

The Role of Age and Psychological Support on Prolonged Grief Disorder

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Abstract

The death of a loved one is a profound experience often accompanied by grief, which can lead to Prolonged Grief Disorder (PGD) in some individuals, particularly following traumatic bereavement. This study explores the interplay between age, psychological support, and PGD levels among traumatically bereaved individuals. We hypothesized that higher age would be associated with higher PGD levels and that psychological support would moderate this relationship, potentially mitigating PGD levels. Participants (N = 47) who lost a loved one to suicide, accident, or murder completed the Traumatic Grief Inventory - Self-Report Plus (TGI-SR+). Contrary to our hypotheses, results suggested that neither age nor psychological support were significantly associated with PGD levels. Furthermore, psychological support did also not moderate the relationship between age and PGD levels. These findings challenge previous research that suggested the role of age and psychological support to be crucial on PGD. These results highlight the need for further investigation into potential predictors of PGD, specifically following traumatic bereavement. Moreover, future research should further explore the role of psychological support, with focus on collecting information on the quality and format of support services to better understand and address the needs of those suffering from traumatic grief.

Introduction to Grief and Prolonged Grief Disorder

The death of a loved one is a profound and universal experience, often accompanied by feelings of grief. Bereaved individuals often find themselves struggling not only with emotional pain, but also with deteriorating mental and physical well-being. According to Pociunaite et al. (2023), most individuals experiencing bereavement undergo a natural healing process characterized by a gradual reduction in grief over time. This finding aligns with Miller's (2012) longitudinal study, which additionally revealed that internal resilience and external support play a crucial role in the healing process. However, for some, grief becomes extraordinarily intense and persistent, leading to significant impairment in daily functioning. In such cases, the individual may be experiencing what is referred to as Prolonged Grief Disorder (PGD), which often requires targeted treatment (Boelen et al., 2020). PGD is a condition characterized by intense, persistent, and disabling grief that lasts for an extended period, significantly impairing a person's ability to function in daily life (American Psychiatric Association [APA], 2022). It typically involves severe emotional pain, longing for the deceased, and difficulty moving forward with life. Previous research indicates that a state of elevated and prolonged grief is a potential risk factor for various health issues, including cancer, cardiac events, increased alcohol and tobacco consumption and suicidal ideation (Chen et al., 1999; Prigerson et al., 1995, 1997 as cited in Lobb et al., 2010). Due to its debilitating effects on both individuals and society, PGD has gained attention from both the scientific community and the general public.

PGD Following Traumatic Bereavement

According to Benjet et al. (2015), the most prevalent potential traumatic event in a person's lifetime is the unexpected death of a significant other. Traumatically bereaved individuals are those who lost a loved one through unnatural deaths caused by accidents, suicides, homicides, disasters, terror, or war, constituting a vulnerable subgroup (Kristensen et al., 2012). In the Netherlands, where approximately 170,000 people pass away annually, around 2,000 deaths are classified as unnatural, leaving behind a large number of bereaved people (Centraal Bureau voor de Statistiek [CBS], 2024). Studies repeatedly link traumatically bereaved individuals to increased risk of developing mental health issues, including PGD (Djelantik et al., 2020; Lenferink & Boelen, 2023). Out of all traumatically bereaved people, approximately half of them develop PGD (Djelantik et al., 2020). However, despite the heightened risk within this population, research on PGD following traumatic loss remains limited.

The additional challenges faced by traumatically bereaved people in comparison to those grieving the loss of a loved one due to natural deaths are manifold. On an individual level, violent deaths are often seen as preventable and unfair, causing the bereaved person to attribute blame either to themselves or others (Rynearson, 2006). Additionally, individuals bereaving violent loss are likely to experience intrusive memories of the deceased person, which they may not be able to control or avoid (Armour, 2006; Prigerson et al., 2008). On a societal level, individuals bereaved due to the violent loss of a loved one reportedly encounter a lack of social recognition and support, combined with stigmatization (Feigelman et al., 2009). These challenges put individuals suffering traumatic losses at greater risk of developing PGD (Burke & Neimeyer, 2013; Schaal et al., 2010; as cited in Heeke et al., 2017).

