

European Journal of Psychotraumatology

ISSN: 2000-8066 (Online) Journal homepage: www.tandfonline.com/journals/zept20

Latent trajectories of DSM-5-TR-based Prolonged Grief Disorder: findings from a data pooling project MARBLES

Justina Pociunaite, Iris van Dijk, Lyanne Reitsma, Erik Edwin Leonard Nordström, Paul A. Boelen & Lonneke I. M. Lenferink

To cite this article: Justina Pociunaite, Iris van Dijk, Lyanne Reitsma, Erik Edwin Leonard Nordström, Paul A. Boelen & Lonneke I. M. Lenferink (2023) Latent trajectories of DSM-5-TR-based Prolonged Grief Disorder: findings from a data pooling project MARBLES, European Journal of Psychotraumatology, 14:2, 2281183, DOI: 10.1080/20008066.2023.2281183

To link to this article: https://doi.org/10.1080/20008066.2023.2281183

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group

View supplementary material

Published online: 27 Nov 2023.

Submit your article to this journal

Article views: 2356

View related articles

View Crossmark data

Citing articles: 20 View citing articles

Full Terms & Conditions of access and use can be found at
https://www.tandfonline.com/action/journalInformation?journalCode=zept20

EUROPEAN JOURNAL OF PSYCHOTRAUMATOLOGY
2023, VOL. 14, NO. 2, 2281183
https://doi.org/10.1080/20008066.2023.2281183

EUROPEAN JOURNAL OF PSYCHO-TRAUMATOLOGY
THE OFFICIAL JOURNAL OF THE EUROPEAN SOCIETY FOR TRAUMATIC STRESS STUDIES

Taylor & Francis
Taylor & Francis Group

BASIC RESEARCH ARTICLE

OPEN ACCESS Check for updates

Latent trajectories of DSM-5-TR-based Prolonged Grief Disorder: findings from a data pooling project MARBLES

Justina Pociunaite[a], Iris van Dijk[b], Lyanne Reitsma[b], Erik Edwin Leonard Nordström [c,d], Paul A. Boelen[b,e] and Lonneke I. M. Lenferink[b,f,g]

[a]Department of Developmental Psychology, Ulm University, Ulm, Germany; [b]Department of Clinical Psychology, Faculty of Social Sciences, Utrecht University, Utrecht, the Netherlands; [c]Center for Crisis Psychology, University of Bergen, Bergen, Norway; [d]Helse Fonna Local Health Authority, Haugesund, Norway; [e]ARQ Centrum'45, Diemen, the Netherlands; [f]Department of Clinical Psychology and Experimental Psychopathology, Faculty of Behavioral and Social Sciences, University of Groningen, Groningen, the Netherlands; [g]Department of Psychology, Health, & Technology, Faculty of Behavioural, Management, and Social Sciences, University of Twente, Enschede, the Netherlands

ABSTRACT

Background: With the release of the text revision of the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5-TR), criteria for Prolonged Grief Disorder (PGD) were included. This necessitates studying grief trajectories based on these criteria.

Objective: This is the first study examining latent trajectories of DSM-5-TR-based PGD symptom levels and testing whether specific risk factors (e.g. cause of death) predicted PGD trajectories.

Method: We evaluated latent DSM-5-TR PGD trajectories using pooled existing data collected at 6–12, 13–24, and 25–60 months post-loss in Danish and Dutch bereaved adults ($N = 398$). Latent Growth Mixture Modelling (LGMM) was employed to determine the trajectories. Multinomial logistic regression analyses were used to examine which risk factors predicted class membership.

Results: The four-class LGMM solution with a quadratic term was best-fitting the data. This solution represented four trajectories: High stable PGD (6%), High PGD quick recovery (10%), High PGD slow recovery (35%), and Low PGD symptoms (49%). Participants with a higher educational level were more likely to be assigned to the Low PGD symptoms trajectory compared to High stable PGD and High PGD slow recovery trajectories. Unnatural causes of death increased the likelihood of being in the High stable PGD and High PGD slow recovery trajectories compared to the Low PGD symptoms trajectory.

Conclusions: Consistent with prior research, the Low PGD symptoms trajectory was the most common. A significant minority experienced high and stable levels of PGD within five years after the loss. About one-third of participants experienced high acute grief levels that decreased slowly; how slow decreasing symptoms relate to an individual's functioning requires further attention. This study demonstrates that a significant minority of bereaved people develop acute PGD symptomatology that does not diminish within five years post-loss, emphasizing the need for early screening for PGD to prevent long-lasting complaints.

Trayectorias latentes del trastorno de duelo prolongado basado en el DSM-5-TR: Hallazgos de un proyecto de agrupación de datos MARBLES

Antecedentes: Con el lanzamiento de la revisión del texto del Manual Diagnóstico y Estadístico de los Trastornos Mentales, 5ª edición (DSM-5-TR), se incluyeron criterios para el Trastorno de Duelo Prolongado (TDP). Esto requiere estudiar las trayectorias del duelo basándose en estos criterios.

Objetivo: Este es el primer estudio que examina las trayectorias latentes de los niveles de síntomas del TDP basados en el DSM-5-TR y prueba si factores de riesgo específicos (p. ej., causa de muerte) predijeron las trayectorias del TDP.

Método: Evaluamos las trayectorias latentes del TDP del DSM-5-TR utilizando datos existentes agrupados recopilados a los 6–12, 13–24, y 25–60 meses después de la pérdida en adultos en duelo daneses y holandeses ($N = 398$). Se empleó el modelo mixto de crecimiento latente (LGMM) para determinar las trayectorias. Se utilizaron análisis de regresión logística multinomial para examinar qué factores de riesgo predecían la pertenencia a una clase.

Resultados: La solución del LGMM de cuatro clases con un término cuadrático fue la que mejor se ajustó a los datos. Esta solución representó cuatro trayectorias: TDP alto y estable (6%),

ARTICLE HISTORY
Received 7 June 2023
Revised 29 September 2023
Accepted 25 October 2023

KEYWORDS
Prolonged Grief Disorder; trajectories; latent growth mixture modelling; data pooling; individual participant data; DSM-5-TR

PALABRAS CLAVE
Trastorno de duelo prolongado; trayectorias; modelos mixtos de crecimiento latente; agrupación de datos; datos de participantes individuales; DSM-5-TR

关键词
延长哀伤障碍; 轨迹; 潜在生长混合模型; 数据池; 个人参与者数据; DSM-5-TR

HIGHLIGHTS

- This is the first latent trajectory study based on DSM-5-TR Prolonged Grief Disorder (PGD) criteria. Data were analysed using latent growth mixture modelling.
- Stable high (6%), quick recovery (10%), slow recovery (35%), low symptoms (49%) PGD trajectories arose.
- Early screening and treatment of PGD seems warranted.

CONTACT Lonneke I. M. Lenferink l.i.m.lenferink@utwente.nl Department of Clinical Psychology, Faculty of Social Sciences, Utrecht University, P.O. Box 80140, Utrecht 3508 TC, the Netherlands; Department of Clinical Psychology and Experimental Psychopathology, Faculty of Behavioral and Social Sciences, University of Groningen, Grote Kruisstraat 2/1, Groningen 9712 TS, the Netherlands; Department of Psychology, Health, & Technology, Faculty of Behavioural, Management, and Social Sciences, University of Twente, Drienerlolaan 5, Enschede 7522 NB, Netherlands

Supplemental data for this article can be accessed online at https://doi.org/10.1080/20008066.2023.2281183.

© 2023 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group
This is an Open Access article distributed under the terms of the Creative Commons Attribution-NonCommercial License (http://creativecommons.org/licenses/by-nc/4.0/), which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited. The terms on which this article has been published allow the posting of the Accepted Manuscript in a repository by the author(s) or with their consent.

recuperación rápida del TDP alto (10%), recuperación lenta del TDP alto (35%), y síntomas de TDP bajos (49%). Los participantes con un nivel educativo más alto tenían más probabilidades de ser asignados a la trayectoria de síntomas bajos del TDP en comparación con las trayectorias del TDP alto estable y de recuperación lenta del TDP alto. Las causas no naturales de muerte aumentaron la probabilidad de estar en las trayectorias del TDP alto estable, y de recuperación lenta del TDP alto, en comparación con la trayectoria de síntomas bajos del TDP.
Conclusiones: De acuerdo con investigaciones anteriores, la trayectoria de síntomas bajos del TDP fue la más común. Una minoría significativa experimentó niveles altos y estables del TDP dentro de los cinco años posteriores a la pérdida. Alrededor de un tercio de los participantes experimentaron niveles elevados de duelo agudo que disminuyeron lentamente; la forma en que los síntomas de disminución lenta se relacionan con el funcionamiento de un individuo requiere mayor atención. Este estudio demuestra que una minoría significativa de las personas en duelo desarrolla una sintomatología aguda del TDP que no disminuye dentro de los cinco años posteriores a la pérdida, lo que enfatiza la necesidad de realizar una detección temprana del TDP para prevenir molestias duraderas.

