
sd_sumtgi <- sd(sumscores[, "SumTGI"], na.rm = TRUE)
```

```
sd_percentage_tgi <- (sd_sumtgi / mean_sumtgi) * 100
```

```
sd_percentage_tgi
```

```
mean_sumtgi
```

```
sd_sumtgi
```

```
# Calculate mean and standard deviation of SumPTSD
```

```
mean_sumptsd <- mean(sumscores[, "SumPTSD"], na.rm = TRUE)
```

```
sd_sumptsd <- sd(sumscores[, "SumPTSD"], na.rm = TRUE)
```

```
sd_percentage_ptsd <- (sd_sumptsd / mean_sumptsd) * 100
```

```
sd_percentage_ptsd
```

```
mean_sumptsd
```

```
sd_sumptsd
```

```
#demographic variables
```

```
#Gender
```

```
# Calculate frequencies of Gender
```

```
unique(datacleaning1.2$Gender)
```

```
gender_freq <- table(datacleaning1.2$Gender)
```



```
gender_freq
```

```
gender_percentages <- prop.table(table(datacleaning1.2$Gender)) * 100
```

```
gender_percentages
```

#Education

```
unique(datacleaning1.2$Education)
```

#categorise education into 2 levels

```
datacleaning1.2$Education_Category <- ifelse(datacleaning1.2$Education %in% c(1, 2, 3), "Lower  
education", "Higher education")
```

```
head(datacleaning1.2[, c("Education", "Education_Category")])
```

```
education_freq <- table (datacleaning1.2$Education_Category)
```

```
education_freq
```

```
education_percentage <- prop.table(table(datacleaning1.2$Education_Category)) * 100
```

```
education_percentage
```

#grief support

```
unique(datacleaning1.2$griefsupport)
```

```
support_freq <- table(datacleaning1.2$griefsupport)
```

```
support_freq
```

```
support_percentage <- prop.table(table(datacleaning1.2$griefsupport)) * 100
```

```
support_percentage
```

Combine sumscores, griefsupport, and Education_Category

```
maindata <- cbind(sumscores, griefsupport = datacleaning1.2$griefsupport, Education_Category =  
datacleaning1.2$Education_Category)
```

Rename maindata

```
colnames(maindata) <- c("SumPHQ", "SumTGI", "SumPTSD", "Grief_Support", "Education_Category")
```

#Age

Create subsets based on date format

```

DoB_dd_mm_yyyy <- grepl("\\d{2}-\\d{2}-\\d{4}", datacleaning1.2$DoB)
Dutch_date <- datacleaning1.2[DoB_dd_mm_yyyy, ]
Dutch_date$DoB <- as.Date(Dutch_date$DoB, format = "%d-%m-%Y")
Dutch_date <- Dutch_date[!is.na(Dutch_date$DoB), ]
International_date <- datacleaning1.2[!DoB_dd_mm_yyyy, ]
International_date$DoB <- as.Date(International_date$DoB, format = "%d/%m/%Y")
Dutch_date$Age <- as.numeric(difftime(Sys.Date(), Dutch_date$DoB, units = "days") / 365.25)
International_date$Age <- as.numeric(difftime(Sys.Date(), International_date$DoB, units = "days") /
  365.25)
all_ages <- c(Dutch_date$Age, International_date$Age)
view(all_ages)

# Calculate the mean age
mean_age <- mean(all_ages, na.rm = TRUE)
print(mean_age)
sd(all_ages)

#Statistical Assumptions
maindata <- as.data.frame(maindata)
maindata$SumPHQ <- as.numeric(maindata$SumPHQ)
maindata$SumPTSD <- as.numeric(maindata$SumPTSD)
maindata$SumTGI <- as.numeric(maindata$SumTGI)
maindata$Grief_Support <- as.numeric(maindata$Grief_Support)

#dummy variable grief support
maindata <- maindata %>% mutate(Grief_Support_Dummy = ifelse(Grief_Support == 1, 0, 1))
maindata <- maindata %>%
  mutate(Education_Dummy = ifelse(Education_Category == "Higher education", 1, 0))

```

Recode Education

```
maindata$Education_Category <- ifelse(maindata$Education_Category == "Higher education", 2, 1)
```

#Normality**# Shapiro-Wilk test for normality**

```
shapiro.test(maindata$SumPHQ)
```

```
shapiro.test(maindata$SumTGI)
```

```
shapiro.test(maindata$SumPTSD)
```

#homoscedacity

```
fligner_test <- fligner.test(SumTGI ~ Grief_Support_Dummy, data = maindata)
```

```
print(fligner_test)
```

```
fligner_test1 <- fligner.test(SumPHQ ~ Grief_Support_Dummy, data = maindata)
```

```
print(fligner_test1)
```

```
fligner_test2 <- fligner.test(SumPTSD ~ Grief_Support_Dummy, data = maindata)
```

```
print(fligner_test2)
```

#Descriptive statistics**#correlation**

```
correlation <- cor.test(x = maindata$SumPTSD, y = maindata$SumPHQ, method = "pearson")
```

```
print(correlation)
```

#catgeorical biserial correlation

```
biserial_PHQ <- biserial.cor(maindata$SumPHQ, maindata$Grief_Support_Dummy)
```

