Understanding Prolonged Grief Disorder in Children: The Influence of Parental Grief and Cause of Death

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Abstract

Introduction: The death of a loved one can significantly impact a child's emotional and psychological well-being, with Prolonged Grief Disorder (PGD) being a potential outcome. While research has mainly explored PGD in adults, studies examining the relationship between parental PGD and child PGD are scarce. This study investigates the association between parental PGD severity and child PGD severity after a loss, with a focus on whether this relationship depends on the cause of death (sudden vs. expected).

Methods: Data were collected from 56 Dutch-speaking parent-child dyads who had experienced a significant loss. Parents completed the Traumatic Grief Inventory - Self-Report Plus (TGI-SR+) to measure parental PGD severity, including a parent-proxy PGD score for their child using the Traumatic Grief Inventory-Kids-Clinician Administered (TGI-K-CA). The child's age, time since the loss, and the cause of death were also recorded.

Results: The results showed a significant positive association between parental and child PGD severity. Children whose parents exhibited higher PGD symptoms tended to display more severe grief symptoms according to the parent ratings. Additionally, age and time since the loss were found to significantly influence child PGD severity. However, the cause of death (sudden vs. expected) did not moderate the relationship between parental and child PGD severity.

Conclusion: The current study highlights the important role of parental grief in shaping child grief and suggests that the severity of parental PGD contributes to higher severity of PGD symptoms in children. Despite the lack of moderation by the cause of death, the results emphasize the importance of the caregiving environment in shaping the child's grief response. Parenting style, particularly the emotional support provided by parents, may play a crucial role in helping children cope with grief. Further research is needed to explore how variations in parenting styles can affect the transmission of grief from parent to child.

Introduction

For children, losing a parent is one of the most traumatic events in their lives (Falala et al., 2024). In 2021 in the Netherlands, approximately 2% of children have lost a parent (Centraal Bureau voor de Statistiek, 2022), a figure that increases significantly when considering the loss of other close family members, such as siblings. Experiencing a loss of a loved one places some children at heightened risk for mental health challenges, including depression, post-traumatic stress, and substance use (Cerel et al., 2006; Keyes et al., 2014) as well as suicide-related behaviours (Guldin et al., 2015; Hill et al., 2019), decreased academic performance (Oosterhoff et al., 2018), and impairments in developmental tasks (Brent et al., 2012). However, one outcome that remains underexplored is the severity of Prolonged Grief Disorder (PGD), which affects a subgroup of bereaved children (Boelen et al., 2017; Van Dijk et al., 2023).

Prolonged Grief Disorder in children

Prolonged Grief Disorder (PGD) was recently recognized as a distinct disorder in the text revision of the Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5-TR) (American Psychiatric Association [APA], 2022). Typically, intense grief diminishes within the first year of the loss (Jordan & Litz, 2014; Pociunaite et al., 2023; Prigerson et al., 2009), whereas PGD symptoms persist and interfere with daily functioning. It is characterized by intense yearning for the deceased, difficulty accepting the loss, and a diminished sense of purpose (APA, 2022). The DSM-5-TR requires for the individual to show persistent symptoms of separation distress (e.g. yearning for the deceased) nearly every day for at least one month, as well as three of eight additional symptoms of “reactive distress to the death”, with the loss having occurred at least 6 months prior for children and 12 months prior for adults (APA, 2022). The addition of PGD in the DSM-5-TR signifies a significant shift in the conceptualization of grief, recognizing it not only as a natural adaptive reaction but also as a possible mental health disorder, distinct from depression and Post Traumatic Stress Disorder (Shevlin et al., 2024).Yet, limited research has explored PGD in children, partly due to the lack of standardized tools for assessment (Alvis et al., 2022).

Thus, a recent study by Van Dijk et al. (2023) with the aid of grief experts and bereaved youths have developed an adapted instrument, the Traumatic Grief Inventory – Kids – Clinician-Administered (TGI-K-CA). This instrument allows for the identification of PGD symptoms in children and adolescents, which represents a key advancement, providing clinicians with a more accurate means of diagnosis. Moreover, several studies have highlighted the importance of researching the unique features of PGD symptoms in children,

to determine whether the risk and protective factors, symptom patterns and diagnostic criteria identified in bereaved adults can be generalized to children (Boelen et al., 2017; Geronazzo-Alman et al., 2019; Spuij et al., 2012). Understanding the differences between adult and child grief can improve our knowledge on the assessment and treatment of PGD in bereaved children. Studies found that PGD symptoms can be reliably assessed in younger populations and that it is distinct from other disorders related to bereavement (e.g. depression and PTSD) and that approximately 10% of bereaved children meet criteria for PGD (Boelen et al., 2017; Van Dijk et al., 2023).

Correlates of PGD in children

While understanding the symptoms of PGD is essential, it is equally important to identify the factors that increase the severity of PGD, particularly in children. Existing research has primarily focused on adults, overlooking key intrapersonal and interpersonal factors unique to children, such as developmental stage and the caregiving environment (Alvis et al., 2022; Kaplow et al., 2012).

Children face unique challenges shaped by their developmental stage and reliance on caregivers for emotional regulation. During this period, the child is going through a time of change not only in terms of biological development, but also social and psychological (Walsh-Burke, 2012). Between the ages of 10 and 19 years, the frontal lobes enter their final growth. This part of the brain is involved during problem solving, memory, judgment, impulse control and social behaviour (Sharma et al., 2013). Simultaneously, children begin to step outside their family environments, a particularly vulnerable time as their emotional capacities are still developing, while still depending on their caregivers for emotional support (World Health Organization, 2012). Thus, the parent-child attachment remains essential in this period. However, children often exhibit ambivalence, expressing both dependence and independence from their parents (Christ et al., 2002). When this attachment is disrupted, children may face heightened vulnerability to psychological distress. This neurodevelopmental stage, combined with emotional dependency, may amplify the psychological impact of bereavement and complicate the grieving process, emphasizing the need for research focused on this age group's unique situation.

Parent-child attachment=

Firstly, given the developmental challenges of children, the caregiving environment plays a crucial role in shaping their grief responses, with the parent-child relationship being particularly significant. The communication, information and interpretation provided by the adults will be reflected in the child's responses. According to Revet et al. (2021), the way a

parent copes with the loss of a partner, combined with the quality of their parenting and the relationship they maintain with their child, can be significant factors in predicting the likelihood of children developing post-traumatic stress disorder (PTSD) or PGD.