基于 DSM-5-TR 的延长哀伤障碍的潜在轨迹：来自MARBLES 数据池项目的发现

背景：随着《精神障碍诊断和统计手册》第五版 (DSM-5-TR) 文本修订版的发布，纳入了延长哀伤障碍 (PGD) 的标准。这就需要根据这些标准来研究哀伤轨迹。
目的：这是第一项研究基于 DSM-5-TR 的 PGD 症状水平的潜在轨迹，并检验特定风险因素（例如死亡原因）是否可以预测 PGD 轨迹。
方法：我们使用在丹麦和荷兰丧亲的成年人 ($N = 398$) 丧亲后 6–12、13–24 和 25–60个月收集的现有数据来评估潜在的 DSM-5-TR PGD 轨迹。采用潜在生长混合模型（LGMM）来确定轨迹。使用多项逻辑回归分析来检查哪些风险因素可以预测班级成员资格。
结果：带有二次项的四类 LGMM 解最适合数据。该解决方案代表了四种轨迹：高稳定 PGD (6%)、高 PGD 快速恢复 (10%)、高 PGD 缓慢恢复 (35%) 和低 PGD 症状 (49%)。与高稳定 PGD 和高 PGD 缓慢恢复轨迹相比，教育水平较高的参与者更有可能被分配到低 PGD 症状轨迹。与低 PGD 症状轨迹相比，非自然原因死亡增加了处于高稳定 PGD 和高 PGD 缓慢恢复轨迹的可能性。
结论：与之前的研究一致，低 PGD 症状轨迹是最常见的。 相当少数人在丧亲后的五年内经历了高水平且稳定的 PGD。大约三分之一的参与者经历了较高的急性哀伤水平，但随后缓慢下降；症状缓慢减轻与个人功能的关系需要进一步关注。这项研究表明，相当一部分丧亲者会出现急性 PGD 症状，且这种症状在丧亲后五年内不会减轻，这强调了早期筛查 PGD 的必要性，以防止延长疾病。

Even though the loss of a loved one is one of the most common distressing experiences in life (e.g. Stroebe et al., 2007), there has been remarkably little research on how grief develops over time. Research has proposed that most people naturally adapt to stressful life changes following a loss. However, a significant minority of about 10% after a natural loss (Lundorff et al., 2017) and 50% after an unnatural loss (Djelantik et al., 2020) develops long-lasting and disabling grief reactions that interfere with daily functioning. In the past three decades, a substantial amount of grief research has been conducted, which has contributed to the inclusion of a Prolonged Grief Disorder (PGD) in the text revision of the 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5-TR; American Psychiatric Association, 2022). In the DSM-5-TR, the core symptoms of PGD are intense yearning and longing for the deceased and preoccupations with thoughts and memories of the deceased. In addition, DSM-5-TR PGD symptoms include avoidance of reminders of the death, identity disruption, disbelief about the death, intense emotional pain, difficulties moving on, emotional numbness, loneliness, and a sense of meaninglessness. These PGD symptoms should also cause functional impairment in daily life and exceed individual and cultural context norms of the bereaved. A final PGD criterion is that the loss should have occurred at least twelve months earlier (six months in children). Furthermore, PGD (i.e. same name but different symptom content (Eisma et al., 2022; Haneveld et al., 2022)) was also included in the 11th revision of the International Classification of Diseases (ICD-11; World Health Organization, 2018). Throughout this article, we use 'PGD' as an umbrella term for disturbed grief reactions, whereas 'DSM-5-TR PGD' refers to PGD criteria as defined in DSM-5-TR.

To date, research has predominantly examined average grief levels or prevalence rates of PGD, but this does not capture how grief develops over time. One way to examine the course of grief reactions and identify differences in grief patterns is through latent trajectory studies. Latent trajectory studies extend PGD research beyond the dichotomous categorization of PGD-presence or absence, and beyond the averaging of PGD symptoms at any point post-loss.

Prior latent trajectory studies found slightly different yet overlapping PGD trajectories. Most studies have found three PGD trajectories (Bonanno & Malgaroli, 2020; Djelantik et al., 2022; Kristensen et al., 2020; Sveen et al., 2018). However, one study found two (Lenferink et al., 2020), and other studies found four (Lundorff et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020) or even five trajectories (Bonanno & Malgaroli, 2020; Nielsen et al., 2019). Table 1 gives an overview of prior studies examining trajectories of PGD. Differences in the number of trajectories emerging in these studies might be explained by the differences across the studies in terms of: (1) criteria used to define disturbed grief reactions (e.g. DSM-5 Persistent Complex Bereavement Disorder (PCBD) vs. ICD-11 PGD), (2) measures used to assess these reactions (e.g. Inventory of Complicated Grief, The Prolonged Grief-13 questionnaire, Traumatic Grief Inventory – Self Report), (3) the number of time points (e.g. three vs. four), (4) time since loss at specific time points (varying from, e.g. 14 months to 6 years, 2–11 months), (5) analytic approach (latent class growth analysis vs. latent growth mixture model), (6) sample size (ranging from 129 to 1735 participants), and (7) characteristics of the study sample in terms of who died and the circumstances of the loss (e.g. people who lost loved ones due to the Indian Ocean tsunami or Utøya terror attacks).

Despite these differences, some findings were similar across prior PGD latent trajectory studies (that is, those performed by Bonanno & Malgaroli, 2020; Djelantik et al., 2022; Kristensen et al., 2020; Lundorff et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020; Sveen et al., 2018). A significant minority experienced a stable and continuous high PGD trajectory (i.e. 7–25% of individuals). Another trajectory was characterized by high PGD symptoms that decreased over time (i.e. 18–48%). Finally, the largest group that was found in all of the aforementioned studies is characterized by a low PGD symptoms trajectory (i.e. 34–71%).

In addition to examining differences in the course of PGD levels, previous latent trajectory studies on PGD have also shed light on factors related to subgroups of people displaying different PGD trajectories. For instance, some found that females, younger people, people with a lower educational level, those who lost a partner or child, and/or those who lost a loved one due to an unnatural death (e.g. accident, homicide, suicide) are at greater risk of showing more severe PGD symptoms over time (Kristensen et al., 2020; Lenferink et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020; Sveen et al., 2018). These characteristics are frequently considered risk factors for PGD (Burke & Neimeyer, 2013).

While prior latent trajectory studies show that differences exist in the course of PGD symptoms, the comparability in findings is limited due to the differences in methodology across the studies. Consequently, more research is needed. In the current study, we expand prior knowledge by using data from a data-pooling project based on existing data from multiple longitudinal studies. This enabled us to include a relatively large sample and, thus, to employ Latent Growth Mixture Model (LGMM). LGMM is a flexible procedure to extract latent homogeneous trajectories in a larger heterogeneous sample (van de Schoot et al., 2017). This procedure is more advantageous than latent class growth modelling because of its ability to consider differences between individuals within each trajectory (Infurna & Luthar, 2016). Moreover, this is, to our knowledge, the first latent trajectory study to investigate PGD trajectories relying on PGD symptoms as defined by the DSM-5-TR criteria. Accordingly, our first aim was to identify trajectories of symptom levels of DSM-5-TR-based PGD in a relatively large heterogeneous sample of bereaved adults while using LGMM. Based on prior research (referred to in Table 1), we expected to find at least three trajectories: one stable high PGD (continuously above cut-off score for PGD), one recovery (starting above cut-off score but decreasing to below cut-off score), and a third stable low (continuously below cut-off score) trajectory.

Our second aim was to identify risk factors associated with the different trajectories. Based on prior studies (e.g. Lundorff et al., 2020; Nielsen et al., 2019), we expected that being female, being younger in age, having a lower educational level, having a closer relationship to the deceased (i.e. experiencing the loss of a partner or child), and encountering an unnatural loss, increased the likelihood of belonging to trajectories that experienced more severe PGD.

1. Method

1.1. Participants and procedures

We used data from the data-archive of the Measurement Archive of Reactions to Bereavement from Longitudinal European Studies (MARBLES) project. The MARBLES project is an ongoing initiative from PB and LL, focused on pooling data from observational studies of disordered grief reactions in bereaved people. This data pooling initiative also involves symptoms of bereavement-related PTSD and depression, coping styles, and sociodemographic and loss-related characteristics. The project was approved by the ethics board of the Faculty of Social Sciences of Utrecht University (FERB19-218).

For the purpose of the current study, we selected data that were collected within the following time frames after loss: 6–12 months post-loss in Wave 1 (W1), 13–24 months post-loss in Wave 2 (W2), and

Table 1. Overview of latent grief trajectory studies.

