



Universiteit
Leiden
The Netherlands

Distinguishing prolonged grief and mental well-being after homicidal loss: a longitudinal factor analytic study in the context of a criminal trial

Nijborg, L.C.J.; Westerhof, G.J.; Kunst, M.J.J.; Keijser, J. de; Lenferink, L.I.M.

Citation

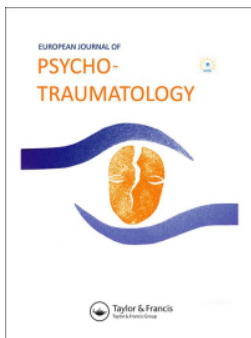
Nijborg, L. C. J., Westerhof, G. J., Kunst, M. J. J., Keijser, J. de, & Lenferink, L. I. M. (2026). Distinguishing prolonged grief and mental well-being after homicidal loss: a longitudinal factor analytic study in the context of a criminal trial. *European Journal Of Psychotraumatology*, 17(1), 1-14. doi:10.1080/20008066.2026.2713263

Version: Publisher's Version

License: [Creative Commons CC BY-NC 4.0 license](#)

Downloaded from: <https://hdl.handle.net/1887/4309952>

Note: To cite this publication please use the final published version (if applicable).



Distinguishing prolonged grief and mental well-being after homicidal loss: a longitudinal factor analytic study in the context of a criminal trial

Lieke C.J. Nijborg, Gerben J. Westerhof, Maarten J.J. Kunst, Jos de Keijser & Lonneke I.M. Lenferink

To cite this article: Lieke C.J. Nijborg, Gerben J. Westerhof, Maarten J.J. Kunst, Jos de Keijser & Lonneke I.M. Lenferink (2026) Distinguishing prolonged grief and mental well-being after homicidal loss: a longitudinal factor analytic study in the context of a criminal trial, *European Journal of Psychotraumatology*, 17:1, 2713263, DOI: [10.1080/20008066.2026.2713263](https://doi.org/10.1080/20008066.2026.2713263)

To link to this article: <https://doi.org/10.1080/20008066.2026.2713263>



© 2026 The Author(s). Published by Informa UK Limited, trading as Taylor & Francis Group



[View supplementary material](#)



Published online: 24 Aug 2026.



[Submit your article to this journal](#)



[View related articles](#)



[View Crossmark data](#)

BASIC RESEARCH ARTICLE

OPEN ACCESS



Distinguishing prolonged grief and mental well-being after homicidal loss: a longitudinal factor analytic study in the context of a criminal trial

Lieke C.J. Nijborg ^a, Gerben J. Westerhof ^a, Maarten J.J. Kunst ^b, Jos de Keijser ^c and Lonneke I.M. Lenferink ^{a,c}

^aDepartment of Psychology, Health, and Technology, Faculty of Behavioural, Management and Social Sciences, University of Twente, Enschede, the Netherlands; ^bInstitute of Criminal Law and Criminology, Faculty of Law, Leiden University, Leiden, the Netherlands; ^cDepartment of Clinical Psychology and Experimental Psychopathology, Faculty of Behavioural and Social Sciences, University of Groningen, Groningen, the Netherlands

ABSTRACT

Background: As per the dual-continua model, mental illness and mental well-being are related, distinct continua of mental health. Whether this association generalises to bereaved people and is stable over time remains uncertain. Moreover, criminal justice system (CJS) involvement may pose a risk to the different continua of mental health of bereaved people.

Objectives: We investigated (1) whether the factor structure of prolonged grief disorder (PGD) and well-being remains stable over time, and (2) whether aspects of CJS involvement are related to latent PGD and well-being levels reported after the criminal trial.

Method: In a sample of MH17-bereaved people ($N = 237$), we used (longitudinal) confirmatory factor analysis to examine the factor structure of PGD and well-being over time. To examine whether aspects of CJS involvement are associated with PGD and well-being levels, we regressed PGD and well-being levels on aspects of CJS involvement in a structural model.

Results: Regarding the first objective, PGD and well-being were distinct, negatively related, constructs among people bereaved by the MH17 plane disaster. This association appears stable over time. Regarding the second objective, no aspects of CJS involvement were related to PGD and well-being levels reported after the trial, while accounting for levels before the criminal trial.

Conclusions: Mental healthcare professionals may want to assess and treat well-being levels in addition to PGD levels, to determine whether targeting well-being in treatment may be a fruitful avenue to pursue. Future studies might want to examine which positive psychology interventions would work well in conjunction with existing grief therapies for people experiencing clinically relevant PGD levels with below-average well-being levels. Also, if replicated, the findings indicate that CJS involvement may not significantly affect the mental health of bereaved people, raising questions about the generalizability of the framework of therapeutic jurisprudence and justice theories to this population.

Distinguiendo el duelo prolongado y el bienestar mental tras una pérdida por homicidio: un estudio longitudinal de análisis factorial en el contexto de un juicio penal

Antecedentes: De acuerdo con el modelo de los dos continuos, la enfermedad mental y el bienestar mental constituyen dos continuos relacionados, pero distintos, de la salud mental. Aún no está claro si esta relación puede generalizarse a las personas en duelo y si se mantiene estable a lo largo del tiempo. Además, la participación del sistema de justicia penal puede representar un factor de riesgo para los distintos continuos de la salud mental en las personas en duelo.

Objetivos: Investigamos (1) si la estructura factorial del trastorno por duelo prolongado (PGD por sus siglas en inglés) y del bienestar se mantiene estable a lo largo del tiempo y (2) si distintos aspectos de la participación en el sistema de justicia penal se asocian con los niveles latentes de PGD y de bienestar reportados tras el juicio penal.

Método: En una muestra de personas en duelo por la catástrofe aérea del vuelo MH17 ($N = 237$), utilizamos análisis factorial confirmatorio longitudinal para examinar la estructura factorial del PGD y del bienestar a lo largo del tiempo. Para evaluar si distintos aspectos de la participación en el sistema de justicia penal se asociaban con los niveles de PGD y de bienestar, se realizó una regresión de estos niveles en función de dichos aspectos en un modelo estructural.

Resultados: En relación con el primer objetivo, el PGD y el bienestar constituyeron constructos distintos, aunque negativamente relacionados, entre las personas en duelo por el desastre

ARTICLE HISTORY

Received 29 January 2026

Revised 24 July 2026

Accepted 26 July 2026

KEYWORDS

Mental health; bereavement; dual-continua model; criminal justice system; trauma

PALABRAS CLAVE

Salud mental; duelo; modelo de los dos continuos; sistema de justicia penal; trauma

HIGHLIGHTS

- Prolonged grief and well-being are distinct, negative related, constructs. This association appears stable over time.
- Prolonged grief and well-being do not predict each other over time.
- Involvement in the criminal justice system was not associated with mental health.

CONTACT Lieke C.J. Nijborg  l.c.nijborg@utwente.nl  Department of Psychology, Health, and Technology, Faculty of Behavioral, Management, and Social Sciences, University of Twente, Drienerlolaan 5, Enschede, 7522 NB, the Netherlands

 Supplemental data for this article can be accessed online at <https://doi.org/10.1080/20008066.2026.2713263>.