By communicating openly about the loss (e.g. sharing memories together) it may aid the child in processing their grief and it conveys that discussing about the grief is acceptable (Lytje & Dyregrov, 2023; Saldinger et al., 2004). Moreover, the way parents cope, influences a child's own coping style. It is vital to acknowledge that a child's coping and emotional regulation methods are largely influenced by their social environment, including parents and peers. The child's past experiences and coping strategies are developed via interaction with their social surroundings (Birgisdóttir et al., 2023). Thus, the behaviour and the grief reaction of the parent after the loss may influence the grieving process of the child, underlining the importance of a supportive caregiving environment during this vulnerable period.

Type of loss: sudden vs. expected

Next to the caregiving environment, the type of loss, specifically its expectedness, is another critical factor. In the literature there is a distinction between sudden natural and sudden violent deaths, it is known that experiencing a sudden death of violent nature is associated with higher levels of PGD, in the general adult population (Buur et al., 2023). The graphic images associated with violent and traumatic deaths may complicate the grief reactions in children as well (Pfefer et al., 1997; Pynoos, 1992). Moreover, it has been found that sudden deaths are associated with increased anxiety, depression and maladaptive grief in children (Dillen et al., 2009; Layne et al., 2008). Nonetheless, some studies found this relationship between different causes of a sudden death and maladaptive grief in children to be nonsignificant, meaning that there was no significant difference found in loss due to a sudden suicide and a sudden natural death (Melhem et al. 2007).

Losing a parent due to a terminal illness is not a sudden death, but this does not necessarily make it less traumatic for the child. In fact, studies have found that anticipated or illness-related losses are associated with distress for the children (Kentor & Kaplow, 2020) and higher levels of maladaptive grief and posttraumatic stress symptoms, compared to sudden natural death (Kaplow et al., 2014). Children's ability to interpret trauma is influenced by their cognitive development, which is still in progress, as well as their reliance on their primary caregiver for emotional support and information. This developmental stage makes it more difficult for them to fully understand the situation, and their emotional regulation mechanisms are still evolving. For example, witnessing disturbing medical procedures or the progressive deterioration of a loved one can be more traumatic for a child than for an adult, as

they may focus on the fear, confusion, or trauma of the experience rather than the emotional aspects of the loss (Dyregrov, 2008). This can distort the child's grieving process, making it more difficult for them to move through the stages of grief, as they may struggle to process the traumatic experience into their emotional understanding of the loss (Kaplow et al., 2014; Saldinger et al., 2004; Pynoos, 1992). Thus, compared to a sudden death, an expected death may place the child in a particularly vulnerable position, where the ongoing exposure to distressing events, heightens the importance of a supportive caregiving environment in helping the child process grief.

Current study

Highly intense feelings of grief can interfere with the normal functioning of daily life (Lytje & Dyregrov, 2024). Additionally, the unique circumstance of childhood grief is gaining more recognition. However, there remains a lack of understanding of the influence of interpersonal factors such as the influence of the parents' severity of PGD on the PGD symptoms of the child after the loss (Alvis et al., 2022; Wardecker et al., 2017). This study aims to address the gap in understanding the relationship between the PGD symptom severity of parents and children after the loss of a loved one. Additionally, we want to see to what extent the expectedness of the death has an influence on this relationship. Therefore, the research question reads: *"To what extent does the symptom severity of the parent's Prolonged Grief Disorder (PGD) affect the child's PGD symptom severity after losing a loved one, and to what extent is this relationship moderated by the cause of death (sudden vs. expected)?"*

Based on previous findings, that children use their (social) environment to make sense of a situation and based on the developmental stage they are in (Alvis et al., 2022; Kaplow et al., 2012; Lytje & Dyregrov, 2023), I hypothesize that the caregivers PGD symptom severity are positively associated with the child's PGD symptom severity. Furthermore, since an expected death causes more distress in children (Kaplow et al., 2014; Kentor & Kaplow, 2020), and since the caregiving environment is important for a child to process grief, I hypothesize that the moderating role of cause of death will reveal stronger associations for expected deaths compared to expected deaths.

Methods

Participants and procedure

The current study used data obtained from a larger study where participants were recruited through the Dutch bereavement website www.rouwbehandeling.nl. This website provides bereaved individuals with insights into their grief process and offers supportive resources. The bereaved parents can access the Traumatic Grief Inventory – Kids – Clinician

Administered (TGI-K-CA) to monitor their child's grief by filling in the TGI-K-CA for their kids. Additionally, the parents can let the kids fill in the TGI-K-CA. Moreover, the parents could fill out the Traumatic Grief Inventory-Self Report Plus (TGI-SR+) to monitor their own grief. Furthermore, informed consent was acquired from all participating adults, and parental approval was obtained for the data gathered from minors. No monetary reward of any kind was given to participants. The data collection took place from April 2024 to November 2024. The study was conducted in accordance with the principles embodied in the Declaration of Helsinki (World Medical Association Declaration of Helsinki, 2013)

The total number of participants was 146, the sample consisted of Dutch speaking parents who have filled out the TGI-K-CA for their children. The age of the children ranged between 5 and 16 years old. The inclusion criteria for the current study consisted of including only data from dyads where the parent had filled in the TGI-SR+ for themselves as well as the TGI-K-CA for their kids. Additionally, only data was included where the dyad had lost a significant person (not including pets). This resulted in a final sample of 56 bereaved parent-child dyads.

Measures

Background and loss-related characteristics

Participants provided information regarding their own age and gender, as well as their child's age and gender. For the assessment of gender, the provided options were: 1 = male, 2 = female, 3 = other. Additionally, the loss-related characteristics were collected, including the relationship of the child to the deceased 1 = father/mother of the child, 2 = brother/sister of the child, 3 = stepbrother/stepsister of the child, 4 = stepfather/stepmother of the child, 5 = grandfather/grandmother of the child, 6 = uncle/aunt of the child, 7 = other, and the cause of death (1 = physical illness, 2 = accident, 3 = suicide, 4 = homicide, 5 = other).

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

The prolonged grief symptoms in the parents were measured using the Traumatic Grief Inventory-Self Report Plus consisting of 22 items (Lenferink et al., 2022). These items included statements such *as "I felt an intense sense of yearning for him/her"*. The participants were asked to rate the frequency of each item in the past month on a 5-point Likert scale (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = always). The TGI-SR+ demonstrated good psychometric properties (Lenferink et al., 2023). The scores on all 22 items were added together to create a PGD total score. According to a validation study, probable PGD caseness can be identified when an individual's score is 71 or higher (Lenferink et al., 2022).

Moreover, in this sample a Cronbach's alpha of 0.92 was found, showing good internal consistency.