Study name	Sample	Time since loss	Grief measures	Analyses	Results: trajectories
Bonanno & Malgaroli (2020)	282 participants younger than 65 years, bereaved by a spouse loss.	T1 = 3 months post-loss; T2 = 14 months post-loss; T3 = 25 months post-loss.	Structured clinical interviews assessing PCBD according to DSM-5, and PGD according to ICD-11 criteria.	Growth Mixture Modelling	Based on PCBD (DSM-5) criteria: 71% resilience, 24% moderate-improving symptoms, 5% prolonged-stable symptoms classes. Based on PGD (ICD-11) criteria: 58% resilience, 18% moderate-improving, 13% moderate-stable, 7% acute-recovery, and 4% prolonged-worsening.
Djelantik et al. (2022)	259 adults, mostly bereaved by a natural loss (89%).	Up to 11 assessments. Ranging from one to 27 months post-loss.	Inventory of Complicated Grief (ICG).	Latent Growth Mixture Modelling	3 trajectories: chronic trajectory (25.1%); acute recovery trajectory (8.4%); resilient trajectory (66.4%).
Kristensen et al. (2020)	129 bereaved adults (86 parents and 43 siblings) after the 2011 Utøya Island terror attack in Norway.	T1 = 18 months post-loss; T2 = 28 months post-loss; T3 = 40 months post-loss.	Inventory of Complicated Grief (ICG)	Latent Class Growth Analysis	3 trajectories: moderate/decreasing class (22.5%); high/slow decreasing class (64.3%); high/chronic class (13.2%).
Lenferink et al. (2020)	172 Dutch citizens bereaved by 2014 flight MH17 adults who lost one or several close persons, including a spouse, family member, friend, or acquaintance in the plane crash.	T1 = 10–17 months post-loss; T2 = 21–28 months post-loss; T3 = 30–34 months post-loss; T4 = 41–43 months post-loss.	Traumatic Grief Inventory-Self Report (TGI-SR)	Latent Class Growth Modelling	Two PCBD classes emerged: mild (81.8%) and chronic (18.2%) PCBD.
Lundorff et al. (2020)	857 adult participants bereaved by a spouse loss.	T1 = 2 months post-loss; T2 = 6 months post-loss; T3 = 11 months post-loss.	The Prolonged Grief-13 and Inventory of Complicated Grief	Growth Mixture Modelling	Four PGD trajectories: resilient (low symptoms) (64.4%), moderate-stable (moderate symptoms) (20.4%), recovery (elevated symptoms decreasing over time) (8.4%), and prolonged grief (continuous elevated symptoms) (6.8%). Trajectories influenced by gender.
Nielsen et al. (2019)	1735 Danish participants who experienced the loss due to a terminal illness. 1138 partners and 597 non-partners of terminally ill patients.	T0 = 0–6 months pre-loss (baseline); T1 = 6 months post-loss; T2 = 3 years post-loss.	The Prolonged Grief-13	A semi-parametric group-based trajectory model	Five specific grief trajectories for partners and four for non-partners. Low grief was identified in 34% of partners and 45% of non-partners, moderate/decreasing grief in 30% of partners and 31% of non-partners, high/decreasing grief in 20% of partners and 16% of non-partners, and high grief in 7% of partners and 8% of non-partners. In addition, a late grief trajectory was identified in 10% of partners.
Smith & Ehlers (2020)	275 bereaved adults (no specific type of loss criteria)	T1 = on average 2.94 months post-loss; T2 = 6–16 months post-loss; T3 = 12–21 months post-loss.	The Prolonged Grief Inventory (PG-13)	Latent Growth Mixture Modelling	In total, 4 classes were identified. 3 were high grief classes: Stable 8.36%, low adaptation 37.82%, and high adaptation 13.09%. The remaining 40.73% were in low grief class.
Sveen et al. (2018)	170 Swedish citizens post 2004 tsunami in the Indian Ocean. Participants lost one or more close persons, including children, partner, parents, siblings, grandparents, parent-in-law and other relatives.	T1 = 14 months post-loss; T2 = approx. 3 years post-loss; T3 = approx. 6 years post-loss.	Inventory of Complicated Grief (ICG)	Latent Growth Mixture Modelling	Three trajectories were identified: resilient (41% of the sample), recovering (48%), and chronic (11%).

Notes: T1 = time since loss at the first measurement point; T2 = time since loss at the second measurement point; T3 = time since loss at the third measurement point; PGD = Prolonged Grief Disorder; PCBD = Persistent Complex Bereavement Disorder.

25–60 months post-loss in Wave 3 (W3). These data were originally collected in three research projects. First, a study led by Boelen (e.g. Boelen et al., 2015) included a heterogeneous sample and consisted of paper-and-pencil questionnaires handed out by professional and lay mental health care workers. Second,

a study by Lenferink (e.g. Lenferink et al., 2020) focused on traumatically bereaved individuals and investigated consequences of losses due to the MH17 plane disaster; the data were collected using online surveys unless participants preferred a paper-and-pencil survey. Third, in a study led by O'Connor (e.g. O'Connor et al., 2015) included elderly spousally bereaved participants who were contacted via the Danish Central Person Register shortly after their spouse died and subsequently received the paper-and-pencil questionnaires via mail. The inclusion criteria for the current study were the completion of PGD measures and participation in at least two waves. The data are time-unstructured and include within-wave variability. Participants completed measures on average at 7.92 (SD = 2.20) months post-loss at W1, 18.44 (SD = 2.02) months post-loss at W2, and 40.66 (SD = 9.13) months post-loss at W3. The total sample consisted of 398 participants. See Table 2 for the participant characteristics and PGD symptom-levels at W1. The age of the participants ranged from 19 to 88 (M = 61.44, SD = 15.36) years. Most participants were female (64.2%). Around two-third of the participants lost their partner, mostly due to a natural cause (60.7%). Supplementary material A presents the participant characteristics for each of the three samples: Dataset 1: Boelen ($n = 84$); Dataset 2: Lenferink ($n = 111$); Dataset 3: O'Connor ($n = 203$).

1.2. Measures

1.2.1. DSM-5-TR PGD symptoms

In the Boelen dataset, DSM-5-TR PGD symptoms were assessed using the Inventory of Complicated Grief – Revised (ICG-R; Boelen et al., 2003). In the Lenferink dataset, symptoms were measured using the Traumatic Grief Inventory – Self Report (TGI-SR; Boelen et al., 2019). In the O'Connor dataset, symptoms were assessed with the Inventory of Complicated Grief (ICG; Prigerson et al., 1995). All three measures similarly instructed respondents to rate the frequency of symptoms of PGD and other putative markers of disturbed grief on five-point scales with anchors *never* (1), *rarely* (2), *sometimes* (3), *often* (4), and *always* (5) in the ICG-R and TGI-SR. Similar five-point scales with slightly differently worded anchors were used in the ICG. See Table 3 for the item mapping used in the current study for PGD DSM-5-TR symptoms with items from the ICG-R, TGI-SR, and ICG. Total PGD levels were calculated by summing the item scores for the 10 PGD symptoms; these total scores ranged from 10 to 50. Following prior research (Lenferink et al., 2022), the cut-off score for probable PGD as per DSM-5-TR was 33. Cronbach's alpha for the PGD DSM-5-TR items were: .88 for W1, .91 for W2, and .93 for W3, indicating high internal consistency.

Table 2. Participant characteristics and baseline symptom-levels of Prolonged Grief Disorder.

Characteristic	Total sample	*N*
Age, *M* (SD)	61.44 (15.36)	394
Gender		394
Male, *N* (%)	141 (35.8)	
Female, *N* (%)	253 (64.2)	
Education		387
<college/university, *N* (%)	229 (57.5)	
≥college/university, *N* (%)	158 (39.7)	
Months since death at W1, *M* (SD)	8.03 (2.35)	398
Deceased [a] is a …		397
Partner, *N* (%)	257 (64.7)	
Child, *N* (%)	47 (11.8)	
Parent, *N* (%)	22 (5.5)	
Other, *N* (%)	71 (17.9)	
Cause of death		323
Unnatural, *N* (%)	127 (39.3)	
Natural, *N* (%)	196 (60.7)	
Symptom-levels, *M* (SD)		
PGD at Wave 1	27.06 (7.67)	375

Notes: PGD = Prolonged Grief Disorder. [a]In the main analyses, this variable is dichotomized into 0 = partner/child vs. 1 = other for the analyses.

1.2.2. Predictors of class membership

The following characteristics of the participants were included as possible predictors of class membership: age of participants (in years), gender (male/female), and educational level (dichotomized into college/university versus other than college/university, see Supplementary material A regarding the education in two different countries). The loss-related characteristics such as cause of death and relationship to the deceased were also included. Following prior research (Djelantik et al., 2020; Doering et al., 2022), cause of death was categorized into natural (e.g. illness) versus unnatural death (e.g. homicide, accident), whereas the relationship to the deceased was categorized into loss of partner/child versus other.

1.3. Statistical analyses

Since the dataset in the current study was derived from a data-archive including studies that use different PGD measures, some PGD measures did not contain an item that matched a certain DSM-5-TR PGD symptom. More specifically, the dataset from Boelen did not assess DSM-5-TR PGD symptom seven and the dataset from O'Connor did not assess DSM-5-TR PGD symptoms six and seven (see Table 3). Therefore, missing data (e.g. item 7), were imputed with the person's mean item score per wave (e.g. mean of items 1–6, 8–10). Prior to imputing the missing data, we checked if less than 50% of the scale items were missing per wave for each person (e.g. van Denderen et al., 2016). If less than 50% of data were missing, the missing data were imputed with the mean score and the scale score computed by summing the total score. In case 50% or more of the items were missing, we considered the PGD sum score missing. These data were assumed to be missing at random (MAR) and were handled

Table 3. Item mapping of PGD-DSM-5-TR symptoms with items from the ICG-R, TGI-SR, and ICG.