Age and Psychological Support as Predictors of PGD Severity

Examining potential predictors for PGD following traumatic bereavement is crucial as it advances our scientific understanding of grief and thereby enables the development of targeted interventions, improving and guiding healthcare policies. In this study, we explore how two potential predictors – age and psychological support – are associated with PGD levels in traumatically bereaved individuals.

It is important to note that the reference to PGD in this study is not based on the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision (DSM-5-TR) criteria introduced in 2022, but rather on the definitions and criteria from earlier research. The influence of age on PGD levels has been extensively studied, with research indicating potential correlations (Kersting et al., 2011; Lundorff et al., 2017; Miller, 2012; Newson et al., 2011). These studies suggest that individuals with higher age tend to experience higher levels of PGD than their younger counterparts. This association could be attributed to various factors. For example, research has found that as individuals age, they are more likely to experience multiple losses in a short period of time, compounding grief and increasing the risk of developing PGD (Newson et al., 2011). Additionally, individuals with higher age may experience more intense grief due to the loss of long-term relationships and a reduction in social support networks as peers pass away (Toftthagen et al., 2017). In fact, changes in social support could be a significant explanatory factor in why individuals with higher age experience higher PGD levels. Older adults often have fewer social connections or face greater difficulty forming new relationships, which can amplify feelings of loneliness and isolation following a loss, contributing to higher levels of PGD (Pinquart & Sorensen, 2001). Another potential explanatory mechanism behind the relationship between age and PGD is

decreased resilience (Coifman et al., 2007). Taylor and Carr (2021) explored how resilience affects older adults' ability to handle significant stressors, including bereavement. They found that older adults with lower resilience are more likely to struggle with the emotional impacts of loss, leading to prolonged grief and other negative mental health outcomes (Taylor & Carr, 2021). Thus, the accumulation of losses over time, changes in social support, and decreased resilience may explain why higher age is positively correlated with higher PGD levels. Furthermore, age has been confirmed as a significant predictor of symptom severity in related mental disorders such as depression (Comijs et al., 2011; Djernes, 2006; Licht-Trunk et al., 2005; Padayachey et al., 2017) and post-traumatic stress disorder (Melese et al., 2024), suggesting that individuals with higher age are more likely to display higher symptom levels. Given PGD's high comorbidity rates with these disorders (Komischke-Konnerup et al., 2021), it is possible that age may also play a significant role in PGD levels.

Though all research is pointing in one direction and confirming the role of age in PGD levels, Heeke et al. (2019) not only found that age was largely unrelated to PGD, but their meta-analysis also revealed that in cases where people lost someone due to homicide, suicide, or accident, individuals with higher age tended to have lower levels of PGD. These inconsistencies in findings motivate further investigation into the relationship between age and PGD levels, especially among traumatically bereaved people.

Moreover, research demonstrates the efficacy of psychological support interventions in reducing PGD levels among bereaved adults (Bryant et al., 2017; Johannsen et al., 2019; Peri et al., 2016). Notably, psychological support is particularly effective in reducing levels among individuals with higher age (Jönsson et al., 2016). This association could be attributed to various factors. In the previous section, several unique struggles associated with higher age were listed, including factors such as the accumulation of losses over time, changes in social support, and decreased resilience. Psychological support addresses all three challenges and can help an individual to cope with them. For instance, psychological support offers tools and frameworks such as cognitive-behavioural techniques, mindfulness practices, and grief counselling frameworks to help individuals with higher age manage challenges after multiple losses (Allie et al., 2018; Yang et al., 2018; as cited in Robinson, 2022). Moreover, while individuals with higher age often experience a reduction in social support and accompanying feelings of loneliness and isolation, psychological support can partially compensate for this loss through therapy group sessions (Sabzmeydani, 2017) and offering the chance to find peers dealing with a similar situation (Bartone et al., 2019), helping to reduce the sense of isolation that contributes to higher PGD levels. Additionally, while individuals with higher

age might be more vulnerable to developing higher PGD levels due to a lower resilience, psychological support has been proven to enhance resilience in individuals coping with loss. Specifically, interventions such as cognitive-behavioural therapy, shown to effectively treat PGD by increasing overall resilience (Boelen et al., 2021; Eklund et al., 2021), are particularly effective in individuals with higher due to its tackling of their unique challenges.