© 2026 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.

aéreo del vuelo MH17. Esta asociación pareció mantenerse estable a lo largo del tiempo. En cuanto al segundo objetivo, ningún aspecto de la participación en el sistema de justicia penal se asoció con los niveles de PGD ni de bienestar reportados tras el juicio penal, tras controlar los niveles previos al juicio.

Conclusiones: Los profesionales de la salud mental podrían considerar evaluar y abordar los niveles de bienestar, además de los niveles de trastorno por PGD, con el fin de determinar si incorporar el bienestar como objetivo terapéutico constituye una estrategia prometedora. Estudios futuros podrían examinar qué intervenciones de psicología positiva funcionan mejor en combinación con las terapias de duelo existentes para personas que presentan niveles clínicamente relevantes de PGD y niveles de bienestar inferiores al promedio.

Asimismo, si estos hallazgos se replican, sugieren que la participación en el sistema de justicia penal podría no afectar significativamente la salud mental de las personas en duelo, lo que plantea interrogantes sobre la generalización del marco de la jurisprudencia terapéutica y de las teorías de la justicia a esta población.

1. Introduction

The death of a loved one due to a natural cause (e.g. illness) results in the development of prolonged grief disorder (PGD) for around 3–5% of bereaved people (Rosner et al., 2021; Trembl et al., 2022, 2024). After unexpected death, such as death by violence, the risk of developing PGD is around four times higher (Doering et al., 2022). According to the Diagnostic and Statistical Manual of Mental Disorders 5 Text-Revision (DSM-5-TR), PGD is marked by a preoccupation with thoughts about, or intense yearning for, the deceased (American Psychiatric Association [APA], 2022). PGD is diagnosable 12 months after the loss when a group of selected symptoms is experienced nearly every day for at least a month and hampers everyday living (APA, 2022). From this point on, ‘disturbed grief’ is used when referring to any conceptualisation of PGD, while ‘PGD’ is used when referring specifically to the diagnostic criteria set described in the DSM-5-TR.

In earlier work on mental health, it was assumed that mental illness, such as disturbed grief, and mental well-being (hereafter: well-being) are inversely related. Well-being comprises three components (Keyes, 2002). Firstly, emotional well-being, which concerns whether one experiences positive emotions on the short- and long-term (Keyes, 2002; Keyes et al., 2008). Secondly, psychological well-being, which refers to living up to one’s true potential (Ryff, 1989, 2014; Waterman, 1993). Thirdly, social well-being, which indicates how well one performs in society (e.g. social integration) (Keyes, 1998; Keyes et al., 2008). Substantial empirical support was found for the division of well-being into these three components across various clinical and general populations (Iasiello et al., 2022).

The dual-continua model of mental health (hereafter: dual-continua model) posits that mental illness and well-being are related, yet distinguishable continua of mental health (Westerhof & Keyes, 2010). A scoping review including mostly cross-sectional

studies using confirmatory factor analysis (CFA) indeed showed that well-being and mental illness are related, yet separate continua (Iasiello et al., 2020). Yet, it remains to be tested whether the dual-continua model is generalisable to bereaved people (i.e. whether PGD and well-being levels are distinct, yet related). If PGD and well-being are indeed distinct constructs, some bereaved people may benefit from an intervention targeting well-being, either alone or in combination with a grief-focused intervention.

Three cross-sectional studies have shown that disturbed grief and well-being are weakly to strongly concurrently related (Craig et al., 2008; Dababneh et al., 2024; Villaceros et al., 2014), suggesting that while related, these constructs may also be distinct. A fourth cross-sectional study has offered further evidence for the generalizability of the dual-continua model to bereaved people. In their latent class analytic study, Reitsma et al. (2024) identified four classes based on indicators of PGD and well-being assessed in people bereaved during the COVID-19 pandemic. One of the four identified classes consisted of people reporting moderate PGD co-existing with high well-being, which is in line with the dual-continua model. Notably, however, latent class analysis is a statistical method that groups *people* (latent classes) based on their response patterns (Hagenaars & McCutcheon, 2002; Lazarsfeld, 1950), while a method such as CFA uses these response patterns to group *items* (latent factors) (Jöreskog, 1969). As the dual-continua model refers to latent factors, CFA has been an often-used analytical approach to test the dual-continua model (Iasiello et al., 2020). However, it remains to be seen whether prior findings from factor analytic studies in non-bereaved samples generalise to bereaved people. Such an analytical approach can also be used to examine whether the factor structure of the dual-continua model is stable over time, which is considered a prerequisite when testing for mean differences of a construct over time (Putnick & Bornstein, 2016).

Certain aspects may be considered when examining the factor structure of PGD and well-being over time.

For example, females, lower educated people, and those closely related to the deceased have been found to be at an increased risk for disturbed grief after violent loss (Heeke et al., 2019; Kokou-Kpolou et al., 2020). In the context of violent loss, involvement in the criminal justice system (CJS) may also pose a risk to the different continua of mental health (da Costa et al., 2017). The framework of therapeutic jurisprudence suggests that legal procedures, such as the opportunity to deliver a statement in court, and decisions can have detrimental or beneficial psychological outcomes for victims (Wexler & Winick, 2008). In view of procedural and distributive justice theories, the psychological outcomes supposedly relate to how victims are treated during criminal proceedings, judicial verdicts about defendant guilt and sentencing, as well as victim compensation (cf. Lind & Tyler, 1988; Thibaut & Walker, 1975; Tyler, 2000).

The relationship between involvement in legal procedures and decisions and psychopathology has been researched in victim populations, showing inconsistent findings (see Kunst et al., 2015). Nevertheless, these topics remain largely unexplored among bereaved victim populations. Examining these topics in bereaved victim populations is important, as they have been exposed to fatal crimes, unlike other victim populations. Researchers have alluded to associations between aspects of CJS involvement and disturbed grief (e.g. Armour, 2002a; Connolly & Gordon, 2015; Englebrecht et al., 2014), yet only two studies empirically tested this potential relationship (Milman et al., 2018; Nijborg et al., 2024). One found that delivering a statement in court was not associated with significant changes in PGD symptoms (Nijborg et al., 2024). The second study found that being less satisfied with police treatment, but not treatment by other agencies (e.g. people from the prosecutor's office), was positively related to disturbed grief (Milman et al., 2018). In contrast, involvement in the CJS has the potential to instil feelings of validation, support (Wemmers, 2013), control, purpose (Armour, 2002b), and empowerment (Bennett Cattaneo & Goodman, 2010), which may be beneficial to well-being. Nonetheless, more research is needed to determine whether aspects of CJS involvement are related to PGD and well-being levels. This information can be used to assess whether the CJS can potentially be tailored to prevent unwanted side effects and induce positive ones.

1.1. Objectives

Our first objective was to investigate the factor structure of PGD and well-being, and its stability over time in a sample of people whose loved one(s) was/were killed in a plane disaster.