	DSM-5-TR PGD symptom	ICG-R	TGI-SR	ICG
1	Intense yearning/longing for the deceased person (B1)	I feel myself longing and yearning for […].	I found myself longing or yearning for the person who died.	I feel myself longing and yearning for […].
2	Preoccupation with thoughts or memories of the deceased person (in children and adolescents, preoccupation may focus on the circumstances of the death) (B2)	I think about […] so much that it can be hard to do the things I normally do.	I had intrusive thoughts or images related to the person who died.	I am preoccupied with thoughts of […]'s death.
3	Identity disruption (e.g. feeling as though part of oneself has died) since the death (C1)	I feel that a part of me died along with the deceased.	It felt as if a part of me has died along with the deceased.	I feel that a part of myself died along with […].
4	Marked sense of disbelief about the death (C2)	I feel disbelief over […]'s death.	It felt unreal that he/she is dead.	I feel disbelief over […]'s death.
5	Avoidance of reminders that the person is dead (in children and adolescents, may be characterized by efforts to avoid reminders) (C3)	I go out of my way to avoid reminders that – is gone.	I avoided places, objects, or thoughts that reminded me that the person I lost has died.	I go out of my way to avoid reminders that […] is gone.
6	Intense emotional pain (e.g. anger, bitterness, sorrow) related to the death (C4)	I am bitter over […]'s death or I can't help feeling angry about […]'s death.	I experienced intense emotional pain, sadness, or pangs of grief or I felt bitterness or anger related to his/her death.	Not assessed
7	Difficulty reintegrating into one's relationships and activities after the death (e.g. problems engaging with friends, pursuing interests, or planning for the future) (C5)	Not assessed	I felt that moving on (e.g. making new friends, pursuing new interests) was difficult for me.	Not assessed
8	Emotional numbness (absence or marked reduction of emotional experience) as a result of the death (C6)	I feel like I have become numb since the death of […].	I felt emotionally numb.	I feel like I have become numb or detached since the death of […].
9	Feeling that life is meaningless as a result of the death (C7)	I feel that life is empty or meaningless without […].	I felt that life is unfulfilling or meaningless without him/her.	I feel that life is empty or meaningless without […].
10	Intense loneliness as a result of the death (C8)	I feel lonely ever since […] died.	I felt alone or detached from other individuals.	I feel lonely since […] died.

Notes: ICG-R = Inventory of Complicated Grief – Revised; TGI-SR = Traumatic Grief Inventory – Self-Report; ICG = Inventory of Complicated Grief.

using the full information maximum-likelihood algorithm. This algorithm was used with the robust maximum likelihood estimator, which is robust to non-normality and non-independence of observations.

LGMM was employed for data-analyses, where the PGD total score was the outcome variable. We followed the Guidelines for Reporting on Latent Trajectory Studies (GRoLTS; van de Schoot et al., 2017) when reporting our analytic steps and results. The data were analysed using Mplus 8.0 (Muthén & Muthén, 2017). To define the model that best fitted the data, we estimated the models in a stepwise manner. Prior to the LGMM, where the random variation around the slope within each class is allowed, we tested whether adding variation in slopes would yield a better model fit compared with fixing the variance to zero within the classes (i.e. Latent Class Growth Model (LCGM)). Regarding the LGMM, we started with the one-class model, after which more classes were added until the best solution was found. Then, additional classes were estimated to ensure the final model indicated the optimal number of classes. Each model had an intercept and a linear change term (i.e. slope). In addition, we tested whether adding a quadratic term improved model fit based on fit indices. While the random slope could vary within each class, the quadratic term variance was fixed to zero, which is a common practice (e.g. Thormar et al., 2016). Otherwise, a complex model with many parameters could lead to model non-convergence. Regarding the potential model convergence issues due to the substantially increased number of parameters, the residual variances were set to be the same across classes. To the best of our knowledge, there is no indication of differences in growth factors variation across classes.

Several fit indices were considered to evaluate model fit. We decided on the best-fitting model based on Akaike Information Criterion (AIC), Bayesian Information Criterion (BIC), and sample-size adjusted Bayesian information criterion (SS-BIC), with lower values indicating a better fit. Moreover, we took entropy R-square values into consideration; values closer to 1.0 indicate a better fit, values between 0.60 and 0.80 indicate moderate to good model fit (Clark & Muthén, 2009). Vuong-Lo-Mendel-Rubin (VLMR-LRt), Lo-Mendel-Rubin likelihood ratio (LMR-LRt), and bootstrap likelihood ratio tests (BLRt) indicated whether the model under consideration had a significantly ($p < .05$) better fit compared with a model with one class less. Further, at least 5% of the sample should be in a class for it to define a meaningful latent entity (Nylund et al., 2007). In addition to statistical indices, we considered other factors in deciding the optimal class solution, namely whether the results are theoretically justified and interpretable.

In order to avoid local solutions (finding maximum or minimum values in one area of the curve rather than the entire curve, also known as missing to distinguish between a global and local maximum

solution), starting values were increased accordingly. The metric of time for the factor loadings was chosen based on the study design: the factors were set at 0 (for wave 1), at 7 (for wave 2), and at 19 (for wave 3). The intervals indicate the centred time stamps between the different measurement times.

Finally, each participant was assigned to a specific class based on the highest posterior probability estimate, that is, the class they are most likely to be a member of. The classification errors (i.e. the possibly uncertain class allocation) depend on the entropy values hence the results of these analyses will be appraised with caution. Class allocations were exported to SPSS Version 28.0 (IBM Corp, 2021) to examine predictors of class membership.[1] We first conducted a series of univariate multinomial logistic regressions for each predictor separately. In a final multivariate model, significant univariate predictors ($p < .05$) were entered simultaneously into one multinomial logistic regression model.

2. Results

2.1. Preliminary analyses

In total, 398 participants completed at least two measurements, of which 375 participated in W1, 346 in W2, and 313 in W3. The mean PGD score was 27.06 (SD = 7.67) at W1, where 21% of the participants scored above the cut-off score of 33. At W2, the mean PGD score was 24.35 (SD = 7.76) with 14% scoring above the cut-off, and 20.97 (SD = 8.05) of which 6% were above the cut-off at W3. The PGD scores at different measurement points (waves) correlated significantly and strongly (r between .71 and.77, all ps < .001).

2.2. Fit indices for latent trajectories of PGD

First, we estimated LCGM models, where the slope variance was fixed to zero. Adding the quadratic term (the faster change pace) improved the model-fit based on all AIC and SS-BIC values. See Supplementary material B for the detailed model fit indices of the LCGM. Next, we tested whether adding random slope variation would improve the model, that is, using LGMM. In fact, using LGMM with the quadratic slope seemed to yield the best fitting model based on improvement in all SS-BIC values. LGMM without the quadratic term appeared not to be a good model for the current data due to its non-convergence with four or more classes. LGMM with quadratic terms were therefore retained as optimal models.

For the LGMM with the quadratic term, the starting values were increased to 3000 sets of random values and 500 final optimizations to avoid a local maxima convergence due to the model complexity. See Table 4 for the fit indices for the one- to six-class LGMM. A four-class solution had the best model fit based on the lowest BIC value. Significant VLMR-Lrt and LMR-Lrt values indicated that the four-class model had a significantly better fit than the model with three classes. Moreover, each class of the four-class model comprised of at least 5% of the sample. While the five-class solution had lower AIC and SS-BIC values than the four-class model, one of the classes consisted of only two participants and the VLMR- and LMR-Lrts were also not significant, indicating that the five-class model did not have a better fit than the four-class model. The entropy value for the four-class solution was moderate to high, denoting acceptable class fit. The four-class LGMM with quadratic slopes was therefore retained. Posterior probabilities ranged from 0.794 to 0.856.

2.3. Characterization of latent PGD trajectories

Figure 1 displays the four-class model for PGD. Supplementary material C displays the plots for the other class solutions, and Supplementary material D illustrates the observed individuals' trajectories in relation to the estimated class trajectory. The largest class included 49% ($n = 194$) of all participants. This class had a relatively low intercept ($b = 22.16$, SE = 0.88, $p < .001$), with a significant linear decrease in PGD symptoms ($b = -0.22$, SE = 0.11, $p = .046$), but the quadratic slope was not significant ($b = -0.01$, SE = 0.01, $p = .275$). The trajectory remained below the PGD threshold, and was named the *Low PGD symptoms* trajectory.

Table 4. Fit statistics for unconditional model of DSM-5-TR PGD symptom trajectories based on LGMM with quadratic terms.

Nr. Of Classes	AIC	BIC	SS-BIC	Entropy	*p* value VLMR-LRt	*p* value LMR-LRt	*p* value B-LRt	Sample size per class
1	6633.292	6669.170	6640.613					
2	6607.467	6659.291	6618.041	0.634	.060	.066	.000	291/107
3	6588.291	6656.060	6602.119	0.726	.036	.040	–[b]	233/140/25
4	6569.161	6652.877	6586.243	0.702	.027	.031	–[b]	194/141/39/25
5	6562.165	6661.827	6582.501	0.739	.116	.127	–[b]	192/139/41/24/2
6[a]	6553.764	6669.371	6577.353	0.766	.484	.494	.615	164/136/60/28/8/3

Notes: [a]The model did not converge. [b]Using the full information maximum-likelihood algorithm rendered the bootstrap likelihood ratio test uninterpretable (e.g. BLRt = 1.000). Considering that any one model fit criterion is not sufficient to determine the most optimal solution and that the combination of all fit indices is important, we considered this as a non-detrimental issue and based the model choice on other indications. AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; B-LRt bootstrap likelihood ratio test; DSM-5-TR = Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition, Text Revision; LGMM = Latent Growth Mixture Model; LMR-LRt = Lo-Mendel-Rubin likelihood ratio test; PGD = Prolonged Grief Disorder; SS-BIC = sample-size adjusted Bayesian information criterion; VLMR-LRt = Vuong-Lo-Mendel-Rubin likelihood ratio test.