This study aims to examine the interplay between age, psychological support, and PGD levels in traumatically bereaved individuals. More specifically, the following research question was examined: To what extent does psychological support influence the effect of age on PGD levels in traumatically bereaved people? The study will test two hypotheses: (1) age is a significant predictor of PGD levels, with higher age associated with elevated PGD levels, consistent with findings from previous studies (Kersting et al., 2011; Lunderoff et al., 2017; Miller, 2012; Newson et al., 2011); and (2) it is theorized that the absence of psychological support may strengthen the positive relationship between age and PGD, based on the understanding that psychological care can mitigate grief symptoms (Boelen et al., 2021; Eklund et al., 2021). These hypotheses are especially relevant to investigate in a traumatically bereaved sample as the distinctive challenges of traumatic bereavement, such as feelings of preventability, injustice, and blame, dealing with intrusive memories of the deceased, and facing social stigmatization, could potentially alter the effectiveness of psychological support. By investigating these hypotheses, this study aims to fill the research gap regarding PGD following traumatic bereavement and provide first insights into the role of psychological support in mitigating PGD levels across different ages.

Methodology

Participants and procedures

This study is part of a bigger project that assesses PGD levels following traumatic loss in daily life using Experience Sampling Methodology (ESM). It consisted of three phases: collection of retrospective data at Time 1 (T1), a two-week ESM phase, and collection of retrospective data at Time 2 (T2).

Eligible participants were adults who lost a loved one (i.e., partner, family member, or close friend) in a potentially traumatic way at least 12 months prior. Individuals needed to be at least 18 years of age, fluent in the Dutch language, and have a smartphone in order to participate. People were recruited through the Rouwmeter, a Dutch website that offers a self-assessment tool to individuals experiencing grief. After completing the assessment on the website, individuals were asked if they were interested to participate in this study. Data

collection of this study took place from March to April 2024. Individuals experiencing high suicidality or diagnosed with a psychotic disorder were excluded from participation.

Invitation emails were sent out to eligible participants, providing a link to the Qualtrics survey where the initial assessment (T1) took place, which typically took about 15 minutes to complete. Participants started by reading a detailed information letter, followed by giving informed consent. Then, participants were administered a series of questions encompassing both personal background and circumstances surrounding their loss. Subsequently, they completed questionnaires assessing PGD, depression, and PTSD levels. After T1 completion, research assistants (all bachelor-level psychology students) reached out to participants via telephone to provide the opportunity to ask questions and provide technical assistance if necessary. Additionally, participants were offered individualised reports of their scores and provided with instructions for downloading and using the Avicienna app used for the following two-week ESM-phase.

The ESM-phase started within one week after T1 assessment. During this phase, participants were asked to answer the same set of items on their phones daily for 14 consecutive days. Messages were sent every three hours at semi-random intervals starting from between 8.30 and 9.30 AM, with participants given one hour to respond. Participants who did not respond received reminders after 10 to 20 minutes, with research assistants calling if more than three surveys were missed to encourage participation. Each set of items took around 2 minutes to complete. Within a week after completion of the ESM-phase, participants were invited to complete the second survey (T2) which had a similar set of questions and lasted approximately 15 minutes.

Although data were collected at three time points as part of the broader research initiative (T1 assessment, the two-week ESM phase, and a final T2 assessment), only T1 data were used for this study's objectives. Participants had the chance to win one 50€ voucher. Ethical approval was obtained by the University of Twente (ID 240186).

Measures

Age and Psychological Support

Age information, measured in years, was calculated based on participant's date of birth. At T1, participants responded to three questions regarding psychological support: (1) Grief-specific psychological support post-loss, (2) history of psychological support pre-loss, and (3) current engagement in psychological support. Responses to these questions were binary (yes/no), and only data on current support and grief-specific support services were used for separate analyses in this study.