Traumatic Grief Inventory-Kids-Clinician Administered (TGI-K-CA)

The prolonged grief symptoms in children were measured by the parents using the Traumatic Grief Inventory – Kids – Clinician Administered (TGI-K-CA), which consists of 16 items aimed at assessing prolonged grief reactions in children and adolescents aged 8–18 years (Van Dijk et al., 2023). These items evaluate the frequency of symptoms associated with prolonged grief disorder, as described in the DSM-5-TR (APA, 2022). Participants were asked to rate the frequency of each symptom experienced in the past month on a 5-point Likert scale (1 = never, 2 = seldom, 3 = sometimes, 4 = often, 5 = always). Summing the scores across all 16 items resulted in a total PGD score, used to quantify the severity of prolonged grief symptoms. The measure's psychometric qualities are currently being confirmed among Dutch bereaved children ages 8 to 18 (Van Dijk et al., 2024). With a Cronbach's alpha of 0.92, the TGI-K-CA showed good internal consistency in this sample.

Analysis plan

The data obtained from the TGI-SR+ and TGI-K-CA questionnaires, including the sample characteristics, were aggregated into a single file and put into R-studio for a statistical analysis. The code used in R-studio can be found in Appendix A. Statistical significance was set at $\alpha = 0.05$ for all tests. Moreover, the assumptions of linearity, independence, homoscedasticity and normality of residuals were tested.

First, to prepare the dataset for analysis, the parents who did not fill in the TGI-SR+ and TGI-K-CA were removed. Then, the PGD severity scores for the parents and children were computed by summing the corresponding item responses from the TGI-SR+ and TGI-K-CA questionnaires, respectively. Moreover, the variable Cause of death was recoded into two categories: 0 = expected (e.g., illness) and 1 = sudden (e.g., accident, suicide, homicide). The cases where the cause of death was described as other were manually put in the right category.

To test the first research question, which was regarding the relationship between the levels of PGD of parent and child, a linear regression analysis was conducted. The parents' PGD severity score served as the independent variable (IV) while the child's PGD severity score served as the dependent variable (DV). To test the main effect of parental PGD severity on child PGD severity.

To investigate whether the cause of death moderates the relationship between parental and child PGD severity, interaction term was created by multiplying the centered parental PGD score with the cause of death variable. The centered variable was obtained by

subtracting the mean of the parental PGD scores from each individual parent's score. This interaction term was added to the regression model to assess if the strength of the association between parental and child PGD severity varies based on whether the death was expected or sudden. Then, if the interaction effect was found to be significant, a simple slope analyses was conducted to further explore how the relationship between parental and child PGD severity differs depending on the cause of death.

Results

Sample characteristics

In total, there were 56 parent-child dyads after adhering to the inclusion and exclusion criteria. Of the children, 28 were male (50.9%) and 27 female (49.1%) with the mean age being 8.77 (*SD* = 4.07). Of the parents, 9 of them were male (16.1%), 47 were female (83.9%) with the mean age being 45.83 (*SD* =7.78). Moreover, 36 of the losses were expected (67.9%), and 17 (32.1%) were sudden. Almost half of the children have lost one of their parents (*n* = 24, 45.38%). Of the parents, 15 met the criteria for probable PGD (28.3%). The mean PGD score for the parent was 63.18 (*SD* = 14.06). The mean PGD score was 42.34 (*SD* = 12.55). The average time since loss was 28.62 months (*SD* = 48.54).

Table 1

Background and loss-related characteristics of parents and children (n = 56)

Characteristic	*N (%)*
Gender child	
Male	28 (50.9)
Female	27 (49.1)
Other	1 (0.02)
Age child (in years), *M(SD)*	8.77 (4.07)
Gender parent	
Male	9 (16.1)
Female	47 (83.9)
Age parent (in years), *M(SD)*	45.83 (7.78)
Cause of death	
Expected	40 (71.4)
Sudden	16 (28.6)
Childs relationship to the deceased	
Parent	25 (44.6)
Sibling	8 (14.3)
Stepfather/mother	1 (1.78)

Grandparent	15 (26.8)
Uncle/ aunt	4 (7.14)
Other	3 (5.36)
Parents with probable PGD	17 (30.3)

The association between a parent's and a child's PGD symptom severity

A linear regression analysis was used to test the main effect of a parent's total PGD score on the child's total PGD score. The overall model proved to be statistically significant (F (1, 43) = 7.32, p <.001) explaining approximately 23% of the variance in the child's PGD score (R^2 = 0.23, $R^2_{adjusted}$ = 0.22). The results indicated that the total PGD score of the parent is a significant predictor of the child's total PGD score (b = 0.43, SE = 0.11, t(54) = 4.01, 95% CI [0.21, 0.64]). This suggests that higher parent's PGD symptom severity is positively associated with a higher child's PGD symptom severity.

As an exploratory step, a multiple regression analysis was performed with the child's PGD level as the dependent variable, the parent's PGD level served as the independent variable and the control variables included kinship, time since loss, gender and age of both parent and child, and the cause of death (expected vs. sudden). The model proved to be significant, F (12, 39) = 2.72, p = .009, R^2 = 0.456, $R^2_{adjusted}$ = 0.2886. This step identified two additional significant predictors: the child's age and the time since loss. As a result, a multiple regression model was conducted, including the parent's PGD score, the child's age, and time since loss as predictors. While this approach was exploratory and not part of the original analysis plan, it offers valuable insights for future hypothesis-driven research. This model was statistically significant, F (3, 49) = 7.32, p < .001, explaining approximately 31% of the variance in the child's PGD score (R^2 = 0.31, $R^2_{adjusted}$ = 0.27).

The results confirmed that the parent's PGD score remained a significant predictor (b = 0.38, SE = 0.10, t(49) = 3.60, p < .001, 95% CI [0.18, 0.58]), further supporting the positive association between the parent's and the child's PGD symptom severity. Additionally, the child's age significantly predicted their PGD score (b = 0.85, SE = 0.36, t(49) = 2.35, p = .023, 95% CI [0.09, 1.61]), indicating that older children tend to report higher PGD symptom severity. Time since loss was also a significant predictor (b = -0.06, SE = 0.03, t(49) = -2.16, p = .036, 95% CI [−0.12, −0.01]), suggesting that a longer time since the loss is associated with lower PGD symptom severity in children.