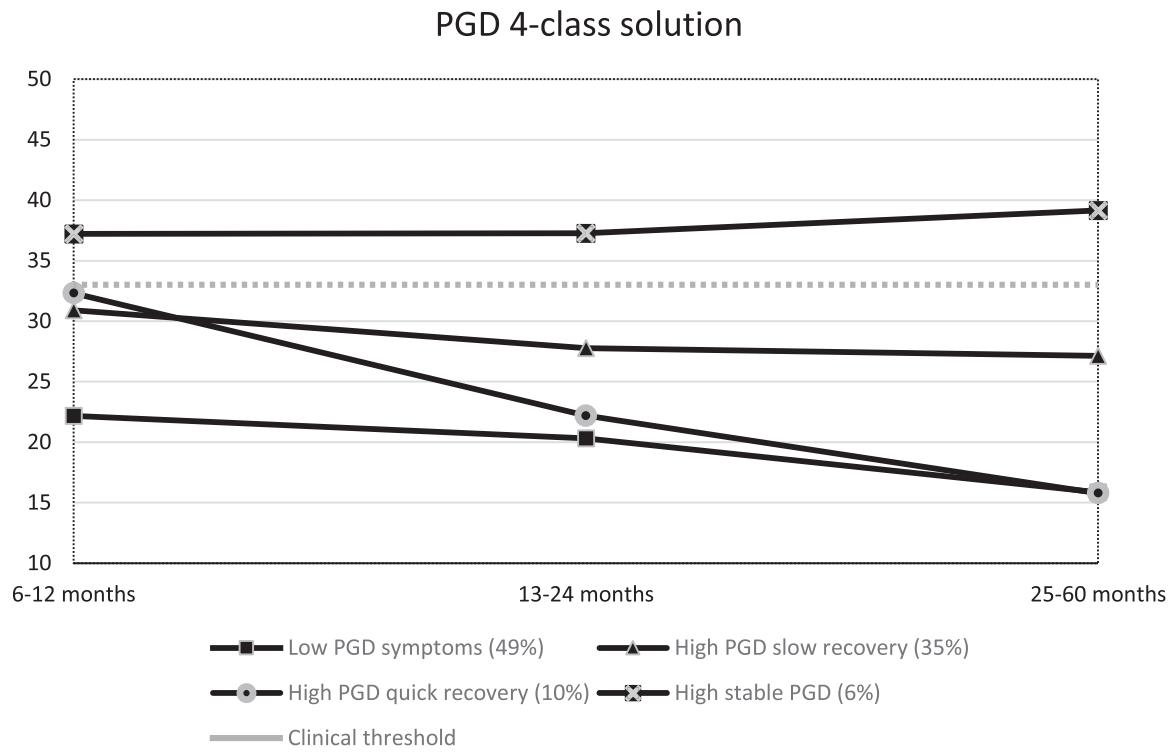


Figure 1. Four-class linear quadratic model for PGD symptoms.
Note: The graph depicts estimated means and trajectories of each class, in comparison to the clinical threshold of 33.

The second largest class included 35% of participants ($n = 141$), where the intercept was slightly below the cut-off for PGD: $b = 30.91$, SE = 0.84, $p < .001$. Both linear and quadratic slopes were significant (linear: $b = -0.60$, SE = 0.12, $p < .001$; quadratic: $b = 0.02$, SE = 0.01, $p < .001$). Over time the PGD levels slowly decreased, but stayed close to subthreshold PGD levels, this trajectory was named the *High PGD slow recovery* trajectory.

The third class comprised 10% of the sample ($n = 39$). While the intercept was relatively high ($b = 32.32$, SE = 2.30, $p < .001$), the decrease in PGD levels was large (linear slope = −1.78, SE = 0.30, $p < .001$). This class showed the fastest decrease within one year post-loss, which was also indicated by the significant quadratic slope ($b = 0.05$, SE = 0.02, $p = .002$), the trajectory was named the *High PGD quick recovery* trajectory.

The fourth and the smallest class included 6% of participants ($n = 25$) and was characterized by high initial PGD levels (intercept = 37.21, SE = 1.43, $p < .001$) that did not significantly change over time, neither linearly ($b = -0.05$, SE = 0.25, $p = .849$), nor quadratically ($b = 0.01$, SE = 0.01, $p = .544$). The trajectory was named the *High stable PGD* trajectory.

2.4. Predictors of class membership

Using univariate multinomial logistic regression analyses, we found that compared to the Low PGD symptoms trajectory, people in the High PGD slow recovery trajectory were more likely to be younger, to have experienced unnatural cause of death, and to have had lower education. Similarly, people in High stable PGD trajectory were more likely to have experienced unnatural causes of death and had a lower education level than the Low PGD symptoms trajectory. People in the High stable PGD trajectory also had a lower education level compared with the High PGD quick recovery trajectory. Other class comparisons were non-significant.[2] See Table 5 for detailed depictions of the results.

In the multinomial logistic regression analyses, including participant's age, education, and cause of death (see Table 6), only education and cause of death were significant predictors of class membership. Compared to the Low PGD symptoms trajectory, people in the High stable PGD, High PGD slow recovery, and High PGD quick recovery trajectories were more likely to have a lower education level. Moreover, people who experienced unnatural losses were more likely to be in the High stable PGD and High PGD slow recovery trajectories compared to the Low PGD symptoms trajectory. People in the High stable PGD trajectory were 3.48 times more likely to have experienced unnatural losses than those in the Low PGD symptoms trajectory. People in High PGD slow recovery trajectory were 2.14 times more likely to have experienced unnatural losses compared to the Low PGD symptoms trajectory. Lastly, the likelihood to be in High PGD quick recovery trajectory compared to Low PGD symptoms trajectory was not related to the participant's age, education, or cause of death.

Table 5. Univariate multinomial regression results predicting the trajectory class membership.

	Reference group								
	Low PGD symptoms			High PGD quick recovery			High PGD slow recovery		
Comparison group	B (SE)	*p*	OR [95% CI]	B (SE)	*p*	OR [95% CI]	B (SE)	*p*	OR [95% CI]
High PGD quick recovery									
Age	−0.006 (0.014)	.666	0.994 [0.967, 1.022]						
Gender	0.620 (0.491)	.206	1.860 [0.711, 4.865]						
Education	−0.437 (0.437)	.317	0.646 [0.274, 1.521]						
Kinship	−0.326 (0.475)	.492	0.722 [0.284, 1.831]						
Cause of death	0.320 (0.513)	.534	1.377 [0.503, 3.766]						
High PGD slow recovery									
Age	−0.015 (0.007)	**.038**	0.985 [0.972, 0.999]	−0.009 (0.014)	.539	0.991 [0.964, 1.019]			
Gender	−0.047 (0.224)	.835	0.954 [0.615, 1.481]	−0.667 (0.498)	.180	0.513 [0.193, 1.362]			
Education	−0.870 (0.228)	**<.001**	0.419 [0.268, 0.655]	−0.433 (0.441)	.326	0.648 [0.273, 1.539]			
Kinship	−0.217 (0.257)	.398	0.805 [0.486, 1.332]	0.109 (0.481)	.821	1.115 [0.434, 2.863]			
Cause of death	0.617 (0.247)	**.012**	1.854 [1.144, 3.006]	0.298 (0.515)	.563	1.347 [0.491, 3.692]			
High stable PGD									
Age	−0.023 (0.014)	.091	0.977 [0.951, 1.004]	−0.017 (0.018)	.356	0.983 [0.948, 1.019]	−0.008 (0.014)	.548	0.992 [0.966, 1.019]
Gender	0.692 (0.529)	.191	1.997 [0.707, 5.636]	0.071 (0.691)	.918	1.074 [0.277, 4.163]	0.738 (0.536)	.169	2.092 [0.731, 5.986]
Education	−1.823 (0.503)	**<.001**	0.161 [0.060, 0.433]	−1.386 (0.629)	**.028**	0.250 [0.073, 0.858]	−0.953 (0.507)	.060	0.386 [0.143, 1.041]
Kinship	−0.563 (0.490)	.250	0.570 [0.218, 1.487]	−0.236 (0.636)	.710	0.789 [0.227, 2.748]	−0.345 (0.495)	.486	0.708 [0.268, 1.869]
Cause of death	0.972 (0.482)	**.043**	2.644 [1.029, 6.794]	0.065 (0.660)	.323	1.921 [0.527, 7.004]	0.355 (0.483)	.462	1.426 [0.554, 3.672]

Notes: Gender (1 = female, 0 = male); Education (1 = Higher professional/University, 0 = Other); Kinship (1 = Partner & Child, 0 = Parent & Other); Cause of death (1 = non-natural, 0 = natural). Bold represents significant findings. B = Unstandardized parameter estimate B; CI = confidence interval; OR = odds ratio; SE = standard error for the unstandardized parameter estimate B.

Table 6. Multivariate multinomial regression results predicting the trajectory class membership.