Investigating the factor structure of a construct (e.g. PGD) entails examining how the items used to assess the construct group together – i.e. whether they reflect a single underlying concept or multiple ones. This was examined in four steps. In the first step, the fit of a two-factor PGD model was compared to the fit of a one-factor model (as proposed by the DSM-5-TR; APA, 2022), based on data from before and after the trial separately. In the second step, the fit of a three-factor well-being model was compared to the fit of a one-factor model (as proposed by Lamers et al. (2011)), again based on data before and after the trial separately. In the third step, the fit of a two-factor PGD/well-being model (one factor for PGD and a second factor for well-being) was compared to the fit of a one-factor model, again based on data from before and after the trial separately. In the fourth and final step, longitudinal measurement invariance (MI) was tested for PGD and well-being separately. If longitudinal MI holds true, this means that PGD and well-being are measured in a similar way across time points, with a consistent factor structure and comparable measurement properties. The second objective was to examine whether aspects of CJS involvement are associated with PGD and well-being levels. This was examined by regressing latent PGD and well-being levels reported after the trial on aspects of CJS involvement, while accounting for PGD and well-being levels reported before the trial, as well as background and loss-related characteristics.

1.2. Hypotheses

H1. We did not expect a relevant improvement in fit for the two-factor PGD model over the one-factor PGD model (Kokou-Kpolou et al., 2022; Lenferink et al., 2022, 2023).

H2. We expected the three-factor well-being model to fit the data better than the one-factor well-being model (see Iasiello et al., 2022).

H3. We expected the two-factor PGD/well-being model to fit the data better than the one-factor PGD/well-being model (cf. Iasiello et al., 2020).

H4. We expected both constructs – i.e. PGD and well-being – to be invariant over time.

H5. We expected that greater satisfaction with treatment by CJS professionals and the verdict, to be related to lower latent PGD and higher latent well-being levels after the trial (cf. Lind & Tyler, 1988; Thibaut & Walker, 1975; Tyler, 2000).

In addition to the hypotheses above, to what extent the remaining aspects of CJS involvement, i.e. whether the person delivered a statement, whether monetary compensation was received, and the number of statements

listened to, relate to latent PGD and latent well-being levels after the trial was examined in an exploratory manner due to limited research.

2. Methods

2.1. Procedure

Civilian aircraft MH17 had 298 people, including 196 Dutch people, on board when it was destroyed by a missile above Ukraine on 17 July 2014. On 9 March 2020, a criminal trial was started against four suspects who were believed to be involved in the plane disaster (Dutch Safety Board, 2015; Ministry of Justice and Security, n.d.). On 17 November 2022, all but one were sentenced to life in prison (Ministry of Justice and Security, n.d.). This study is part of a longitudinal survey study, consisting of eight measurement occasions, examining the psychosocial consequences for those bereaved by the plane disaster (Buiters et al., 2022; Lenferink et al., 2017, 2019, 2020; Nijborg et al., 2024). The ethics committee of the University of Groningen (EC-BSS) approved this study (ID: PSY-1920-S-0171). Written informed consent was obtained from participants.

Data collection for the first measurement occasion took place before the criminal trial (hereafter: pre-trial), between 17 February and 9 March 2020. The second measurement was started after the criminal trial (hereafter: post-trial) on 21 February and lasted until 1 June 2023. Respondents were recruited at three different time points: at the start of the study, at pre-trial and at post-trial (for details see Lenferink et al. (2017) and Buiters et al. (2022)).

2.2. Participants

At post-trial, the researchers sent a total of 205 invitations to people who had participated in prior measurement occasions and provided consent to be contacted for future measurement occasions. Six of the 205 former participants participated via paper-and-pencil surveys sent via post. Of the 205 people who were invited, 159 participated at post-trial (i.e. response rate is 78%). Two reminders were sent to participants. Those who did not complete the survey two weeks after the second reminder were contacted via telephone (if possible). If the participant chose to withdraw from the study, they were asked to provide a reason. The three most common reasons for non-participation were: expressing no desire to participate (e.g. too busy or not experiencing loss-related distress) ($N = 7$), the participant passing away ($N = 4$), and it being too emotional ($N = 4$). For 25 participants reasons for dropout are unknown. Thirteen new participants (i.e. did not participate in earlier waves) were recruited at post-trial by a lawyer of the MH17

legal aid team ($N = 7$), the MH17 Disaster Foundation ($N = 5$), or another participant ($N = 1$).

The sample consisted of adults, proficient in Dutch or English, who have lost loved ones (i.e. partner/spouse, family member, or friend) due to the MH17 plane disaster. One hundred ninety-nine bereaved people participated at pre-trial, 172 at post-trial, and 134 at both measurement occasions. In total, 237 people participated at pre- and/or post-trial, and were therefore included in the analyses.

2.3. Measures

2.3.1. Traumatic grief inventory self-report plus (TGI-SR+)

At pre- and post-trial, the 22-item TGI-SR+ was used to assess PGD severity according to the DSM-5-TR criteria (Lenferink et al., 2022). The instructions were adjusted to ensure the bereavement experiences relate to the MH17 plane disaster. Participants who lost multiple loved ones were instructed to choose the loss that was most distressing or most often on their mind. If a decision could not be made, the participant had to choose at random. The items (e.g. 'In the past month, I had intrusive thoughts or images related to the person who died') were rated from 1 (= never) to 5 (= always) (Lenferink et al., 2022). A total PGD score (range: 10–50) was computed at pre- and post-trial by summing the scores on items 1, 3, 6, 9, 10, 11, 18, 19, 21 and the highest score specified on items 2 and 8 (Lenferink et al., 2022). A total PGD score ≥ 33 signifies probable PGD when using the DSM-5-TR criteria (Lenferink et al., 2022). The psychometric properties of the TGI-SR+ are satisfactory (Kokou-Kpolou et al., 2022; Lenferink et al., 2022, 2023). Cronbach's alpha was .93 at pre-trial and .92 at post-trial.

2.3.2. Mental health continuum-short form (MHC-SF)

At pre- and post-trial, the 14-item MHC-SF was used to assess emotional (items: 1–3), social (items: 4–8), and psychological well-being (items: 9–14) (Keyes, 2005, 2009; Keyes et al., 2008; Dutch translation: Lamers et al., 2011). Each item (e.g. 'During the past month, how often did you feel happy?') was rated from 0 (= never) to 5 (= every day) (Keyes, 2009; Keyes et al., 2008; Lamers et al., 2011). A total well-being score (range: 0–70) was computed by summing all items. Also, an average total item score (range: 0–5) and average subscale item scores (ranges: 0–5) were computed at pre- and post-trial (Franken et al., 2019). For the average total item score and average subscale item scores, a score < 2.6 signifies below-average well-being levels, based on norm scores reported in the general population (Franken et al., 2019). The MHC-SF has good psychometric properties (Iasiello

et al., 2022). Cronbach's alpha for mental well-being (i.e. the total well-being score) was .93 at pre-trial and .92 at post-trial. Cronbach's alphas for the subscales ranged from .79 to .90.

2.3.3. Satisfaction with treatment by CJS professionals

The degree of satisfaction with treatment by CJS professionals was determined at post-trial using four self-developed items. These items were used to rate satisfaction with: (1) the Netherlands Public Prosecution Service, (2) the criminal trial, (3) the judges, and (4) the defence team. Each item was rated from 1 (= very dissatisfied) to 10 (= very satisfied). A total score (range: 4–40) was calculated by summing the scores. Cronbach's alpha was .68.