The possible moderating effect of unexpectedness of death on the relationship between a parent's and child's PGD symptom severity

To examine whether the cause of death (expected = 0, sudden = 1), moderates the relationship between the parent's PGD score and the child's PGD score, a multiple regression analysis was performed with the parents PGD severity as the independent variable, the child's PGD severity as the dependent variable and the cause of death as the moderator. The overall model was significant, $F(3,52)= 5.21$, $p = .003$, explaining approximately 23% of the variance in the child's PGD score ($R^2 = 0.23$, $R^2_{adjusted} = 0.19$). However, the interaction between parent's PGD score and cause of death was not significant (b = 0.03, SE = 0.22, $t(52) = 0.15$, $p = .883$), indicating that the cause of death did not significantly moderate the relationship between the parent's and child's PGD severity. Similarly, the main effect of cause of death was not significant, ($b = -1.04$, SE = 3.39, $t(52) = -0.31$, $p = .760$). Despite the lack of interaction effects, the parent's PGD score remained a significant predictor of the child's PGD score, $b = 0.42$, SE = 0.16, $t(52) = 2.64$, $p = .011$, 95% CI [0.10, 0.73] , further supporting a positive association between the parent's PGD symptom severity and the child's PGD symptom severity. These findings suggest that while a parent's PGD symptom severity is positively associated with the child's PGD symptom severity, this relationship does not appear to be influenced by the cause of death.

A linear regression analysis was performed as an exploratory step, in which the cause of death was used as a predictor of parental PGD scores, it proved to be non-significant, $F(1, 54) = 1.16$, $p = .286$, $R^2 = .021$. The regression coefficient for cause of death ($b = 4.48$, SE = 4.15, $p = .286$) indicated that parents who experienced a sudden loss scored, on average, 4.48 points higher than the sample mean on PGD severity than those who experienced an expected loss. However, this difference was not statistically significant.

Discussion

The current study aimed to examine the association between parental and child prolonged grief disorder symptom severity and whether this relationship was dependent on the cause of death (expected vs. sudden). The analyses were conducted using the data from 56 parent-child dyads who have experienced the loss of a loved one. Results showed that there was a significant association between parental PGD symptom severity and child PGD symptom severity. Specifically, higher PGD symptoms in parents were linked to higher symptoms in their children. Furthermore, two additional predictors were found to influence the child's symptom severity, namely the child's age and the time since loss. Older children tended to report higher PGD symptoms, while a longer time since loss was associated with lower PGD severity in children. Additionally, the cause of death did not significantly moderate the relationship between parent and child PGD, nor did it independently predict the

child PGD severity. This indicated that the nature of the loss might not alter the direct influence of a parent's grief on a child's grief, emphasizing the critical role of parental grief on the child's grief experience, regardless of the cause of loss.

The relationship between parental PGD severity and child PGD severity

The findings revealed that the severity of PGD symptoms in parents is positively associated with higher PGD symptoms in children, supporting the first hypothesis. These results are consistent with a longitudinal study by Lenferink and O'Connor (2023), which found that parental grief significantly predicted adult children's PGD levels. The current findings can be explained by the idea that children benefit from a supportive caregiving environment, which may be disrupted when parents experience higher PGD symptoms. As suggested by Kwok et al. (2005), parents with less severe PGD symptoms may play a mediating role, fostering a more positive, warm, and caring environment that benefits their children. These results highlight the need for future research to explore the underlying mechanisms of this relationship. Factors such as family communication styles, the child's attachment style, and parenting approaches could contribute to the transference of grief symptoms. For example, the study by Shapiro et al. (2013), proposed that lower maladaptive grief symptoms are associated with the parents' communication. When parents engage in an open, positive communication style about the loss, children may also be inclined to ask questions and process the loss. Future longitudinal studies are necessary to establish causality and to further investigate the potential association between the parental PGD level and this communication style.

The influence of age and time since loss on child PGD

Beyond the primary analyses, an exploratory investigation identified the child's age a as potential predictor of child PGD severity. More specifically, older children reported higher levels of grief. Although it might be expected that younger children experience more PGD due to greater dependence on their caregivers, this result may be explained by older children having a better understanding of the loss (Kaplow et al., 2012). However, it could also be due to the DSM-5-TR not capturing all the age-related manifestations of grief. (Alvis et al., 2022; Kaplow et al., 2012; Lytje & Dyregrov, 2024). Moreover, time since loss was found to be significant. A longer time since loss was associated with a lower PGD score in children, these findings are consistent with research conducted by Maciejewski et al. (2007), where they found that the PGD symptoms in children diminish over time. Moreover, a recent trajectory study by Sandler et al. (2024) found that 60% of bereaved youth had high PGD scores nine to twelve months after a loss. Two thirds of that group later experienced a decrease of grief

symptoms, as a result they were no more likely to face mental health issues later in time than those who had low grief levels from the start. However, future research could explore how a child's age at different developmental stages impacts grief, how and the time since loss impacts grief and its stability over time

The moderation of cause of death

It was hypothesized that the moderating effect of the cause of death (expected vs. sudden) would show a stronger relationship between the parental and child PGD severity when the death was expected. This hypothesis was based on prior studies suggesting in the case of expected deaths, children may find these losses more traumatic (Kaplow et al., 2020). As a result, children may need increased support and guidance from their parents to process the loss, hence the stronger relationship between parental PGD severity and child PGD severity. Specifically, if the parent is coping well and experiencing lower levels of PGD after an expected death, they are likely to provide the necessary emotional support, thereby strengthening the relationship between parental and child PGD severity, potentially resulting in lower levels of PGD in children as well. Conversely, if the parent finds the expected death traumatic and experiences higher PGD symptoms, their impaired functioning could negatively impact the caregiving environment, adding to the child's grief and further amplifying the relationship between the two, possibly leading to higher PGD in children.

However, the present study found that the cause of death did not significantly moderate the relationship between parental and child PGD severity. Research by Melhem et al. (2007) provides a potential insight for the insignificant finding. Their study found no significant difference between the specific cause of a sudden death, e.g. suicide, accident or illness, as all three increased the risk of mental health problems such as depression, in both the children and caregivers in the same way. Importantly, the authors emphasized the impaired functioning of the surviving caregiver after a sudden loss, which negatively impacted caregiving environment that adversely affected the children's functioning. These findings suggest that it may be that the overall caregiving environment and the surviving parent's psychological status play a more critical role in shaping child outcomes than the cause of death, which is in line with our previous findings. Future studies could investigate this further by exploring the effect of the parents' behaviours, such as their communication style on the child's grief severity.