		Reference group Low PGD symptoms			High PGD quick recovery			High PGD slow recovery	
Comparison group	B (SE)	*p*	OR [95% CI]	B (SE)	*p*	OR [95% CI]	B (SE)	*p*	OR [95% CI]
High PGD quick recovery									
Age	−0.010 (0.016)	.532	0.990 [0.959, 1.022]						
Education	−0.188 (0.540)	.728	0.829 [0.287, 2.390]						
Cause of death	0.223 (0.554)	.687	1.250 [0.422, 3.705]						
High PGD slow recovery									
Age	−0.002 (0.008)	.836	0.998 [0.982, 1.015]	0.008 (0.016)	.608	1.008 [0.977, 1.041]			
Education	−1.068 (0.258)	**<.001**	0.344 [0.207, 0.570]	−0.880 (0.541)	.104	0.415 [0.144, 1.199]			
Cause of death	0.762 (0.274)	**.005**	2.142 [1.252, 3.664]	0.539 (0.557)	.334	1.714 [0.575, 5.110]			
High stable PGD									
Age	−0.010 (0.016)	.539	0.990 [0.960, 1.022]	<0.001 (0.021)	.986	1.000 [0.960, 1.043]	−0.008 (0.016)	.606	0.992 [0.962, 1.023]
Education	−2.180 (0.563)	**<.001**	0.113 [0.037, 0.341]	−1.992 (0.736)	**.007**	0.136 [0.032, 0.577]	−1.112 (0.556)	**.046**	0.329 [0.111, 0.978]
Cause of death	1.247 (0.517)	**.016**	3.479 [1.263, 9.581]	1.023 (0.708)	.148	2.783 [0.695, 11.147]	0.485 (0.502)	.334	1.624 [0.607, 4.346]

Notes: Education (1 = Higher professional/University, 0 = Other); Cause of death (1 = non-natural, 0 = natural). Bold represents significant findings. B = Unstandardized parameter estimate B; CI = confidence interval; OR = odds ratio; SE = standard error for the unstandardized parameter estimate B.

3. Discussion

This is, to the best of our knowledge, the first study examining latent trajectories of DSM-5-TR-based PGD symptomatology. Our first aim was to identify trajectories of PGD symptom-levels within the first five years after loss in a sample of 398 bereaved adults using LGMM. Our analyses revealed that a four-class model best represented the data. The classes included a Low PGD symptoms trajectory (49%) characterized by decreasing subthreshold PGD symptoms; a High PGD slow recovery trajectory (35%) characterized by high PGD symptoms which attenuated slowly; a High PGD quick recovery trajectory (10%) with an initial high level of PGD which decreased quickly; and a High stable PGD trajectory (6%) characterized by high and unremitting levels of PGD.

Eight prior studies examined grief trajectories in bereaved people (Bonanno & Malgaroli, 2020; Djelantik et al., 2022; Kristensen et al., 2020; Lenferink et al., 2020; Lundorff et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020; Sveen et al., 2018). These studies found two to five trajectories, with most finding three trajectories. The pattern of grief trajectories in the present study is broadly consistent with these earlier studies. More specifically, we also found that the majority of bereaved showed a Low PGD symptoms trajectory. This finding also accords with a review of trajectory studies examining reactions to potentially traumatic events (PTEs) (Galatzer-Levy et al., 2018). That review showed that about two in three people exposed to PTEs do not show clinically relevant levels of distress.

Notably, we found that a minority of people included in our analyses showed a trajectory of High stable PGD levels. This is also consistent with other latent trajectory studies on grief (Bonanno & Malgaroli, 2020; Kristensen et al., 2020; Lenferink et al., 2020; Lundorff et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020; Sveen et al., 2018). The prevalence of this trajectory (i.e. 6%) is close to PGD DSM-5-TR prevalence rates found in an earlier study in a representative German bereaved sample (3.3%; Rosner et al., 2021). People in the High stable PGD trajectory did not show significant changes within five years after loss, which indicates that, after loss, a minority of bereaved people continue to show high PGD levels and may be in need of support (Maciejewski et al., 2016; Nordström et al., 2022; Stammel et al., 2013). Early screening and treatment seem therefore warranted for this group, because their grief reactions are unlikely to recover naturally (Litz et al., 2014; Reitsma et al., 2023).

The High PGD slow recovery trajectory evidenced lower PGD symptom severity compared to the High stable trajectory. However, this trajectory is also clinically important as PGD symptom levels remained persistent and elevated. We have limited knowledge so far

regarding how this trajectory affects daily functioning. A study with bereaved persons two years after a spousal loss that had subsyndromal depression reported functional impairment and intense grief (Pasternak et al., 1994). It could be that the trajectory that is slightly below the PGD threshold could go undetected, nevertheless, more research is needed in this area.

The High PGD quick recovery trajectory showed severe PGD symptoms within the first year post-loss but the symptoms reduced to low PGD symptoms with the passage of time. In the initial period following loss, it may be difficult to distinguish this grief trajectory from other trajectories. This does seem important, however, since there is a chance that offering treatment to this group is not needed as PGD symptoms will recover naturally over time (Johannsen et al., 2019; Wittouck et al., 2011).

Nielsen et al. (2019) identified a late grief trajectory that showed initial low PGD reactions that increased over time, comprising approximately 10% of the sample. Nielsen et al.'s study is the only latent grief trajectory study that found a delayed onset trajectory. While a delayed onset of PTSD responses has been documented in traumatized samples (Galatzer-Levy et al., 2018), it appears not a common phenomenon in PGD. The fact that we, together with other latent trajectory studies on PGD (Bonanno & Malgaroli, 2020; Djelantik et al., 2022; Kristensen et al., 2020; Lenferink et al., 2020; Lundorff et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020; Sveen et al., 2018), were unable to detect a trajectory characterized by delayed onset of PGD, suggests that PGD has distinct, though somewhat overlapping (Lenferink et al., 2020), trajectories from PTSD regarding the course of symptoms over time. Early screening and treatment of PGD seem warranted because it is probable that PGD develops early on in the grief process and is not delayed.

Our second aim was to identify factors that predicted the likelihood of assignment to specific grief trajectories. We found that lower education increased the chance of a person following High stable PGD and High PGD slow recovery trajectories compared with the Low PGD symptoms trajectory. This aligns with prior research (Lenferink et al., 2020; Nielsen et al., 2019). That relatively lower education was associated with a more problematic grief trajectory may be explained by lower education coinciding with more difficulties to reflect on and integrate the loss into one's life story (Boelen et al., 2006; Lenferink et al., 2018). Moreover, individuals who experienced an unnatural loss (e.g. homicide, accident, suicide) were more likely to be in the High stable PGD or High PGD slow recovery trajectory than the Low PGD symptoms trajectory. This is in line with previous systematic reviews examining correlates of PGD levels as well as prior PGD latent trajectory studies (Heeke et al., 2019; Lenferink et al., 2020; Lobb et al., 2010; Nielsen et al., 2019). Being unable to make sense of an unnatural death or frequently ruminating about the death may be a more salient risk factor of a High stable PGD trajectory than the objective circumstances of the loss (Boelen et al., 2015; Heeke et al., 2019). Future research is warranted to investigate these features in more detail in relation to latent trajectories of PGD.

In the univariate analyses, older individuals were more likely to be in the Low PGD symptoms trajectory compared to the High PGD slow recovery trajectory. This is consistent with earlier latent trajectory studies (Kristensen et al., 2020; Nielsen et al., 2019; Smith & Ehlers, 2020; Sveen et al., 2018). However, age was no longer significantly related to PGD trajectories when accounting for other loss and socio-demographic characteristics (i.e. education and cause of death). In a representative sample of German adults (14–95 years), Doering et al. (2022) found that age was not related to PGD caseness and PGD severity, when other characteristics were taken into consideration (see also Djelantik et al., 2020; Lundorff et al., 2017). In contrast to many other studies, gender and kinship were not related to the different trajectories. Even though gender and kinship might not have a role in predicting the different trajectories of PGD in our study, contrary to prior trajectory studies (Lundorff et al., 2020), this may also be due to an overrepresentation of females and close kinship in the current sample, possibly leading to the increase of Type II error, and impeding the generalizability of results. Finally, the Low PGD symptoms and High PGD quick recovery trajectories were not different regarding any of the examined risk factors.

Several limitations of this study are noteworthy. First, we used harmonization procedures for item mapping of DSM-5-TR PGD symptoms with items from three different questionnaires. The wording between the different questionnaire items slightly deviated, which may result in some items being more accurate representations of the DSM-5-TR PGD criteria than others. For instance, the items reflecting DSM-5-TR PGD criterion B2 ('Preoccupation with thoughts or memories of the deceased person') is phrased slightly different in TGI-SR ('I had intrusive thoughts or images related to the person who died.') compared with the ICG ('I am preoccupied with thoughts of (…)'s death'). It remains to be studied how these differences in wording of items across measures may have affected our results. However, there are indications that different measures assessing grief intensity correlate very strongly (i.e. correlations $\geq .80$) (Lenferink, van Dijk et al., 2023). This suggests that different grief measures have more communalities than differences, however caution is warranted when comparing the results across studies using different grief measures

and different criteria-sets for prolonged grief (see for discussion: Boelen & Lenferink, 2020; Eisma, 2023; Lenferink et al., 2021). It is noteworthy that because of the recency of the new PGD DSM-5-TR criteria, the studies were conducted prior to the release of these criteria. Future studies should use validated measures to assess DSM-5-TR PGD symptoms, such as the Traumatic Grief Inventory – Self-Report Plus (Lenferink et al., 2022) or the Traumatic Grief Inventory – Clinician Administered (Lenferink, Franzen et al., 2023). Second, caution should be applied in generalizing our findings to ICD-11 criteria. Interestingly, Bonanno and Malgaroli (2020) identified three latent DSM-5 PCBD trajectories: resilience, moderate-improving, and prolonged-stable symptoms. However, two additional trajectories emerged when using ICD-11 PGD criteria: prolonged-worsening and acute-recovering symptoms. It would be interesting for future studies to compare latent PGD trajectories using ICD-11 and DSM-5-TR criteria, also considering that DSM-5-TR criteria for PGD differ substantially from PCBD criteria in DSM-5. Third, we could not determine when exactly the changes in PGD symptoms occurred due to variation in time since loss within and between each time point. The variation in time was particularly large in Wave 3, ranging from 25 to 60 months post-loss. However, considering evidence suggesting that grief trajectories become more stable over time (e.g. Sveen et al., 2018), PGD symptoms are possibly less likely to change within this timeframe. Nevertheless, future research should include more frequent assessment of PGD symptoms with restricted time frames in order to obtain a more fine-grained perspective on PGD trajectories. Fourth, although we were able to detect changes in PGD symptoms over time, we do not know to what extent these changes might have been due to effective interventions. Fifth, we were only able to examine a selection of possible predictors of class membership. Other potentially relevant factors (e.g. history of psychological support, negative cognitions, avoidance behaviours) likely play a more important role in predicting class membership.