2.3.4. Satisfaction with verdict

At post-trial, the participants indicated how satisfied they were with the verdict (i.e. a life sentence for three defendants and the acquittal of one defendant) on a scale from 1 (= very dissatisfied) to 10 (= very satisfied).

2.3.5. Statement delivery

Data regarding whether or not the participant delivered an oral or a written statement were collected in another measurement occasion of the overarching longitudinal study that took place after the participants had the opportunity to deliver a statement during the court hearings (hereafter: post-statement) (for details see Nijborg et al. (2024)). Answer options were: 1 = yes, I created a written statement, 2 = yes, I delivered an oral statement, 3 = no, a loved one created a written statement, 4 = no, a loved one delivered an oral statement, or 5 = no, nor I nor my loved ones delivered a statement, neither written or orally. Notably, according to Dutch criminal law, only relatives of the deceased can deliver a statement during the court hearings. However, not everyone was given the opportunity, e.g. due to only three people being allowed to speak per victim. In our sample, 15 people indicated not having had the opportunity to deliver a statement.

2.3.6. Receipt of monetary compensation

At post-trial, the participants were asked 'Did you receive compensation for your damages?'. Answer options were: 0 = no, 1 = yes, I received compensation for the pain and suffering I experienced due to the loss of my loved one(s), 2 = yes, I received compensation for the material damages that I sustained as a result from the plane disaster, 3 = yes, I received compensation for both the pain and suffering I experienced and the material damages I sustained. Partners, parents, and children of the deceased could apply for compensation, as well as cohabiting siblings, grandparents, grandchildren, uncles, aunts, nieces, nephews,

and in-laws of the deceased (Rechtbank Den Haag, 2022).

2.3.7. Passive involvement

At post-statement, participants indicated the number of statements they listened to (online or while being physically present) about the MH17 plane disaster. Answer options were: 1 = none, 2 = 1–10, 3 = 11–20, 4 = 21–40, 5 = 41–60, 6 = 61–80, 7 = 81 or more. Their answer was used as an indicator of the degree in which the participant followed the course of the criminal trial.

2.3.8. Background and loss-related characteristics

We included biological sex (1 = male, 2 = female), level of education (1 = primary school, 2 = secondary school, 3 = secondary vocational education, 4 = university (of applied sciences)), and (closest) relationship to the deceased (1 = child, 2 = partner/spouse, 3 = parent, 4 = sibling, 5 = other) in the analyses as covariates, as these have been found to be related to PGD levels (Heeke et al., 2019; Kokou-Kpolou et al., 2020) and may also relate to well-being levels after loss (e.g. Lamers et al., 2012; Westerhof, 2013). For the participants who lost multiple people, closest relationship to the deceased was determined, ordered from child, partner/spouse, parent, sibling to other.

2.4. Data analysis

Less than 5% of the data were missing per wave. Based on skewness (< 3) and kurtosis (< 10) values of the items, the data were normally distributed (Kline, 2016). Thus, full information maximum likelihood estimation was used. Multiple imputation was used for missing data on the predictors and covariates. Specifically, 100 imputed datasets were generated. The predictors and covariates were tested for multicollinearity prior to running the analyses. Pairwise correlations among predictors were generally low (when significant) and variance inflation factors were within acceptable limits, suggesting no concern for multicollinearity. Consequently, all predictors and covariates were included in the analysis.

Specific guidelines were followed to select the best fitting model (Kline, 2016). Comparative Fit Index (CFI) and Tucker Lewis Index (TLI) estimates > 0.90 suggest acceptable model fit and > 0.95 excellent model fit. Moreover, root-mean-square error of approximation (RMSEA) and standardised root-mean-square residual (SRMR) estimates between 0.05 and 0.10 suggest acceptable fit, and < 0.05 excellent fit. Lower Akaike, Bayesian, and Sample-Size adjusted Bayesian Information Criteria (AIC, BIC, and SS-BIC) estimates suggest superior fit. Models were statistically compared using chi-squared

difference tests, with a p -value $< .05$ providing support for a better fit (Muthén & Muthén, 2021). We considered CFI estimates that differ ≤ 0.02 when comparing a more constrained model with a less constrained model as support for demonstrating MI for the more constrained model (Putnick & Bornstein, 2016; van de Schoot et al., 2012). Note, in terms of model parsimony, no additional modifications were made beyond those specified below (e.g. correlated errors or cross-loadings) to improve model fit.

We tested whether longitudinal MI holds true for the factor structure of PGD and well-being, by conducting CFAs (Jöreskog, 1969). This was explored in four steps using Mplus (Version 8.0; Muthén & Muthén, 1998–2017). In the first step, two sets of CFAs were conducted to assess the factor structure of PGD at pre- and post-trial. Based on prior research (Kokou-Kpolou et al., 2022; Lenferink et al., 2022, 2023), the statistical fit of a two-factor PGD model was compared to the fit of a one-factor model. We did not expect a relevant improvement in fit for the two-factor PGD model over the one-factor model (Kokou-Kpolou et al., 2022; Lenferink et al., 2022, 2023). In the one-factor PGD model, all indicators of PGD load on one construct (i.e. PGD). In the two-factor PGD model, indicators of PGD load on two separate, but related factors (i.e. separation distress on factor one and accessory symptoms on factor two). Specifically, in this model the two items relating to persistent yearning and preoccupation with thoughts load on ‘separation distress’ and the remaining items load on ‘accessory items’. These latent factors were allowed to correlate.

In the second step, two more sets of CFAs were performed to evaluate the factor structure of well-being at pre- and post-trial. Based on prior research (see Iasiello et al., 2022), the statistical fit of a three-factor well-being model was compared to the fit of a one-factor model. We expected the three-factor well-being model to fit the data better than the one-factor model (see Iasiello et al., 2022). In the one-factor well-being model, all indicators of well-being load on one construct (i.e. well-being). In the three-factor well-being model, indicators of well-being load on three separate, yet related factors (i.e. emotional, social, and psychological well-being). Specifically, three items pertaining to positive affect and life satisfaction load on ‘emotional well-being’. Five items pertaining to social contribution, social integration, social actualisation, social acceptance, and social coherence load on ‘social well-being’. Six items pertaining to self-acceptance, environmental mastery, positive relations with others, personal growth, autonomy, and purpose in life load on ‘psychological well-being’. These latent factors were allowed to correlate. The three well-being indicators with the highest factor loading on average were included in the subsequent

set of CFAs. To specify, if we found evidence for the one-factor well-being model, we included the three items with, on average, the highest factor loading overall. If we found evidence for the three-factor well-being model, we included the item with the highest factor loading on average of each subscale to represent the underlying factors (i.e. emotional, social, and psychological well-being). This decision was made to maintain a more parsimonious model, considering the complexity of the models relative to the available sample size (pre-trial: $N = 199$, post-trial: $N = 172$, total sample: $N = 237$) (Kline, 2016).