An additional exploratory analysis was conducted to examine whether the cause of death was associated with parental PGD severity and was found to be insignificant. These findings suggest that the cause of death does not significantly influence the severity of

parental PGD symptoms. While prior research highlights sudden and violent losses as risk factors for prolonged grief in adults (Buur et al., 2023), our exploratory analysis did not replicate this effect for parents. Given these results, the insignificant moderating effect of the cause of death on the relationship between parental and child PGD severity may be further explained, as neither the parents' nor the children's grief severity was significantly influenced by the cause of death.

Limitations and future research

Despite the contribution of this study to the limited body of knowledge on PGD in children, it is important to acknowledge the limitations. First, because the study is cross-sectional it is not possible to draw conclusions about the directionality or causality of the relationship between parental and child PGD symptom severity. Thus, it remains unclear whether parental grief influences child grief or vice versa. To address this limitation, a longitudinal design is recommended to further explore the relationship over time.

Secondly, the data included parent self-report and grief in children reported by parents. Due to the limited number of dyads where the child reported their own grief, the parent report of their child's grief was used for analysis. However, previous studies examined both parental and child perspectives and found discrepancies in certain areas between the reported grief by the child's parent and the child self-report (Foster et al., 2011; Greenwald et al., 2016). These findings suggest that the parents' perception of their child's grief may not fully capture the child's grief experience, and therefore the results should be interpreted with caution.

Additionally, due to the relatively small sample size of 56 dyads, the generalizability and statistical power of the current study may be limited (Cohen, 1992). Moreover, the study included dyads where the loss occurred less than six months ago, which does not meet the DSM-5-TR criteria for probable PGD, requiring at least six months post-loss for children and twelve months for adults (APA, 2022). Consequently, the study could not assess PGD caseness based on these criteria.

Lastly, the expectedness of the death was not directly measured in this study. Instead, the causes were coded as either sudden or expected. For example, deaths due to illness were classified as expected, even though some illness-related deaths may have been sudden natural deaths. This approach may have oversimplified the categorization of the level of expectedness, which is an important factor in grief reactions (Clements et al., 2004; Schmidt & Azoulay, 2012). Future research should aim to include a more nuanced measure of unexpectedness to better capture its influence on grief severity.

Future studies are warranted based on the limitations of this study and findings about the significant association between parental PGD and child PGD severity. It is recommended that future studies address the caregiving environment, such as parenting style, in order to better understand the mechanisms of grief transference between parent and kid. For example, research by Alvis et al. (2020) focused on utilizing measures of parenting behaviours within the context of bereavement, thus they examined the newly developed Grief Facilitation Inventory (GFI). The GFI, which was found to be reliable, is a tool designed to measure caregiver behaviours that are believed to either support or hinder children's grief responses. Incorporating such measures may provide valuable insights into how caregivers influence their children to cope with their grief.

Conclusion

To conclude, the main aim of this study was to investigate the relationship between child PGD severity and parental PGD severity, as well as the potential moderating effect of the cause of death (expected vs. sudden). The importance of the caregiving environment for the levels of PGD in a child were underscored by the results, as higher parental PGD severity was associated with higher child PGD severity. The cause of death (expected vs. sudden) had no influence on this relationship. Additionally, my findings propose that a child's developmental stage plays a role in their grief symptom severity, with older children reporting higher levels of PGD. Additionally, a longer time since loss shows lower PGD severity in children. Given the study's limitations, such as its cross-sectional design, reliance on parent-proxy reports, and the small sample size, these findings require further replications using a longitudinal design and incorporating self-reports of grief from children. Furthermore, exploring the role of the caregiving environment of the child, such as communication style in the family, could lead to additional insights in better understanding the mechanisms driving the transmission of grief. This study contributes to the limited knowledge on child grief by shedding light on the relationship between a parent and child PGD severity, providing a foundation for future research to further explore the complex dynamics of grief in children and families.