Traumatic Grief Inventory - Self Report Plus (TGI-SR+)

At T1, PGD levels were assessed using the Traumatic Grief Inventory - Self-Report Plus (TGI-SR+) developed by Lenferink et al. (2022). The TGI-SR+ is a 22-item self-report measure used to assess PGD levels in accordance with, but not limited to, DSM-5-TR criteria for PGD. Derived from the earlier 18-item TGI-SR questionnaire (Boelen & Smid, 2017), the TGI-SR+ was expanded with four additional items to encompass all DSM-5-TR criteria (Lenferink et al., 2022). The Dutch version of TGI-SR+ was used for the current study. Participants provided ratings on a 5-point Likert scale, ranging from 1 (*never*) to 5 (*always*), indicating to what extent they experienced each grief reaction in the past month. For example, participants indicated their agreement with statements such as “In the past month, did you feel alone or detached from others?”. The TGI-SR+ has good psychometric properties. Internal consistency for the DSM-5-TR items is notably high ($\omega > 0.90$), and prior research suggests strong test-retest reliability (Lenferink et al., 2022). The sum score was calculated by summing up the scores on the 22 items, resulting in a total score for disturbed grief. In an initial validation study, a cut-off score of ≥ 71 was determined to differentiate between disturbed and non-disturbed grief (Lenferink et al., 2022).

Data Analysis

Descriptive statistics were used to analyse background- and loss-related characteristics of the sample, as well as their information about current and grief support services. Mean, standard deviation, and range were calculated for age and PGD levels to offer a comprehensive overview of the extent and variability of age groups and PGD levels within the sample. To investigate the effect of age on PGD levels, a simple linear regression analysis was performed, with PGD levels as the dependent variable, and age in years as the independent variable. To investigate the effect of current psychological support on PGD levels, a simple linear regression analysis was performed, with PGD levels as the dependent variable and current support as the independent variable. To investigate the potential moderating role of psychological support on the relationship between age and PGD levels, a moderation analysis was conducted using linear regression. This analysis examined whether the association between age and PGD levels varied depending on the presence or absence of psychological support currently received by participants. Psychological support was included in the model as an interaction term alongside age.

Additionally, the following analyses were conducted post-hoc. The potential moderating effect of grief support on the relationship between age and PGD levels was investigated by running a second moderation analysis. Furthermore, we ran a quadratic

regression, with PGD as the dependent variable, and age in years as the quadratic independent variable.

Results

Descriptive Statistics

Of the 52 participants who completed the initial survey at T1, 5 participants were excluded due to suicidality, resulting in a final total of 47 participants. Most participants were female (85.11%). More than half (60%) of the sample had the highest education level. Most participants lost a child (40.43%) or a partner (25.53%). The primary cause of death was suicide (48.94%), closely followed by accident (42.55%). The age of the participants ranged from 29 to 76 ($M = 51.6$, $SD = 10.38$) years. Nearly one third (27.66%) of respondents were currently receiving psychological support and two third (65.96%) had received grief support. PGD levels ranged from 37 to 101 ($M = 72.4$, $SD = 15.01$). Twenty-five participants (53.19%) scored above the cut-off score, potentially qualifying for disturbed grief.

Assumptions

A linear regression analysis was performed to test the main hypothesis that higher age is associated with higher PGD levels. Linearity was assessed by examining a scatterplot of the residuals versus the predicted values. The scatterplot did not reveal any irregular patterns, suggesting that the assumption of linearity was met. By examining a scatterplot of “residuals versus fits”, the observed correlation was approximately 0, indicating that the assumption of independence of errors was satisfied. Homogeneity of variances was assessed by examining a plot of residuals versus the predicted values. The plot showed a random scatter, indicating that the variance of the residuals was constant across all levels of the predicted values, satisfying the assumption of homogeneity of variances. Lastly, normality of residuals was evaluated through a histogram and a Q-Q plot of the residuals. The histogram showed a roughly normal distribution, and the Q-Q plot indicated that the residuals closely followed a straight line, suggesting that the residuals were normally distributed. All four assumptions of linear regression were met.

Current Support, Age, and PGD levels

Results show that higher age is not significantly associated with higher PGD levels, $t(45) = 0.28$, $p > .78$. A moderation analysis was performed to test whether psychological support negatively moderates the relationship between age and PGD levels, thereby weakening the association between age and PGD levels. The results show that psychological support does not significantly moderate the relationship between age and PGD levels ($t(43) = -0.33$, $p > .74$). This suggests that there is no significant difference in PGD levels between

individuals with higher age who were receiving psychological support and those who were not. In other words, currently receiving psychological support does not result in lower PGD levels for participants with higher age compared to their peers who are not receiving such support. The regression model explained 4% of the variance in PGD levels ($R^2 = .04$). Next, we performed a regression analysis to test the direct effect of current psychological support on PGD levels. Results indicate a non-significant effect of current psychological support on PGD levels ($t(45) = 1.96, p > .056$), suggesting that the presence of current support is not associated with lower PGD levels.