In the third step, two sets of CFAs were performed to examine the factor structure of all PGD indicators and the three chosen well-being indicators at pre-trial and post-trial. Based on prior research (cf. Iasiello et al., 2020), the statistical fit of a two-factor PGD/well-being model was compared to the fit of a one-factor model. We expected the two-factor PGD/well-being model to fit the data better than the one-factor model (cf. Iasiello et al., 2020). In the one-factor PGD/well-being model, all PGD indicators and the three chosen well-being indicators load on one construct. In the two-factor model, all PGD indicators and the three chosen well-being indicators load on separate, but related constructs (i.e. PGD and well-being, respectively). In this model, the latent factors were allowed to correlate. If the same number of factors were identified at pre- and post-trial, we concluded that configural invariance was demonstrated for the PGD/well-being model (van de Schoot et al., 2012).

In the fourth and final step, longitudinal MI of PGD and well-being was tested separately, also by performing CFAs. Notably, all well-being indicators were included in the longitudinal CFAs. If configural invariance holds true, we assessed whether the pattern of factor loadings was similar before and after the trial (i.e. metric invariance; van de Schoot et al., 2012). If metric invariance also holds true, it was established whether the patterns of factor loadings and intercepts were similar before and after the trial (i.e. scalar invariance; van de Schoot et al., 2012). We expected both constructs – i.e. PGD and well-being – to be invariant over time. Note, all models converged without estimation problems. Therefore, differences in model fit are attributed to variation in model specification instead of estimation instability.

Lastly, we examined to what extent aspects of CJS involvement are associated with post-trial latent PGD and well-being levels by regressing post-trial latent PGD and well-being levels on all examined aspects of CJS involvement, as well as background and loss-related characteristics, using structural equation modelling. Here as well, post-trial latent well-being levels were modelled using only three indicators (the indicator with, on average, the highest

Table 1. Sample characteristics ($N = 237$).

Aspects of CJS involvement, and background and loss-related characteristics	Pre-trial ($N = 199$)	Post-trial ($N = 172$)
Biological sex ($N = 237$), N (%)		
Male	74 (37)	62 (36)
Female	125 (63)	110 (64)
Country of birth ($N = 237$), N (%)		
The Netherlands	152 (76)	140 (81)
Malaysia	16 (8)	7 (4)
Australia	10 (5)	9 (5)
Other	21 (11)	16 (9)
Age at the time of the disaster ($N = 237$), M (SD)	48.0 (15.8)	48.4 (15.2)
Level of education ($N = 237$), N (%)		
University (of applied sciences)	136 (68)	123 (72)
Secondary vocational education	26 (13)	18 (11)
Secondary school	37 (19)	30 (17)
Primary school	0 (0)	1 (<1)
Number of losses ($N = 237$), N (%)		
One	82 (41)	62 (36)
Two	60 (30)	57 (33)
Three	23 (12)	23 (13)
Four	30 (15)	26 (15)
Five	3 (2)	3 (2)
Six	1 (<1)	1 (<1)
Deceased relative is my ... ^a ($N = 236$), N (%)		
Child	55 (28)	45 (26)
Partner/spouse	9 (5)	5 (3)
Parent	24 (12)	22 (13)
Sibling	64 (32)	59 (35)
Other	47 (24)	40 (23)
PGD levels, M (SD)	26.8 (9.5)	23.5 (8.2)
Probable PGD caseness, N (%)	54 (27)	20 (12)
Total well-being levels, M (SD)	37.9 (14.5)	40.6 (13.9)
Below-average well-being, N (%)	84 (44)	65 (39)
High PGD/below-average well-being ^b	32 (17)	18 (11)
High PGD/above-average well-being	18 (10)	2 (1)
Low PGD/below-average well-being	51 (27)	47 (28)
Low PGD/above-average well-being	88 (47)	102 (60)
Average well-being levels, M (SD)		
Emotional well-being	3.0 (1.2)	3.2 (1.2)
Social well-being	2.2 (1.1)	2.4 (1.1)
Psychological well-being	3.0 (1.1)	3.1 (1.1)
Satisfaction with treatment by CJS professionals ($N = 171$), M (SD)	n/a	31.9 (5.4)
Satisfaction with verdict ($N = 171$), M (SD)	n/a	8.0 (2.0)
Statement delivery ^c ($N = 101$), N (%)	n/a	
Oral statement		24 (28)
Written statement		13 (15)
Oral statement, someone else		15 (17)
Written statement, someone else		5 (6)
Neither themselves nor someone else		29 (34)
Receipt of monetary compensation ($N = 169$), N (%)	n/a	
Immaterial compensation		56 (33)
Material compensation		3 (2)
Both		4 (2)
None		106 (63)
Number of statements listened to ^c ($N = 101$), N (%)	n/a	
None		29 (29)
1–10		43 (43)
11–20		8 (8)
21–40		8 (8)
41–60		3 (3)
61–80		2 (2)
81 or more		8 (8)

Note. At pre-trial, the total PGD score for one participant (<1%) and the total well-being score for nine (5%) were missing. At post-trial, the total well-being score for three participants (2%) was missing. 'n/a' is used when a variable was not assessed at a specific time point. A maximum of 57% of the data were missing on aspects of CJS involvement. CJS = Criminal Justice System; PGD = Prolonged Grief Disorder.

^aOnly the participant's closest relationship to the deceased was included in the analysis in case of multiple deaths, ordered from child, partner/spouse, parent, sibling to other.

^bHigh PGD is defined as PGD symptoms exceeding the cut-off score and whether participants were classified as having above- or below-average well-being was based on norm scores reported in the general population.

^cData regarding statement delivery and number of statements listened to were collected at post-statement ($N = 103$).

factor loading on each subscale). This was done while taking pre-trial total scores of PGD and well-being into account. Due to our relatively small sample, post-trial latent well-being levels were modelled using three well-being indicators, and pre-trial PGD and well-being total scores were used instead of latent variables, as including all indicators at each time point was not feasible. This decision was made to maintain a more parsimonious model, considering the complexity of the models relative to the available sample size (Kline, 2016). Given the additional complexity of the model relative to the available sample size, as well as the amount of missing data on several predictors and covariates, parameter estimates should be interpreted with appropriate caution as they may be unstable and sample-dependent.

The following aspects of CJS involvement (i.e. predictors), and background and loss-related variables (i.e. covariates) were included in the structural model: satisfaction with treatment by CJS professionals and the verdict (two continuous variables with higher values representing more satisfaction), statement delivery (0 = no, 1 = yes), receipt of monetary compensation (0 = no, 1 = yes), passive involvement (a continuous variable with higher values indicating a higher degree in which the participant followed the course of the criminal trial), biological sex (recoded as: 0 = male, 1 = female), level of education (0 = other, 1 = university (of applied sciences)), and (closest) relationship to the deceased (0 = other, 1 = child or spouse/partner). Data were dichotomised to prevent computational difficulties due to the limited sample size. Notably, participants assigned to the non-statement delivery group include participants who did not or could not deliver a statement in court. Participants assigned to the non-receipt of monetary compensation group include participants who did not or could not file a claim for compensation, and participants who filed a claim but reported that they did not receive compensation. We expected that greater satisfaction with treatment by CJS professionals and the verdict, to be related to lower latent PGD and higher latent well-being levels after the trial (cf. Lind & Tyler, 1988; Thibaut & Walker, 1975; Tyler, 2000). In addition, to what extent the remaining aspects of CJS involvement, i.e. whether the person delivered a statement, whether monetary compensation was received, and the number of statements listened to, relate to latent PGD and latent well-being levels after the trial was examined in an exploratory manner due to limited research.