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Appendix A

R code

```
##feray coban

#INSTALL PACKAGES and set directory
install.packages("broom")
install.packages("foreign")
install.packages("haven")
install.packages("labelled")
install.packages("lmSupport")
install.packages("tidyverse")

# Load the libraries
library(broom)
library(dplyr)
library(foreign)
library(haven)
library(labelled)
library(lmSupport)
library(tidyverse)
library(tidyr)
# set working directory and load dataset
setwd("~/Downloads/thesis grief")

data <- read_sav("Rouwmeter voor Kinderen_2024_December_students.sav")
View(data)

#Checking the labels:
```

```
labelled::var_label(data)

#Checking specific values:

val_labels(data$KinshipC)


for (col_name in names(data)) {
  if (is.labelled(data[[col_name]])) {
    cat("Column:", col_name, "\n")
    print(val_labels(data[[col_name]]))
    cat("\n")
  }
}

# exclude thing such as ; parents not filling in questionnaire, kinship being pets etc

## remove wrong data. R_7l3ogXZMiXJDxhQ , R_2BZjPcSNqbv8BMd , R_8Djti6s2ZBOwim5, their ages were too low to be a parent


data_filtered <- subset(data, Intro1 != 2 )

invalid_ids <- c("R_7l3ogXZMiXJDxhQ", "R_2BZjPcSNqbv8BMd", "R_8Djti6s2ZBOwim5")

data_filtered$AgeP[data_filtered$ResponseId %in% invalid_ids] <- NA

data_filtered$AgeC[data_filtered$ResponseId %in% invalid_ids] <- NA

View(data_filtered)



##transforming from numeric to factor enzo. categoriseren man en vrouw etc.

data_filtered$GenderParent <- factor(data_filtered$GenderParent, levels = c(1, 2), labels = c("man", "vrouw"))

data_filtered$GenderChild <- factor(data_filtered$GenderChild, levels = c(1, 2), labels = c("man", "vrouw"))

data_filtered$KinshipC <- factor(data_filtered$KinshipC,
                                 levels = c(1, 2, 4, 5, 6, 7, 8),
```

```
                labels = c("vader/moeder van het kind",
                           "broer/zus van het kind",
                           "stiefbroer/stiefzus van het kind",
                           "stiefvader/stiefmoeder van het kind",
                           "opa/oma van het kind",
                           "oom/tante van het kind",
                           "anders, namelijk: .... van het kind"))



# Check the structure of the data to ensure conversion
str(data_filtered)
View(data_filtered)
summary(data_filtered)



### sum up scores parents
colnames(data_filtered)
tgi_scores <- data_filtered
tgi_scores$PGD_score_parent <- rowSums(tgi_scores[, c("TGI_1", "TGI_2", "TGI_3",
"TGI_4",
                                                      "TGI_5", "TGI_6", "TGI_7", "TGI_8",
                                                      "TGI_9", "TGI_10", "TGI_11", "TGI_12",
                                                      "TGI_13", "TGI_14", "TGI_15", "TGI_16",
                                                      "TGI_17", "TGI_18", "TGI_19", "TGI_20",
                                                      "TGI_21", "TGI_22")],
                                       na.rm = TRUE)
tgi_scores$PGD_score_child <- rowSums(tgi_scores[, c("TGI_K_CA_1_ParentReport",
"TGI_K_CA_2_PR", "TGI_K_CA_3_PR",
```

```
                                    "TGI_K_CA_4_PR", "TGI_K_CA_5_PR",
"TGI_K_CA_6_PR",
                                    "TGI_K_CA_7_PR", "TGI_K_CA_8_PR",
"TGI_K_CA_9_PR",
                                    "TGI_K_CA_10_PR", "TGI_K_CA_11_PR",
"TGI_K_CA_12_PR",
                                    "TGI_K_CA_13_PR", "TGI_K_CA_14_PR",
"TGI_K_CA_15_PR",
                                    "TGI_K_CA_16_PR")],
                          na.rm = TRUE)
tgi_scores$CoD <- as.numeric(tgi_scores$CoD)
View(tgi_scores)



# Recode CoD into two categories: natural (0) and unnatural (1)


tgi_scores$CoD_recode <- ifelse(tgi_scores$CoD == 1, 0,   # Natural cause
                        ifelse(tgi_scores$CoD %in% c(3, 4, 5), 1, NA))  # Unnatural cause


# View the rows where CoD == 6
subset(tgi_scores, CoD == 6)
# Manually recode CoD == 6 rows
tgi_scores$CoD_recode[5] <- 0  # For the row that is unnatural
tgi_scores$CoD_recode[10] <- 1  # For the row that is unnatural
tgi_scores$CoD_recode[12] <- 0  # For the row that is natural
tgi_scores$CoD_recode[13] <- 0  # For the row that is natural
tgi_scores$CoD_recode[20] <- 0  # For the row that is natural
tgi_scores$CoD_recode[44] <- 0  # For the row that is natural
tgi_scores$CoD_recode[8] <- 0  # For the row that is natural
##   # Zet CoD om naar een factor
```

```
tgi_scores$CoD <- factor(data_filtered$CoD,
                         levels = c(1, 3, 4, 5, 6),
                         labels = c("Illness",
                                    "Accident",
                                    "Suicide",
                                    "Homicide",
                                    "Other"))



# Check the result
table(tgi_scores$CoD_recode)
head(tgi_scores[, c("CoD", "CoD_recode", "PGD_score_parent", "PGD_score_child")])
View(tgi_scores)
summary(tgi_scores)

## missing data?
sum(is.na(tgi_scores$PGD_score_parent))
sum(is.na(tgi_scores$PGD_score_child))
## explore the dataset
summary(tgi_scores$PGD_score_parent)
summary(tgi_scores$PGD_score_child)



## time for research questions ###
# Load necessary libraries
library(tidyverse)
library(ggplot2)
library(car)
library(lmtest)
```

```
#Ensure CoD_recode is treated as a factor
tgi_scores$CoD_recode <- as.factor(tgi_scores$CoD_recode)
tgi_scores$GenderChild <- as.factor(tgi_scores$GenderChild)
tgi_scores$GenderParent <- as.factor(tgi_scores$GenderParent)

# RQ1: Correlation between PGD scores of parents and children
cor(tgi_scores$PGD_score_parent, tgi_scores$PGD_score_child, use = "complete.obs")

cor_test_result <- cor.test(tgi_scores$PGD_score_parent, tgi_scores$PGD_score_child, use =
"complete.obs")
print(cor_test_result)
library(ggplot2)
ggplot(tgi_scores, aes(x = PGD_score_parent, y = PGD_score_child)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE, color = "blue") +
  labs(title = "Correlation Between PGD Scores of Parents and Children",
       x = "PGD Score of Parent",
       y = "PGD Score of Child")

##### disturbed grief of parent likeliness of pgd symptom in child

     # Create a binary variable for Parent PGD based on DSM-5 cut-off
tgi_scores$Parent_PGD <- ifelse(tgi_scores$PGD_score_parent >= 71, 1, 0)

# B criterion: At least one symptom endorsed with score 4 or 5
B_criterion <- ifelse(tgi_scores$TGI_K_CA_1_ParentReport >= 4 |
tgi_scores$TGI_K_CA_2_PR >= 4, 1, 0)

# C criterion: At least 3 symptoms endorsed with score 4 or 5
```

```
C_criterion_count <- rowSums(tgi_scores[, c("TGI_K_CA_3_PR", "TGI_K_CA_4_PR",