Post-hoc: Grief Support, Age, and PGD Levels

We found that grief support is not associated with lower PGD levels, $t(45) = 0.27, p > .79$. A moderation analysis was performed to test whether grief support has a negative moderating effect on the relationship between age and PGD levels. The results show a non-significant effect of grief support on the relationship between age and PGD levels ($t(43) = 0.56, p > .58$), indicating that individuals with higher age receiving grief support do not experience lower PGD levels than their peers without grief support. The R-squared value for the regression model is 0.01, indicating that the included predictor of grief support does not adequately explain the variation in PGD levels.

Post-hoc: Quadratic Age Effect

A quadratic regression was performed to examine the relationship between age and PGD levels. The model does not significantly explain the variance in PGD levels ($R^2 = -0.02, F(2,44) = .58, p = .56$), indicating that neither the linear, nor the quadratic age effect are significant predictors of PGD levels.

Discussion

In this study, we aimed to explore the interplay between age, psychological support, and PGD levels in traumatically bereaved individuals. Specifically, we tried to answer the research question: To what extent does psychological support influence the effect of age on PGD levels in traumatically bereaved people? To address this, we tested two hypotheses. First, we examined whether higher age was associated with increased PGD levels. Second, we investigated whether the absence of psychological support strengthened the positive relationship between age and PGD levels.

Contrary to our initial hypothesis, our study did not find a significant association between higher age and increased PGD levels among traumatically bereaved adults. Additionally, our results did not demonstrate a significant moderating effect of psychological

support on the relationship between age and PGD levels. Grief support was also not a significant predictor for PGD levels.

Role of Age on PGD

Our findings diverge from some previous research indicating that individuals with higher age are more susceptible to experiencing PGD. Studies of Lundorff et al. (2017), Miller (2012), and Kersting et al. (2011) suggested a positive correlation between age and PGD levels. However, our results challenge this notion, aligning more closely with the findings of Heeke et al. (2019) who found that age was largely unrelated to PGD. This discrepancy highlights the need for a closer investigation into the role of age in PGD levels among traumatically bereaved individuals. In an effort to determine the role of age in PGD levels, we examined age as a quadratic variable, considering the possibility of a non-linear relationship. However, this analysis also did not reveal a significant association between age and PGD levels, suggesting that the relationship between age and PGD in traumatically bereaved individuals may be more complex than previously understood and necessitating additional research.

Several factors may explain these discrepancies. Lundorff et al. (2017) and Kersting et al. (2011) included participants with varying types of bereavement, whereas our study specifically focused on traumatic bereavement. The nature of traumatic loss, characterized by feelings of preventability, injustice, and blame, along with dealing with intrusive memories and social stigmatization, might alter the effects of age on PGD levels, potentially leading to different outcomes. Additionally, cultural context may play a significant role and account for some of the variation (Hantrais, 1999). Cultural attitudes towards bereavement can vary widely, impacting how individuals experience and report grief. For instance, Miller (2012) conducted their study in the United States, where factors such as individualistic societal norms, healthcare practices, and the availability of support systems post-loss may influence how grief is experienced, expressed, and studied, potentially contributing to the observed differences.

Role of Psychological Support on PGD

Our findings are also different from previous research demonstrating the efficacy of psychological support interventions in reducing PGD levels among bereaved adults (Bryant et al., 2017; Johannsen et al., 2019; Peri et al., 2016). Contrary to our expectations, our results suggested that individuals currently receiving psychological support had higher PGD levels than those not receiving such support. While these findings did not reach statistical significance, they indicate a trend in the opposite direction of what was hypothesized. One

possible explanation is that attendees might be in the beginning stages of their psychological treatment, where the therapeutic effects have not yet fully developed and consequently did not reflect in their PGD levels. Since we did not collect data on when participants started receiving psychological support, this remains a factor to consider. Another potential explanation is that we did not collect information on participant satisfaction or the perceived effectiveness of the psychological support received. A potential mismatch between the specific type of treatment and the participant's needs may have caused the psychological support to be ineffective, ultimately unable to change PGD levels (Shear & Skritskaya, 2012).