2.5. Open science practices

The analytic plan was pre-registered on the Open Science Framework (ID number = fr4xb). The pseudonymized dataset, data dictionary, and Mplus output

files that support the findings of this study are available on the Data Archiving and Networked Services (DANS) repository using this link: <https://doi.org/10.17026/SS/HN5O05>. As stated in the pre-registration, we intended to examine whether longitudinal MI holds true for the factor structure of PGD and well-being when evaluated simultaneously by performing CFAs. Unfortunately, the models did not converge, likely due to the limited sample size. Thus, we first examined the factor structure of PGD and well-being separately at pre- and post-trial. After this, we examined whether longitudinal MI holds true for the constructs separately. Moreover, we did not anticipate more than 50% missing data on the variables 'statement delivery' and 'passive involvement'. Due to this, we conducted the same analysis without using imputed data (i.e. a sensitivity analysis). However, this model did not converge, again likely due to the limited sample size. For completeness, we further deviated from the originally planned analyses by examining associations between predictors and covariates and post-trial latent PGD and well-being levels without accounting for pre-trial PGD and well-being levels.

3. Results

3.1. Sample characteristics

Sample characteristics are displayed in Table 1. The majority of participants was female, born in the Netherlands, highly educated, lost multiple loved ones, and lost most often (at least) a sibling.

3.2. Factor structure of PGD

Fit indices of the PGD models at pre- and post-trial can be found in Table 2. The correlation between the PGD total score at pre- and post-trial was strong and positive ($\rho = .76$; $p < .001$). Note, distinctions were made between weak ($.10 \leq r/\rho < .30$), moderate ($.30 \leq r/\rho < .50$), and strong ($r/\rho \geq .50$) correlations (Cohen, 1988). At pre-trial, the CFI, TLI, and SRMR estimates suggested that both PGD models showed acceptable fit. Nevertheless, the significant chi-squared difference test and lower AIC, BIC, and SS-BIC estimates suggested that the two-factor PGD model exhibited superior fit when compared to the one-factor PGD model. The correlation between these two factors was strong and positive ($r = .88$; $p < .001$). At post-trial, the CFI, TLI, RMSEA, and SRMR estimates suggested that both PGD models showed acceptable fit. Nonetheless, the non-significant chi-squared difference test and relatively similar AIC, BIC, and SS-BIC estimates suggested that adding a second factor to the PGD model did not result in a significant improvement in fit. Considering the high correlation between the latent factors at pre-trial, the acceptable

fit of the one-factor PGD model at pre-trial, and the preference for the one-factor PGD model at post-trial, we chose to retain the one-factor PGD model at both time points for reasons of parsimony. This aligns with our expectation that the two-factor PGD model would not result in a relevant improvement in fit over the one-factor model. Thus, the hypothesis was retained. The factor loadings of the one-factor PGD models are displayed in Supplementary Figure 1.

3.3. Factor structure of well-being

Fit indices of the well-being models at pre- and post-trial can be found in Table 2. The correlation between the well-being total score at pre- and post-trial was strong and positive ($\rho = .77$; $p < .001$). At both pre- and post-trial, the one-factor well-being model did not show acceptable fit, as evidenced by the CFI, TLI, and RMSEA estimates. At both time points, the three-factor well-being model exhibited superior fit when compared to the one-factor well-being model. This was demonstrated by the significant chi-squared difference tests, estimates of CFI, RMSEA, and SRMR suggesting acceptable fit, as well as lower AIC, BIC, and SS-BIC estimates. The factors correlated strongly and positively at both pre- (r s ranging from .74 to .89; all p s $< .001$) and post-trial (r s ranging from .77 to .85; $p < .001$). Consequently, the three-factor well-being model was retained at both time points. This aligns with our expectation that the three-factor well-being model would fit the data better than the one-factor model. Thus, the hypothesis was retained. The factor loadings of the three-factor well-being models are displayed in Supplementary Figure 2.

3.4. Factor structure of PGD and well-being

As the three-factor well-being model was found to exhibit superior fit over the one-factor well-being model at pre- and post-trial, we included the item with the highest factor loading on average of each subscale to represent the underlying factors. The chosen indicators were item 2 (i.e. 'Positive affect' representing emotional well-being), item 4 (i.e. 'Social contribution' representing social well-being), and item 14 (i.e. 'Purpose in life' representing psychological well-being).

Fit indices of the PGD/well-being models at pre- and post-trial can be found in Table 2. At both pre- and post-trial, the CFI, TLI, and RMSEA estimates indicated that the one-factor PGD/well-being model did not show acceptable fit. At both time points, the two-factor PGD/well-being model exhibited superior fit when compared to the one-factor model. This was demonstrated by the significant chi-squared difference tests, estimates of CFI, TLI, RMSEA, and SRMR suggesting acceptable fit, as well as lower AIC, BIC, and SS-BIC estimates. The correlation between the factors was

Table 2. Fit indices of PGD and well-being models ($N = 237$).

Model	χ^2 (df)	df	$\Delta\chi^2$	CFI	TLI	RMSEA (90% CI)	SRMR	AIC	BIC	SS-BIC
PGD at pre-trial ($N = 199$)										
One-factor	116.93***	35		.933	.914	.108 (.087–.130)	.043	5318.35	5417.15	5322.11
Two-factor	105.34***	34	11.60***	.942	.923	.103 (.081–.125)	.040	5308.76	5410.85	5312.64
PGD at post-trial ($N = 172$)										
One-factor	84.23***	35		.949	.934	.090 (.066–.115)	.042	4269.44	4363.86	4268.87
Two-factor	80.73***	34	3.49	.951	.935	.089 (.064–.115)	.041	4267.95	4365.52	4267.36
Well-being at pre-trial ($N = 191^a$)										
One-factor	339.66***	77		.835	.805	.134 (.119–.148)	.067	8197.21	8333.81	8200.77
Three-factor	209.92***	74	129.74***	.915	.895	.098 (.083–.114)	.054	8073.47	8219.82	8077.28
Well-being at post-trial ($N = 170^b$)										
One-factor	273.30***	77		.845	.817	.122 (.107–.138)	.065	7308.64	7440.35	7307.36
Three-factor	179.32***	74	93.98***	.917	.898	.091 (.075–.109)	.053	7220.66	7361.77	7219.29
PGD/well-being models at pre-trial ($N = 199$)										
One-factor	307.97***	65		.836	.803	.137 (.122–.153)	.087	7288.82	7417.25	7293.70
Two-factor	161.62***	64	146.35***	.934	.920	.088 (.071–.104)	.056	7144.47	7276.20	7149.48
PGD/well-being models at post-trial ($N = 172$)										
One-factor	255.27***	65		.845	.814	.130 (.114–.147)	.081	5956.36	6079.11	5955.62
Two-factor	157.28***	64	97.98***	.924	.907	.092 (.074–.110)	.058	5860.38	5986.28	5859.62
Measurement invariance one-factor PGD model ($N = 237$)										
Configural	308.28***	159		.941						
Metric	311.48***	168	3.19	.943						
Scalar	324.65***	177	13.17	.942						
Measurement invariance three-factor well-being model ($N = 231^c$)										
Configural	594.65***	321		.915						
Metric	603.00***	332	8.34	.916						
Scalar	614.95***	343	11.95	.916						

Note. *** $p < .001$. PGD = Prolonged Grief Disorder; CFI = Comparative Fit Index; TLI = Tucker Lewis Index; RMSEA = Root Mean Square Error of Approximation; CI = Confidence Interval; SRMR = Standardised Root Mean Square Residual; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; SS-BIC = Sample-Size adjusted Bayesian Information Criterion.