"TGI_K_CA_5_PR",
                                            "TGI_K_CA_6_PR", "TGI_K_CA_7_PR", "TGI_K_CA_8_PR",
                                            "TGI_K_CA_9_PR", "TGI_K_CA_10_PR",
"TGI_K_CA_11_PR")] >= 4)


# D criterion: Symptom endorsed with score 4 or 5
D_criterion <- ifelse(tgi_scores$TGI_K_CA_16_PR >= 4, 1, 0)


# Combine B, C, and D criteria to determine Child_PGD
tgi_scores$Child_PGD <- ifelse(B_criterion == 1 & C_criterion_count >= 3 & D_criterion
== 1, 1, 0)


#likeliness of severity pgd parent influence likelyhood of child to develop pgd
# Simplified logistic regression model with selected predictors
model_simplified <- glm(Child_PGD ~ PGD_score_parent + AgeC + CoD_recode,
                        family = binomial(link = "logit"),
                        data = tgi_scores)
# Summarize the results
summary(model_simplified)


  #### using the cut off score for disturbed grief in parent
tgi_scores$Parent_PGD <- factor(tgi_scores$Parent_PGD, levels = c(0, 1), labels = c("No
PGD", "PGD"))


  # Step 2: Logistic regression model
model_binary <- glm(Child_PGD ~ Parent_PGD + AgeC + CoD_recode,
                    family = binomial(link = "logit"),
                    data = tgi_scores)
  # Summarize the model
```

```
summary(model_binary)


#not including age
# Step 2: Logistic regression model
model_binary <- glm(Child_PGD ~ Parent_PGD + CoD_recode,
                    family = binomial(link = "logit"),
                    data = tgi_scores)
# Summarize the model
summary(model_binary)


### checking the binary model above
# Fit the binary logistic regression model
model_binary <- glm(Child_PGD ~ Parent_PGD + CoD_recode,
                    family = binomial(link = "logit"),
                    data = tgi_scores)


# Fit the null model (only intercept, no predictors)
model_null <- glm(Child_PGD ~ 1,
                  family = binomial(link = "logit"),
                  data = tgi_scores)


# Perform likelihood ratio test to compare the null model and the full model
anova(model_null, model_binary, test = "Chisq")



# RQ2: Linear regression - Child's PGD score predicted by Parent's PGD score, including
covariates
# Center PGD_score_parent for better interpretation
tgi_scores$PGD_score_parent_centered <- scale(tgi_scores$PGD_score_parent, center =
TRUE, scale = FALSE)
```

```
# Linear regression model including everything
model_every <- lm(PGD_score_child ~ PGD_score_parent_centered + AgeP + AgeC + GenderChild + KinshipC+ GenderParent+ TSL + CoD_recode, data = tgi_scores)
summary(model_every)


model_1 <- lm(PGD_score_child ~ PGD_score_parent_centered, data = tgi_scores)
summary(model_1)


model_2 <- lm(PGD_score_child ~ PGD_score_parent_centered + AgeC + TSL, data = tgi_scores)
summary(model_2)



#visualise
library(ggplot2)


# PGD Score of Parent vs. Child
ggplot(tgi_scores, aes(x = PGD_score_parent_centered, y = PGD_score_child)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE, color = "blue") +
  labs(title = "PGD Score of Parent vs. Child",
       x = "Centered PGD Score of Parent",
       y = "PGD Score of Child")


# RQ3: Interaction effect of Cause of Death on the relationship between parent and child PGD scores
model_interaction <- lm(PGD_score_child ~ PGD_score_parent_centered * CoD_recode + AgeP + AgeC + GenderChild + GenderParent + TSL, data = tgi_scores)
summary(model_interaction)
```

```
model_interaction <- lm(PGD_score_child ~ PGD_score_parent_centered * CoD_recode , data = tgi_scores)

summary(model_interaction)



tgi_scores$CoD_recode <- factor(tgi_scores$CoD_recode, levels = c(0, 1), labels = c("Natural", "Unnatural"))

ggplot(tgi_scores, aes(x = PGD_score_parent_centered, y = PGD_score_child, color = CoD_recode)) +
  geom_point() +
  geom_smooth(method = "lm", se = FALSE, aes(group = CoD_recode)) +
  labs(title = "Interaction Between Parent PGD and Cause of Death",
       x = "Parental PGD Score (Centered)",
       y = "Child PGD Score",
       color = "Cause of Death")


# Ensure Child_PGD and Parent_PGD are treated as factors
tgi_scores$Child_PGD <- as.factor(tgi_scores$Child_PGD)
tgi_scores$Parent_PGD <- as.factor(tgi_scores$Parent_PGD)
# interaction using the cut offs
model_interaction2 <- glm(Child_PGD ~ Parent_PGD * CoD_recode,
                          family = binomial(link = "logit"),
                          data = tgi_scores)


summary(model_interaction2)



# Check assumptions of linear regression for the models
```

```
## 1. Linearity: Check residuals vs. fitted values plot
par(mfrow = c(1, 2))  # To display two plots side by side
plot(model, which = 1)  # Residuals vs Fitted
plot(model_interaction, which = 1)  # Residuals vs Fitted

## 2. Normality of residuals: Q-Q plot
plot(model, which = 2)  # Q-Q plot
plot(model_interaction, which = 2)  # Q-Q plot
# Shapiro-Wilk test
shapiro.test(residuals(model))

shapiro.test(residuals(model_interaction))


## 3. Homoscedasticity: Check for constant variance of residuals
# You can use Breusch-Pagan test from lmtest package
bptest(model)  # Breusch-Pagan test for heteroscedasticity
bptest(model_interaction)  # Breusch-Pagan test for interaction model

## 4. Independence of residuals: Durbin-Watson test
durbinWatsonTest(model)  # Check for autocorrelation
durbinWatsonTest(model_interaction)  # Check for autocorrelation

# Visualize the interaction effect of Cause of Death


# Plot with correct grouping
ggplot(tgi_scores, aes(x = PGD_score_parent, y = PGD_score_child, color = CoD_recode)) +
  geom_point() +
```

```
  geom_smooth(method = "lm", aes(group = CoD_recode), se = FALSE) +  # specify group to differentiate lines
  labs(title = "Interaction effect of Cause of Death",
       x = "Parent's PGD Score",
       y = "Child's PGD Score",
       color = "Cause of Death (0 = natural, 1 = unnatural)")

##checking the other models with the cut off scores and not the sums of pgd
# Check for linearity by adding a quadratic term for continuous variables (AgeC here)
tgi_scores$AgeC2 <- tgi_scores$AgeC^2

# Re-run the model with quadratic term
model_linearity <- glm(Child_PGD ~ Parent_PGD + CoD_recode,
                       family = binomial(link = "logit"), data = tgi_scores)

# Check model summary
summary(model_linearity)

# You can also plot the partial residuals to visualize linearity
library(car)
crPlots(model_linearity)
# Check multicollinearity using VIF
library(car)
vif(model_binary)  # Replace 'model_binary' with your actual model name

# Check for influential observations using Cook's distance
cooks_d <- cooks.distance(model_binary)