Furthermore, our analysis suggests that the impact of grief support on PGD levels may be limited, both in the immediate aftermath of loss and over an extended period. This is in line with the findings of Stroebe et al. (2005), who argued that grief therapy may often not be beneficial because it could potentially hinder natural grieving processes. Bonanno and Lilienfeld (2008) supported this view, saying that "*Most bereaved people do not need and will not benefit from clinical intervention.*" (Bonanno & Lilienfeld, 2008, p.377), as many demonstrate resilience and process grief according to their unique mental models of loss. Imposing standardized grief interventions may therefore do more harm than good. However, Stroebe et al. (2005) identified a specific subgroup that does benefit from grief counselling and therapy: individuals with naturally high distress levels, previous psychiatric issues, or insecure attachment styles (Stroebe et al., 2005). Thus, while conventional grief therapy may not universally benefit all bereaved individuals, early identification of those likely to benefit is crucial (Bonanno & Lilienfeld, 2008; Stroebe et al., 2005). Though this study collected data on psychopathology, we did not assess participants' history of psychiatric issues, attachment levels, or distress levels. Hence, it is uncertain what proportion of our sample may be part of the subgroup that benefits from grief therapy.

Additionally, Harrop et al. (2020) highlighted another aspect of the discussion, focusing on the format of psychological support. While psychological support services are widely implemented, there is considerable variation in outcomes. The effectiveness of grief support services often depends on several factors, such as the nature of the intervention and individual differences among bereaved individuals (Harrop et al., 2020). Time and format of the support also plays a significant role. Wagner et al. (2020) suggest that the effectiveness of psychological support can depend on when it is provided. Immediate interventions might not be as beneficial as support given at a later stage when the individual is more ready to process their grief. Additionally, the format (individual vs. group therapy, in-person vs. online) can also impact effectiveness (Wagner et al., 2020).

A notable aspect of our sample is that half of the participants lost a loved one through suicide, which often leaves the bereaved person with intense feelings of blame and guilt (Spillane et al., 2018). This unique characteristic might explain that more than half of the sample scored above cut-off score for a probable PGD diagnosis. Interestingly, despite the high prevalence of potential PGD diagnoses, only one third of participants indicated that they were currently receiving psychological support. This means that many participants with high PGD levels are not receiving psychological support, which raises important questions about the underlying reasons. Future research should investigate whether factors such as lack of motivation to seek support or other barriers prevent access to psychological care for individuals with high PGD levels.

Clinical Implications

Our findings suggest that age may not be a reliable predictor of PGD levels among traumatically bereaved individuals, necessitating further investigation into other potential predictors. Additionally, our study raises questions regarding the impact of psychological support in mitigating PGD levels. Future studies should explore additional factors influencing the impact of psychological interventions, such as the timing and format of support. ESM methods could be used to gather detailed information about the psychological support individuals receive and how often they apply techniques learned in therapy (Lenferink et al., 2022). This approach could help assess the immediate translation of psychological support into daily life and explore why psychological support seems ineffective in mitigating PGD levels.

Strengths & Shortcomings

A notable strength of our study is its focus on traumatically bereaved individuals, an under-researched group, providing valuable insights into this specific population. Our sample's relatively high mean age of 51 years offers a unique perspective on PGD in individuals with higher age. However, some limitations should be noted. Biases may have been introduced due to our relatively small sample size (Lin, 2018), the over-representation of women, and reliance on self-report measures (Lenferink et al., 2022). Retrospective measures, such as self-report questionnaires, are often considered to have limitations in terms of validity, emphasizing the need to interpret findings with care (Lenferink et al., 2022).

Future research could address these limitations by expanding sample size and ensuring more balanced gender representation. Additionally, applying alternative methods beyond self-report questionnaires may increase the strength of findings, considering the known limitations of retrospective measures in terms of validity (Lenferink et al., 2022).