^aEight participants had missing data on all well-being indicators.

^bTwo participants had missing data on all well-being indicators.

^cSix participants had missing data on all well-being indicators.

moderate and negative at pre-trial ($r = -.48$; $p < .001$), and strong and negative at post-trial ($r = -.63$; $p < .001$). As the two-factor PGD/well-being model exhibited superior fit when compared to the one-factor model at both pre- and post-trial, this model was retained. Based on the findings, it was concluded that configural invariance holds true for the two-factor PGD/well-being model. This aligns with our expectation that the two-factor PGD/well-being model would fit the data better than the one-factor model. Thus, the hypothesis was retained. Figure 1 displays the factor loadings of the two-factor PGD/well-being models.

3.5. Longitudinal measurement invariance of the one-factor PGD model and three-factor well-being model

The results of the longitudinal CFAs showed that the one-factor PGD model and the three-factor well-

being model demonstrated configural, metric, and scalar invariance over time (i.e. $\Delta CFI \leq 0.02$). This aligns with our expectation that both constructs – i.e. PGD and well-being – are invariant over time. Thus, the hypothesis was retained. The results can be found in Table 2.

3.6. Predictors and covariates of post-trial latent PGD levels and post-trial latent well-being levels

Pre-trial PGD levels predicted post-trial latent PGD levels, but not post-trial latent well-being levels, while taking all possible predictors and covariates into account (see Table 3). Specifically, higher pre-trial PGD levels were associated with higher post-trial latent PGD levels. Moreover, pre-trial well-being levels predicted post-trial latent well-being levels, but not post-trial latent PGD levels, while

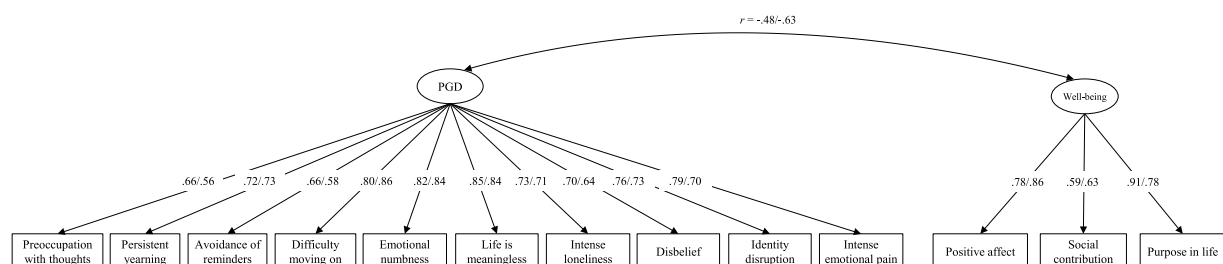


Figure 1. Two-factor PGD/well-being model at pre-trial ($N = 199$) and post-trial ($N = 172$). Note. Pre-trial factor loadings and correlations are on the left and those of post-trial on the right. Latent factors are visualised as ellipses and observed variables (measured indicators) are visualised as rectangles. PGD = Prolonged Grief Disorder.

Table 3. Predictors and covariates of post-trial latent PGD levels and post-trial latent well-being levels ($N = 172$).

Predictors and covariates	β	95% CI	SE
Post-trial latent PGD			
Satisfaction with treatment by CJS professionals	−0.01	[−0.18, 0.16]	0.09
Satisfaction with verdict	−0.13	[−0.31, 0.05]	0.09
Statement delivery	0.05	[−0.11, 0.20]	0.08
Receipt of monetary compensation	0.07	[−0.06, 0.21]	0.07
Passive involvement	0.04	[−0.12, 0.20]	0.08
Biological sex	0.09	[−0.04, 0.22]	0.07
Level of education	−0.10	[−0.23, 0.03]	0.07
Relationship to the deceased	0.10	[−0.04, 0.24]	0.07
Pre-trial PGD levels	0.55***	[0.40, 0.69]	0.07
Pre-trial well-being levels	−0.07	[−0.22, 0.08]	0.08
Post-trial latent well-being			
Satisfaction with treatment by CJS professionals	0.08	[−0.12, 0.29]	0.10
Satisfaction with verdict	−0.03	[−0.24, 0.19]	0.11
Statement delivery	−0.05	[−0.24, 0.15]	0.10
Receipt of monetary compensation	−0.03	[−0.19, 0.14]	0.08
Passive involvement	0.07	[−0.13, 0.26]	0.10
Biological sex	0.02	[−0.13, 0.18]	0.08
Level of education	−0.03	[−0.18, 0.12]	0.08
Relationship to the deceased	−0.01	[−0.17, 0.16]	0.08
Pre-trial PGD levels	−0.18	[−0.37, 0.01]	0.10
Pre-trial well-being levels	0.56***	[0.39, 0.73]	0.09

Note. *** $p < .001$. PGD = Prolonged Grief Disorder; CJS = Criminal Justice System; CI = Confidence Interval.

taking all possible predictors and covariates into account. Specifically, higher pre-trial well-being levels were associated with higher post-trial latent well-being levels. None of the predictors and covariates were predictive of post-trial latent PGD and well-being levels. This is contrary to our expectation that greater satisfaction with treatment by CJS professionals and the verdict would be related to lower latent PGD and higher latent well-being levels after the trial. Thus, the hypothesis was rejected. See Supplementary Table 1 for associations between predictors and covariates and post-trial latent PGD and well-being levels without accounting for pre-trial PGD and well-being levels.

4. Discussion

We investigated (1) whether the factor structure of PGD (using the DSM-5-TR criteria) and well-being remains stable over time, and (2) whether aspects of CJS involvement are related to latent PGD and well-being levels reported after the criminal trial, while accounting for levels reported before the criminal trial. To achieve this, we examined data of 237 people bereaved by the MH17 plane disaster.