```
print(biserial_PHQ)
```

```
biserial_TGI <- biserial.cor(maindata$SumTGI, maindata$Grief_Support_Dummy)
```

```
print(biserial_TGI)
```

```
biserial_PTSD <- biserial.cor(maindata$SumPTSD, maindata$Grief_Support_Dummy)
```

```
print(biserial_PTSD)
```

#same thing with education

```
biserial_PHQE <- biserial.cor(maindata$SumPHQ, maindata$Education_Dummy)
```

```
print(biserial_PHQE)
```

```
biserial_TGIE <- biserial.cor(maindata$SumTGI, maindata$Education_Dummy)
```

```
print(biserial_TGIE)
```

```
biserial_PTSD <- biserial.cor(maindata$SumPTSD, maindata$Education_Dummy)
```

```
print(biserial_PTSD)
```

#mean, sd

```
summary(maindata$SumPHQ)
```

```
sd(maindata$SumPHQ)
```

```
summary(maindata$SumTGI)
```

```
sd(maindata$SumTGI)
```

```
summary(maindata$SumPTSD)
```

```
sd(maindata$SumPTSD)
```

```
summary(maindata$Grief_Support)
```

```
sd(maindata$Grief_Support)
```

```
summary(maindata$Education_Category)
```

```
sd(maindata$Education_Category)
```

#hypothesis 1

```
unique(datacleaning1.2$griefsupport)
```

```
h1D <- lm(SumPHQ ~ Grief_Support_Dummy, data=maindata)
```

```
summary(h1D)
```

```
h1PGD <- lm(SumTGI ~ Grief_Support_Dummy, data=maindata)
```

```
summary(h1PGD)
```

```
h1PTSD <- lm(SumPTSD ~ Grief_Support_Dummy, data=maindata)
```

```
summary(h1PTSD)
```

#hypothesis 2

```
maindata$Education_Category<- as.factor(maindata$Education_Category)
```

```
levels(maindata$Education_Category) <- c("Lower education", "Higher education")
```

```
moder <- lm(SumPHQ ~ Grief_Support_Dummy * Education_Dummy, data=maindata)
```

```
summary(moder)
```

```
moderT <- lm(SumTGI ~ Grief_Support_Dummy * Education_Dummy, data=maindata)
```

```
summary(moderT)
```

```
moderP <- lm(SumPTSD ~ Grief_Support_Dummy * Education_Dummy, data=maindata)
```

```
summary(moderP)
```

#cronbachs alpha

```
TGI <- datacleaning1.2[, c("TGI_1", "TGI_2", "TGI_3", "TGI_4", "TGI_5", "TGI_6", "TGI_7", "TGI_8",  
"TGI_9", "TGI_10", "TGI_11", "TGI_12", "TGI_13", "TGI_14", "TGI_15", "TGI_16", "TGI_17",  
"TGI_18", "TGI_19", "TGI_20", "TGI_21", "TGI_22")]
```

```
PTSD <- datacleaning1.2[,c("PTSD_1", "PTSD_2", "PTSD_3", "PTSD_4", "PTSD_5", "PTSD_6",  
"PTSD_7", "PTSD_8", "PTSD_9", "PTSD_10", "PTSD_11", "PTSD_12", "PTSD_13", "PTSD_14",  
"PTSD_15", "PTSD_16", "PTSD_17", "PTSD_18", "PTSD_19")]
```

```
PHQ <- datacleaning1.2[,c("PHQ_1_1", "PHQ_1_2", "PHQ_1_3", "PHQ_1_4", "PHQ_1_5",  
"PHQ_1_6", "PHQ_1_7", "PHQ_1_8", "PHQ_1_9")]
```

Calculate Cronbach's alpha

```
cronbach.alpha(TGI, CI=TRUE, standardized=TRUE)
```

```
cronbach.alpha(PTSD, CI=TRUE, standardized=TRUE)
```

```
cronbach.alpha(PHQ, CI=TRUE, standardized=TRUE)
```

#extra correlation no grief support

```
no_grief_support <- subset(maindata, Grief_Support == 1)
```

```
grief_support <- subset(maindata, Grief_Support == 2)
```

```
mean(grief_support$SumPHQ)
```

```
sd((grief_support$SumPHQ))
```

```
mean(grief_support$SumPTSD)
```

```
sd((grief_support$SumPTSD))
```

```
mean(grief_support$SumTGI)
```

```
sd((grief_support$SumTGI))
```

#Explorative analysis

```
ExPT <- lm(SumPTSD ~ Education_Dummy, data=maindata)
```

```
summary(ExPT)
```

```
ExPH <- lm(SumPHQ ~ Education_Dummy, data=maindata)
```

```
summary(ExPH)
```

```
ExTG <- lm(SumTGI ~ Education_Dummy, data=maindata)
```

```
summary(ExTG)
```

#how many participants are over the cut off score

```
probably_PGD <- subset(maindata, SumTGI >= 71)
```

```
probably_PTSD <- subset(maindata, SumPTSD >= 33)
```

```
probably_depression <- subset(maindata, SumPHQ >= 20)
```