Conclusion

This research aimed to explore the extent to which psychological support influences the effect of age on PGD levels in traumatically bereaved people. In conclusion, our findings indicate that there were no significant effects of psychological support on the relationship between age and PGD levels. Nevertheless, our study contributes to the growing body of literature on PGD following traumatic loss, the role of age in PGD levels, and the effectiveness of psychological support. While our findings did not support our initial hypotheses, they raise some interesting starting points for future research such as investigating other potential predictors for PGD, such as attachment types and prior mental health history, exploring barriers to accessing psychological support, and examining specific dimensions of psychological interventions, such as timing, duration, and delivery format. Despite limitations, our study highlights the importance of evaluating the effectiveness of different psychological support services in the treatment of PGD. Further research with larger, more diverse samples and longitudinal designs is needed to validate our findings and increase our understanding of the mechanisms underlying PGD following traumatic loss.

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Appendix

R-code

```
#import data
setwd("C:/Users/khadi/OneDrive/Desktop/datasets")
getwd("C:/Users/khadi/OneDrive/Desktop/datasets")

library(readr)
library(foreign)
grief <- read.spss("ESM3_T1.sav", to.data.frame=TRUE)

#load packages
library(dplyr)
library(tidyr)
library("ggplot2")

#CLEAN DATA SET
#exclude suicidal participants (5)
grief_2 <- grief %>% drop_na(TGI_1)
```

```
#show column names.
```

```
colnames(grief_2)
```

```
#remove irrelevant columns
```

```
grief_2 <- subset(grief_2, select= -c (EndDate, Progress, Finished,
                                     RecordedDate, Consent_1, Consent_2, DOB0,
                                     DOB1, DOB2, DOB3, DOB4, DOB5, DOB6,
                                     HOME_0, HOME_1, HOME_2, HOME_3, HOME_4, HOME_5,
                                     HOME_6,
                                     Ex.psychotic, KINSH0, KINSH1, KINSH2, KINSH3, KINSH4,
                                     KINSH5, KINSH6,
                                     DOD0, DOD1, DOD2, DOD3, DOD4, DOD5, DOD6,
                                     cause_5_TEXT, CAUSE0, CAUSE1, CAUSE2, CAUSE3, CAUSE4,
                                     CAUSE5, CAUSE6,
                                     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,
                                     Brooding_1_1, Brooding_1_2, Brooding_1_3, Brooding_1_4,
                                     Brooding_1_5,
                                     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, PTSD_20,
                                     StartDate, kinship_8_TEXT, A_un_expected, suicidal1.1,
                                     WSAS_1_1,
                                     WSAS_1_2, WSAS_1_3, WSAS_1_4, WSAS_1_5, Ind_Report))
```

```
#Add a column with participants' age to the grief_2 dataframe
```

```
grief_2$AGE <- c("51", "55", "55", "60", "39", "29", "59", "61", "32", "49",
                 "51", "52", "44", "42", "56", "65", "56", "50", "54", "56",
                 "36", "47", "48", "63", "33", "53", "58", "36", "66", "47",
                 "66", "54", "56", "64", "63", "39", "44", "48", "55", "35",
                 "52", "76", "54", "44", "52", "69", "51")
```



```
#explore the data
library(tidyverse)
library(ggplot2)

#barplot
ggplot(grief_2) +
  aes(x = currentsupport) +
  geom_bar(bins = 30L, fill = "#0c4c8a") +
  theme_minimal()

summary(grief_2$currentsupport)
summary(grief_2$historysupport)
summary(grief_2$griefsupport)

ggplot(grief_2) +
  aes(x = AGE) +
  geom_bar(bins = 30L, fill = "#0c4c8a") +
  theme_minimal()

#TGI-SR+
library(readr)
library(plyr)
require(plyr)
library(likert)

#show coding for TGI
unique(grief_2$TGI_1)

#1: convert likert into numbers (1-5)
grief_3 <- grief_2 %>%
  mutate_if(is.character, as.factor)
```

```

numeric_grief <- grief_3 %>% mutate_at(
  vars("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"),
  funs(case_when(
    .=="Nooit"~1,
    .=="Zelden"~2,
    .=="Soms"~3,
    .=="Vaak"~4,
    .=="Altijd"~5,
  ))
)