Notwithstanding the limitations, a notable strength of the study is that this study is the first grief trajectory study based on PGD DSM-5-TR criteria. Additionally, the longitudinal design including three time-points within five years post-loss in a relatively large sample of adults exposed to natural and unnatural loss are an important strength of this study. Especially the inclusion of a relatively early PGD assessment (i.e. 6–12 months post-loss) provides new insights into the development of PGD and identification of people at risk for developing PGD as per DSM-5-TR. Lastly, our sample was heterogeneous, for instance, in terms of type of loss or relationship to the deceased, which enhances the generalizability of the results to a broader population of bereaved people.

4. Conclusion

To conclude, our findings bear possible implications for the assessment and treatment of PGD symptoms. For instance, our findings indicate that, among people with elevated PGD symptoms in the first year of bereavement, a substantial group continues to experience severe symptoms (or only slowly recovers from these symptoms). People in this group may benefit from early treatment interventions. It is also possible that the people who showed initially high PGD levels but a quick recovery symptom pattern may also benefit from such interventions to boost their recovery. It is an important goal for future research to continue investigating which groups of mourners benefit most from preventive care.

Notes

1. Upon request from one reviewer, we also conducted the multinomial regression analyses using the three-step approach (Vermunt, 2010) and its manual implementation, which corrects for classification with known measurement errors (Asparouhov & Muthén, 2014).
2. No meaningful changes in parameter estimates emerged using the three-step model (Vermunt, 2010), except for the participant's age and kinship. First, the predictive power of age did no longer reach the 5% significance threshold in the univariate analyses. Second, a closer relationship to the deceased (partner or child) was related to a higher chance of a person being in a High PGD slow recovery or High stable PGD trajectories than Low symptoms PGD trajectory. The results are presented in Supplementary Material E. Following van de Schoot et al. (2017), we continued with the standard three-step method, analysing the data separately to ease the results' replication and interpretation.

Acknowledgements

We are grateful to the conference committee of the European Grief Conference 2022, who made it possible to host a Paper-in-a-Day workshop, which resulted in this paper. We would also like to thank associate professor Maja O'Connor for sharing the data included in this paper. Fleur Clemens and Bibi Schut supported us in data-management of the MARBLES data-archive.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data that support the findings, as well as the syntax used for analyses of this study, are available on the Open Science Framework: https://osf.io/syhz9/.

ORCID

Erik Edwin Leonard Nordström http://orcid.org/0000-0001-8851-9509

References

American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders (5th ed.) text revision*. American Psychiatric Publishing. https://doi.org/10.1176/appi.books.9780890425787

Asparouhov, T., & Muthén, B. (2014). *Auxiliary variables in mixture modeling: 3-step approaches using Mplus*.

Boelen, P. A., de Keijser, J., & Smid, G. (2015). Cognitive–behavioral variables mediate the impact of violent loss on post-loss psychopathology. *Psychological Trauma: Theory, Research, Practice, and Policy*, *7*(4), 382–390. https://doi.org/10.1037/tra0000018

Boelen, P. A., Djelantik, A. A. A. M. J., de Keijser, J., Lenferink, L. I. M., & Smid, G. E. (2019). Further validation of the Traumatic Grief Inventory-Self Report (TGI-SR): A measure of persistent complex bereavement disorder and prolonged grief disorder. *Death Studies*, *43*(6), 351–364. https://doi.org/10.1080/07481187.2018.1480546

Boelen, P. A., & Lenferink, L. I. M. (2020). Comparison of six proposed diagnostic criteria sets for disturbed grief. *Psychiatry Research*, *285*, Article 112786. https://doi.org/10.1016/j.psychres.2020.112786

Boelen, P. A., Van den Bout, J., De Keijser, J., & Hoijtink, H. (2003). Reliability and validity of the Dutch version of the Inventory of Traumatic Grief (ITG). *Death Studies*, *27*(3), 227–247. https://doi.org/10.1080/07481180302889

Boelen, P. A., van den Hout, M. A., & van den Bout, J. (2006). A cognitive-behavioral conceptualization of complicated grief. *Clinical Psychology: Science and Practice*, *13*(2), 109–128. https://doi.org/10.1111/j.1468-2850.2006.00013.x

Bonanno, G. A., & Malgaroli, M. (2020). Trajectories of grief: Comparing symptoms from the DSM-5 and ICD-11 diagnoses. *Depression and Anxiety*, *37*(1), 17–25. https://doi.org/10.1002/da.22902

Burke, L. A., & Neimeyer, R. A. (2013). Prospective risk factors for complicated grief: A review of the empirical literature. In, M. Stroebe, H. Schut, J. van den Bout (Eds.) *Complicated grief: Scientific foundations for health care professionals* (pp. 145–161). Routledge/Taylor & Francis Group.

Clark, S., & Muthén, B. O. (2009). *Latent class analysis results to variables not included in the analysis*. https://www.semanticscholar.org/paper/Latent-Class-Analysis-Results-to-Variables-not-in-Clark/cce3d5c47c876af83978d4e7490085049af52f41

Djelantik, A. A. A. M. J., Robinaugh, D. J., & Boelen, P. A. (2022). The course of symptoms in the first 27 months following bereavement: A latent trajectory analysis of prolonged grief, posttraumatic stress, and depression. *Psychiatry Research*, *311*, Article 114472. https://doi.org/10.1016/j.psychres.2022.114472

Djelantik, A. A. A. M. J., Smid, G. E., Mroz, A., Kleber, R. J., & Boelen, P. A. (2020). The prevalence of prolonged grief disorder in bereaved individuals following unnatural losses: Systematic review and meta regression analysis. *Journal of Affective Disorders*, *265*, 146–156. https://doi.org/10.1016/j.jad.2020.01.034

Doering, B. K., Barke, A., Vogel, A., Comtesse, H., & Rosner, R. (2022). Predictors of prolonged grief disorder in a German representative population sample: Unexpectedness of bereavement contributes to grief severity and prolonged grief disorder. *Frontiers in Psychiatry*, *13*. https://doi.org/10.3389/fpsyt.2022.853698

Eisma, M. C. (2023). Prolonged grief disorder in ICD-11 and DSM-5-TR: Challenges and controversies. *Australian & New Zealand Journal of Psychiatry*, *57*(7), 944–951. https://doi.org/10.1177/00048674231154206

Eisma, M. C., Janshen, A., & Lenferink, L. I. M. (2022). Content overlap analyses of ICD-11 and DSM-5 prolonged grief disorder and prior criteria-sets. *European Journal of Psychotraumatology*, *13*(1), Article 2011691. https://doi.org/10.1080/20008198.2021.2011691

Galatzer-Levy, I. R., Huang, S. H., & Bonanno, G. A. (2018). Trajectories of resilience and dysfunction following potential trauma: A review and statistical evaluation. *Clinical Psychology Review*, *63*, 41–55. https://doi.org/10.1016/j.cpr.2018.05.008

Haneveld, J., Rosner, R., Vogel, A., Kersting, A., Rief, W., Steil, R., & Comtesse, H. (2022). Same name, same content? Evaluation of DSM-5-TR and ICD-11 prolonged grief criteria. *Journal of Consulting and Clinical Psychology*, *90*(4), 303–313. https://doi.org/10.1037/ccp0000720

Heeke, C., Kampisiou, C., Niemeyer, H., & Knaevelsrud, C. (2019). A systematic review and meta-analysis of correlates of prolonged grief disorder in adults exposed to violent loss. *European Journal of Psychotraumatology*, *10*(1), Article 1583524. https://doi.org/10.1080/20008198.2019.1583524

IBM Corp. (2021). *IBM SPSS statistics for Windows, version 28.0*.