# Plot Cook's distance
```

```
plot(cooks_d, type = "h", main = "Cook's Distance", ylab = "Cook's Distance")
abline(h = 4 / length(cooks_d), col = "red")  # Threshold line at 4/n

# Identify influential points
influential_points <- which(cooks_d > (4 / length(cooks_d)))
influential_points

# Check for overdispersion
residual_deviance <- deviance(model_binary)
df_residual <- df.residual(model_binary)
overdispersion <- residual_deviance / df_residual

overdispersion  # If this value is > 1.5 or 2, it indicates overdispersion

### sample characteristics ###
# Gender distribution
gender_counts <- table(tgi_scores$GenderChild)   ## the child
gender_proportions <- prop.table(gender_counts)
gender_summary <- data.frame(
  Gender_Level = names(gender_counts),
  Number_of_Participants = as.numeric(gender_counts),
  Proportion_of_Participants = as.numeric(gender_proportions)
)
print("Gender Summary:")
print(gender_summary)

gender_counts <- table(tgi_scores$GenderParent)  # the parents
gender_proportions <- prop.table(gender_counts)
gender_summary <- data.frame(
```

```
  Gender_Level = names(gender_counts),
  Number_of_Participants = as.numeric(gender_counts),
  Proportion_of_Participants = as.numeric(gender_proportions)
)
print("Gender Summary:")
print(gender_summary)

# Cause of Death distribution
cod_counts <- table(tgi_scores$CoD_recode) ## natural/unnatural
cod_proportions <- prop.table(cod_counts)
cod_summary <- data.frame(
  Cause_of_Death = names(cod_counts),
  Number_of_Participants = as.numeric(cod_counts),
  Proportion_of_Participants = as.numeric(cod_proportions)
)
print("Cause of Death Summary:")
print(cod_summary)

cod_counts <- table(tgi_scores$CoD) ## cod but not recoded
cod_proportions <- prop.table(cod_counts)
cod_summary <- data.frame(
  Cause_of_Death = names(cod_counts),
  Number_of_Participants = as.numeric(cod_counts),
  Proportion_of_Participants = as.numeric(cod_proportions)
)
print("Cause of Death Summary:")
print(cod_summary)

# Age summary (AgeP and AgeC)
```

```
# Calculate summary statistics for AgeP, excluding missing values
age_summary <- data.frame(
  Mean_AgeP = mean(tgi_scores$AgeP, na.rm = TRUE),
  SD_AgeP = sd(tgi_scores$AgeP, na.rm = TRUE)
)

# Print the summary statistics
print(age_summary)

ageC_summary <- data.frame(
  Mean_AgeC = mean(tgi_scores$AgeC, na.rm = TRUE),
  SD_AgeC = sd(tgi_scores$AgeC, na.rm = TRUE)
)

# Print the summary statistics for AgeC
print(ageC_summary)

# Kinship summary (KinshipP and KinshipC)
kinshipP_summary <- table(tgi_scores$KinshipP)
kinshipP_proportions <- prop.table(kinshipP_summary)
print(kinshipP_summary)



# Get the summary for KinshipC
kinshipC_summary <- table(tgi_scores$KinshipC)
kinshipC_proportions <- prop.table(kinshipC_summary)

# Create a summary table for KinshipC
```

```
kinshipC_summary_df <- data.frame(
  KinshipC_Level = names(kinshipC_summary),
  Number_of_ParticipantsC = as.numeric(kinshipC_summary),
  Proportion_of_ParticipantsC = as.numeric(kinshipC_proportions)
)
print(kinshipC_summary_df)



# PGD scores summary
pgd_summary <- data.frame(
  Mean_PGD_Score_Parent = mean(tgi_scores$PGD_score_parent, na.rm = TRUE),
  SD_PGD_Score_Parent = sd(tgi_scores$PGD_score_parent, na.rm = TRUE),
  Mean_PGD_Score_Child = mean(tgi_scores$PGD_score_child, na.rm = TRUE),
  SD_PGD_Score_Child = sd(tgi_scores$PGD_score_child, na.rm = TRUE)
)
print(pgd_summary)

#PGD children and parents yes or no
#  PGD Parent
pgd_parent_counts <- table(tgi_scores$Parent_PGD)
pgd_parent_proportions <- prop.table(pgd_parent_counts)



pgd_parent_summary <- data.frame(
  PGD_Status = names(pgd_parent_counts),
  Number_of_Parents = as.numeric(pgd_parent_counts),
  Proportion_of_Parents = as.numeric(pgd_parent_proportions)
)
```

```
#  PGD of Child
pgd_child_counts <- table(tgi_scores$Child_PGD)
pgd_child_proportions <- prop.table(pgd_child_counts)

pgd_child_summary <- data.frame(
  PGD_Status = names(pgd_child_counts),
  Number_of_Children = as.numeric(pgd_child_counts),
  Proportion_of_Children = as.numeric(pgd_child_proportions)
)
# Print summaries
print(pgd_parent_summary)
print(pgd_child_summary)




# TSL in months summary
tsl_summary <- data.frame(
  Mean_TSL = mean(tgi_scores$TSL, na.rm = TRUE),
  SD_TSL = sd(tgi_scores$TSL, na.rm = TRUE)
)
print(tsl_summary)



## checking tgi reliability
install.packages("psych")
library(psych)
```

```
# parent TGI scores (TGI_1 to TGI_22)
parent_TGI_items <- tgi_scores[, 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")]

# Calculate Cronbach's alpha for the parent TGI scores
parent_alpha <- alpha(parent_TGI_items, na.rm = TRUE)

# Print the results for the parent TGI scores
print("Parent TGI Alpha:")
print(parent_alpha)

# child TGI scores (TGI_K_CA_1_ParentReport to TGI_K_CA_16_PR)
child_TGI_items <- tgi_scores[, c("TGI_K_CA_1_ParentReport", "TGI_K_CA_2_PR",
"TGI_K_CA_3_PR",
                                  "TGI_K_CA_4_PR", "TGI_K_CA_5_PR", "TGI_K_CA_6_PR",
                                  "TGI_K_CA_7_PR", "TGI_K_CA_8_PR", "TGI_K_CA_9_PR",
                                  "TGI_K_CA_10_PR", "TGI_K_CA_11_PR", "TGI_K_CA_12_PR",
                                  "TGI_K_CA_13_PR", "TGI_K_CA_14_PR", "TGI_K_CA_15_PR",
                                  "TGI_K_CA_16_PR")]

# Calculate Cronbach's alpha for the child TGI scores
child_alpha <- alpha(child_TGI_items, na.rm = TRUE)

# Print the results for the child TGI scores
```

```
print("Child TGI Alpha:")
print(child_alpha)



## check if parent reports align with childs
tgi_scores$PGD_SCORE_CA <- rowSums(tgi_scores[, c("TGI_K_CA_1", "TGI_K_CA_2",
"TGI_K_CA_3",
                                                  "TGI_K_CA_4", "TGI_K_CA_5", "TGI_K_CA_6",
                                                  "TGI_K_CA_7", "TGI_K_CA_8", "TGI_K_CA_9",
                                                  "TGI_K_CA_10", "TGI_K_CA_11", "TGI_K_CA_12",
                                                  "TGI_K_CA_13", "TGI_K_CA_14", "TGI_K_CA_15",
                                                  "TGI_K_CA_16")],
                           na.rm = TRUE)


## check if theres an association
variables <- tgi_scores[, c("PGD_SCORE_CA", "PGD_score_child", "PGD_score_parent")]
# correlation matrix
correlation_matrix <- cor(variables, use = "pairwise.complete.obs")
# Print the correlation matrix
print(correlation_matrix)


#
library(corrplot)
corrplot(correlation_matrix, method = "number", type = "upper")
#
regression_model_extra <- lm(PGD_SCORE_CA ~ PGD_score_child + PGD_score_parent,
data = tgi_scores)
summary(regression_model_extra)
```