```

```
summary(numeric_grief)
```

```
#2:calculate overall PGD score for each participant, add results in a column
```

```
PGD_scores <- numeric_grief %>% select(c(13:34))
```

```
rowSums(PGD_scores)
```

```

grief_2$PGD_scores <- c("58", "73", "83", "62", "70", "77", "65", "84", "69", "56",
      "87", "89", "58", "97", "76", "66", "58", "88", "71", "47",
      "71", "65", "90", "67", "96", "101", "87", "72", "91", "58",
      "56", "70", "77", "82", "94", "63", "42", "61", "94", "79",
      "81", "77", "50", "67", "65", "76", "37")

```

```
#re-code current support into 1, 0
```

```
require(dplyr)
```

```
grief_2 <- grief_2 %>%
```

```
  mutate(currentsupport = ifelse(currentsupport == "Nee",0,1))
```

```
#make griefsupport into dummy for HYP2
```

```
grief_2$griefsupport_dummy=ifelse(grief_2$griefsupport=="Ja", 1, 0)
```

```
# View subset of the data:
```

```
grief_2 %>%
  select(AGE, currentsupport, PGD_scores) %>%
  View()
```

```
# Make a new data frame with only the analysis items:
```

```
analysis_data <- grief_2 %>%
  select(AGE, PGD_scores, currentsupport_dummy)
```

```
HYP2 <- grief_2 %>%
  select(AGE, PGD_scores, griefsupport_dummy)
```

```
#linear regression
```

```
#turn all values into numeric
```

```
unique(analysis_data$AGE)
class(analysis_data$AGE)
finalanalysisdata <- analysis_data %>%
  mutate_if(is.character, as.numeric)
```

```
finalHYP2 <-HYP2 %>%
  mutate_if(is.character, as.numeric)
```

```
class(finalanalysisdata$AGE)
```

```
summary(finalanalysisdata$AGE)
sd(finalanalysisdata$AGE)
```

```
summary(grief_2$Gender)
```

```
summary(grief_2$Education)
summary(grief_2$kinship)
summary(grief_2$cause)
summary(finalanalysisdata$PGD_scores)
sd(finalanalysisdata$PGD_scores)
summary(grief_2$currentsupport)
summary(grief_2$griefsupport)

#check if data meets 4 assumptions of linearity
install.packages("performance")
library(performance)
check_model(model)

#REGRESSION ANALYSIS
model <- finalanalysisdata %>%
  lm(PGD_scores ~ AGE, data = .)
model

library(broom)
model <- finalanalysisdata %>%
  lm(PGD_scores ~ AGE, data = .)
model %>%
  tidy()

finalanalysisdata %>%
  lm(PGD_scores ~ AGE, data = .)
  tidy()

model2 <- lm(PGD_scores ~ AGE, finalanalysisdata)
summary(model2)

#regression analysis to test direct effect of current support on PGD
```

```

library(broom)
modell <- finalanalysisdata %>%
  lm(PGD_scores ~ currentsupport_dummy, data = .)
modell %>%
  tidy()

#direct effect of grief support on PGD
library(broom)
modelll <- finalHYP2 %>%
  lm(PGD_scores ~ griefsupport_dummy, data = .)
modelll %>%
  tidy()

#plot results
finalanalysisdata %>%
  ggplot(aes(x = AGE, y = PGD_scores)) +
  geom_point() +
  geom_smooth(se = FALSE, method = lm)

#moderation analysis
library(lmtest)
library(ggplot2)

model <- lm(PGD_scores ~ AGE * currentsupport_dummy, finalanalysisdata)
summary(model)

#moderation of HYP2 (grief support)
modHYP2 <- lm(PGD_scores ~ AGE * griefsupport_dummy, finalHYP2)
summary(modHYP2)

out <- finalanalysisdata %>%
  lm(PGD_scores ~ AGE + currentsupport + AGE:currentsupport, data = .)
out %>%

```

```
tidy(conf.int = TRUE)
```

```
#quadratic age effect: check for non-linearity
```

```
#create a new variable for quadratic age
```

```
AGE2 <- finalanalysisdata$AGE^2
```

```
QuadraticRegression <- lm(PGD_scores~AGE+AGE2, data = finalanalysisdata)
```

```
summary(QuadraticRegression)
```