Infurna, F. J., & Luthar, S. S. (2016). Resilience to major life stressors is not as common as thought. *Perspectives on Psychological Science : A Journal of the Association for Psychological Science*, *11*(2), 175–194. https://doi.org/10.1177/1745691615621271

Johannsen, M., Damholdt, M. F., Zachariae, R., Lundorff, M., Farver-Vestergaard, I., & O'Connor, M. (2019). Psychological interventions for grief in adults: A systematic review and meta-analysis of randomized controlled trials. *Journal of Affective Disorders*, *253*, 69–86. https://doi.org/10.1016/j.jad.2019.04.065

Kristensen, P., Dyregrov, K., & Gjestad, R. (2020). Different trajectories of prolonged grief in bereaved family members after terror. *Frontiers in Psychiatry*, *11*, Article 545368. https://doi.org/10.3389/fpsyt.2020.545368

Lenferink, L., de Keijser, J., Denderen, M., & Boelen, P. A. (2018). Latent classes of posttraumatic stress symptoms in two samples of bereaved people. *International Journal of Stress Management*. https://doi.org/10.1037/str0000121

Lenferink, L. I. M., Boelen, P. A., Smid, G. E., & Paap, M. C. S. (2021). The importance of harmonising diagnostic criteria sets for pathological grief. *The British Journal of Psychiatry: The Journal of Mental Science*, *219*(3), 473–476. https://doi.org/10.1192/bjp.2019.240

Lenferink, L. I. M., Eisma, M. C., Smid, G. E., de Keijser, J., & Boelen, P. A. (2022). Valid measurement of DSM-5 persistent complex bereavement disorder and DSM-5-TR and ICD-11 prolonged grief disorder: The Traumatic Grief Inventory-Self Report Plus (TGI-SR+). *Comprehensive Psychiatry*, *112*, Article 152281. https://doi.org/10.1016/j.comppsych.2021.152281

Lenferink, L. I. M., Franzen, M., ten Klooster, P. M., Knaevelsrud, C., Boelen, P. A., & Heeke, C. (2023). The Traumatic Grief Inventory-Clinician Administered: A psychometric evaluation of a new interview for ICD-11 and DSM-5-TR prolonged grief disorder severity and probable caseness. *Journal of Affective Disorders*, *330*, 188–197. https://doi.org/10.1016/j.jad.2023.03.006

Lenferink, L. I. M., Nickerson, A., de Keijser, J., Smid, G. E., & Boelen, P. A. (2020). Trajectories of grief, depression, and posttraumatic stress in disaster-bereaved people. *Depression and Anxiety*, *37*(1), 35–44. https://doi.org/10.1002/da.22850

Lenferink, L. I. M., van Dijk, I., Eisma, M. C., Eklund, R., Boelen, P. A., & Sveen, J. (2023). Psychometric evaluation of the Swedish Traumatic Grief Inventory Self–Report Plus (TGI–SR+) in bereaved parents. *Clinical Psychology & Psychotherapy*. Advance online publication. https://doi.org/10.1002/cpp.2922

Litz, B. T., Schorr, Y., Delaney, E., Au, T., Papa, A., Fox, A. B., Morris, S., Nickerson, A., Block, S., & Prigerson, H. G. (2014). A randomized controlled trial of an internet-based therapist-assisted indicated preventive intervention for prolonged grief disorder. *Behaviour Research and Therapy*, *61*, 23–34. https://doi.org/10.1016/j.brat.2014.07.005

Lobb, E. A., Kristjanson, L. J., Aoun, S. M., Monterosso, L., Halkett, G. K. B., & Davies, A. (2010). Predictors of complicated grief: A systematic review of empirical studies. *Death Studies*, *34*(8), 673–698. https://doi.org/10.1080/07481187.2010.496686

Lundorff, M., Bonanno, G. A., Johannsen, M., & O'Connor, M. (2020). Are there gender differences in prolonged grief trajectories? A registry-sampled cohort study. *Journal of Psychiatric Research*, *129*, 168–175. https://doi.org/10.1016/J.JPSYCHIRES.2020.06.030

Lundorff, M., Holmgren, H., Zachariae, R., Farver-Vestergaard, I., & O'Connor, M. (2017). Prevalence of prolonged grief disorder in adult bereavement: A systematic review and meta-analysis. *Journal of Affective Disorders*, *212*, 138–149. https://doi.org/10.1016/j.jad.2017.01.030

Maciejewski, P. K., Maercker, A., Boelen, P. A., & Prigerson, H. G. (2016). 'Prolonged grief disorder' and 'persistent complex bereavement disorder', but not 'complicated grief', are one and the same diagnostic entity: An analysis of data from the Yale Bereavement Study. *World Psychiatry: Official Journal of the World Psychiatric Association (WPA)*, *15*(3), 266–275. https://doi.org/10.1002/wps.20348

Muthén, B. O., & Muthén, L. K. (2017). *Mplus user's guide, version 8.3*. Muthén & Muthén.

Nielsen, M. K., Carlsen, A. H., Neergaard, M. A., Bidstrup, P. E., & Guldin, M.-B. (2019). Looking beyond the mean in grief trajectories: A prospective, population-based cohort study. *Social Science & Medicine*, *232*, 460–469. https://doi.org/10.1016/j.socscimed.2018.10.007

Nordström, E.-E. L., Thimm, J. C., Kaltiala, R., & Kristensen, P. (2022). Prolonged grief, post-traumatic stress, and functional impairment in parents and siblings 8 years after the 2011 Utøya terror attack. *European Journal of Psychotraumatology*, *13*(2), Article 2152930. https://doi.org/10.1080/20008066.2022.2152930

Nylund, K. L., Asparouhov, T., & Muthén, B. O. (2007). Deciding on the number of classes in latent class analysis and growth mixture modeling: A Monte Carlo simulation study. *Structural Equation Modeling: A Multidisciplinary Journal*, *14*(4), 535–569. https://doi.org/10.1080/10705510701575396

O'Connor, M., Nickerson, A., Aderka, I. M., & Bryant, R. A. (2015). The temporal relationship between change in symptoms of prolonged grief and posttraumatic stress following old age spousal bereavement. *Depression and Anxiety*, *32*(5), 335–340. https://doi.org/10.1002/da.22349

Pasternak, R. E., Reynolds, C. F., Miller, M. D., Frank, E., Fasiczka, A., Prigerson, H., Mazumdar, S., & Kupfer, D. J. (1994). The symptom profile and two-year course of subsyndromal depression in spousally bereaved elders. *The American Journal of Geriatric Psychiatry*, *2*(3), 210–219. https://doi.org/10.1097/00019442-199400230-00005

Prigerson, H. G., Maciejewski, P. K., Reynolds, C. F., Bierhals, A. J., Newsom, J. T., Fasiczka, A., Frank, E., Doman, J., & Miller, M. (1995). Inventory of complicated grief: A scale to measure maladaptive symptoms of loss. *Psychiatry Research*, *59*(1), 65–79. https://doi.org/10.1016/0165-1781(95)02757-2

Reitsma, L., Boelen, P. A., de Keijser, J., & Lenferink, L. I. M. (2023). Self-guided online treatment of disturbed grief, posttraumatic stress, and depression in adults bereaved during the COVID-19 pandemic: A randomized controlled trial. *Behaviour Research and Therapy*, *163*, Article 104286. https://doi.org/10.1016/j.brat.2023.104286

Rosner, R., Comtesse, H., Vogel, A., & Doering, B. K. (2021). Prevalence of prolonged grief disorder. *Journal of Affective Disorders*, *287*, 301–307. https://doi.org/10.1016/j.jad.2021.03.058

Smith, K. V., & Ehlers, A. (2020). Cognitive predictors of grief trajectories in the first months of loss: A latent growth mixture model. *Journal of Consulting and Clinical Psychology*, *88*(2), 93–105. https://doi.org/10.1037/ccp0000438

Stammel, N., Heeke, C., Bockers, E., Chhim, S., Taing, S., Wagner, B., & Knaevelsrud, C. (2013). Prolonged grief disorder three decades post loss in survivors of the Khmer Rouge regime in Cambodia. *Journal of Affective Disorders*, *144*(1), 87–93. https://doi.org/10.1016/j.jad.2012.05.063

Stroebe, M., Schut, H., & Stroebe, W. (2007). Health outcomes of bereavement. *The Lancet*, *370*(9603), 1960–1973. https://doi.org/10.1016/S0140-6736(07)61816-9

Sveen, J., Johannesson, K. B., Cernvall, M., & Arnberg, F. K. (2018). Trajectories of prolonged grief one to six years after a natural disaster. *PLoS One*, *13*(12), e0209757. https://doi.org/10.1371/journal.pone.0209757

Thormar, S. B., Sijbrandij, M., Gersons, B. P. R., Van de Schoot, R., Juen, B., Karlsson, T., & Olff, M. (2016). PTSD symptom trajectories in disaster volunteers: The role of self-efficacy, social acknowledgement, and tasks carried out. *Journal of Traumatic Stress*, *29*(1), 17–25. https://doi.org/10.1002/jts.22073

van de Schoot, R., Sijbrandij, M., Winter, S. D., Depaoli, S., & Vermunt, J. K. (2017). The GRoLTS-checklist: Guidelines for reporting on latent trajectory studies. *Structural Equation Modeling: A Multidisciplinary Journal*, *24*(3), 451–467. https://doi.org/10.1080/10705511.2016.1247646

van Denderen, M., de Keijser, J., Huisman, M., & Boelen, P. A. (2016). Prevalence and correlates of self-rated posttraumatic stress disorder and complicated grief in a community-based sample of homicidally bereaved individuals. *Journal of Interpersonal Violence*, *31*(2), 207–227. https://doi.org/10.1177/0886260514555368

Vermunt, J. K. (2010). Latent class modeling with covariates: Two improved three–step approaches. *Political Analysis*, *18*, 450–469.

Wittouck, C., Van Autreve, S., De Jaegere, E., Portzky, G., & van Heeringen, K. (2011). The prevention and treatment of complicated grief: A meta-analysis. *Clinical Psychology Review*, *31*(1), 69–78. https://doi.org/10.1016/j.cpr.2010.09.005

World Health Organization. (2018). *ICD-11. Prolonged grief disorder criteria.* https://icd.who.int/browse11/l-m/en#/http://id.who.int/icd/entity/1183832314.