Regarding our first objective, in line with our hypotheses and prior research (Iasiello et al., 2022; Kokou-Kpolou et al., 2022; Lenferink et al., 2022, 2023), we found support for the unidimensional structure of PGD and the three-dimensional structure of well-being. Moreover, the findings align with our hypothesis that both constructs are invariant over

time. Specifically, we extend prior research by being one of the first to show that the found factor structure shows longitudinal measurement invariance for PGD and well-being, when examined separately (Boelen & Lenferink, 2022; Joshanloo, 2020; Lamers et al., 2012). This means that PGD and well-being are measured in a similar way across time points, with a consistent factor structure and comparable measurement properties. This is crucial in longitudinal research to ensure that any changes observed in PGD and well-being levels are due to actual changes in the constructs being measured and not due to changes in how the measures operate. Note, however, that although the models converged despite our relatively small sample size, replication of the findings in larger samples is necessary to draw firmer conclusions.

In line with our hypothesis, the results regarding the factor model that combined PGD with well-being suggest that PGD and well-being are distinct, negatively related, constructs. Examining the factor structure of PGD and well-being (represented by three indicators) simultaneously in a two-factor model showed that the negative relationship found between the two constructs is stable over time and unlikely to be attributed to measurement error. These findings provide tentative evidence for the dual-continua model (Keyes, 2005; Westerhof & Keyes, 2010) and its generalizability to bereaved people (Reitsma et al., 2024). Specifically, as previously found (Reitsma et al., 2024), the results show that a bereaved person with probable PGD does not necessarily experience below-average well-being levels and vice versa. Notably, however, the conclusions should be interpreted with caution and as preliminary, as our limited sample did not allow for us to include all well-being indicators in the analyses. If replicated in future research using all well-being indicators, mental healthcare professionals may want to assess and treat well-being levels in addition to disturbed grief. Bereaved people who report below-average well-being levels may benefit from a positive psychology intervention targeting well-being, while those who experience clinically relevant PGD levels alongside below-average well-being levels may benefit from such an intervention following a grief-focused intervention, if well-being remains low (cf. e.g. Bolier et al., 2013). Future studies may want to examine which positive psychology interventions would work well in conjunction with existing grief therapies (e.g. grief-focused cognitive-behavioural therapy).

Regarding our second objective, none of the aspects of CJS involvement – i.e. the degree of satisfaction with treatment by CJS professionals and the verdict, whether a statement was delivered, whether monetary compensation was received, and the number of statements listened to – were longitudinally related to PGD and well-being levels reported after the trial. The

findings are not in line with our hypothesis and inconsistent with the framework of therapeutic jurisprudence and procedural and distributive justice theories (cf. Lind & Tyler, 1988; Thibaut & Walker, 1975; Tyler, 2000; Wexler & Winick, 2008).

The findings regarding aspects of CJS involvement have both clinical and theoretical implications. As the longitudinal design of the present study allowed us to account for prior PGD and well-being levels, our results regarding whether aspects of CJS involvement relate to the different continua of mental health have more rigour than those of previous research that did not account for prior levels. Specifically, the findings suggest that levels reported prior to the trial are better predictors of levels reported after the trial than aspects of CJS involvement. If replicated, the findings may indicate that for bereaved people CJS involvement has neither advantages nor disadvantages in terms of mental health. To elaborate, at the group level, no statistically reliable association was detected between CJS involvement and PGD levels or well-being levels, suggesting involvement does not advantage (i.e. decrease PGD levels and/or increase well-being levels) or disadvantage (i.e. increase PGD levels and/or decrease well-being levels) the bereaved. Notably, these conclusions are drawn with caution, as our relatively small sample may have limited the power to detect possible differences. Moreover, a theoretical implication could be that the framework of therapeutic jurisprudence and procedural and distributive justice theories require refinement with regards to criminal proceedings involving bereaved people. To elaborate, the theories are based on experiences of non-bereaved crime victims with various legal procedures and primarily suggest effects at the group level. Our findings, however, call into question whether the framework and theories generalise to bereaved crime victims. Despite not observing effects at the group level, CJS involvement may still have an impact on the mental health of some bereaved people (see e.g. Kunst et al., 2015).

Several strengths of this study are noteworthy. First, all participants were bereaved by the same crime and were, therefore, confronted with the same criminal trial. As a result, neither aspects of the trial nor crime could confound the findings. Second, the longitudinal design of the study allowed us to examine the stability of the dual-continua model over time. Consequently, we are able to make firmer statements about the relationship between PGD and well-being, and in a broader sense the relationship between both continua of mental health (i.e. well-being and mental illness).

Besides having several strengths, the present study also has its limitations. Specifically, there are also aspects that jeopardise the generalisability of the findings to other bereaved samples. To begin with, due to our relatively small sample size, not all well-being indicators could be included in the analyses.

Therefore, future studies with larger samples may want to examine whether including all well-being indicators results in similar findings. Notably, while other factors (e.g. comorbid symptoms or potential interventions) may influence PGD and well-being levels in general, these were beyond the scope of the current study. Also, the cause of death and the aftermath were the same for all participants, resulting in the sample being relatively homogeneous. In a similar vein, not only was the event unique, but also its aftermath. For example, special measures were taken to ensure that MH17-bereaved people received the best possible care. The criminal trial also had several unique features, such as the fact that it concerned 298 victims, that more than 100 bereaved people exercised their right to speak, and that it involved four defendants who were unknown to the bereaved and all absent during the trial. Consequently, the findings may not generalise to people bereaved by other causes or confronted by other criminal trials. Furthermore, the findings may also not generalise to all MH17-bereaved people due to self-selected sampling. Moreover, multiple imputation was used to handle missing data on predictors and covariates, with two predictors (i.e. statement delivery and passive involvement) having 57% missing data. Considering the sensitivity analysis did not converge, the findings regarding these variables should be interpreted with caution. Notably, the use of multiple imputation was driven by the need to provide insight into possible trial-related predictors (e.g. statement delivery and passive involvement) that are rarely assessed in bereaved samples and were central to this research. Lastly, some participants provided answers for statement delivery and receipt of monetary compensation that were not legally possible within the confines of the criminal trial. This pertains to approximately one percent of the sample. While unlikely, self-report might have slightly biased the findings. Related to this, imputing data for the variables statement delivery and receipt of monetary compensation may have also resulted in combinations that were not legally possible, e.g. a friend of the deceased that delivered a statement or non-cohabiting siblings that received compensation. This pertains to approximately one-tenth of the sample, and may have introduced bias. Considering the amount of missing data, the findings should be considered preliminary. Replication in future studies with larger samples is necessary to draw firm conclusions about the relationships between aspects of CJS involvement and PGD and well-being levels.

In conclusion, this is to the best of our knowledge the first longitudinal CFA study indicating that mental illness is related, yet distinct from mental well-being in a sample of bereaved people. Moreover, this is also the very first study providing empirical support for the

applicability of the dual-continua model of mental health after bereavement, by showing that PGD and mental well-being are distinct, negatively related constructs that do not predict each other over time. In addition, we found that PGD and well-being levels before the trial are better predictors of levels after the trial than aspects of CJS involvement. All in all, our findings contribute to a better understanding of mental health in bereaved people, which is not merely characterised by the absence of PGD, but should also comprise the presence of mental well-being.

Acknowledgements

We extend our deepest gratitude to everyone who participated in the study. Moreover, there are several people we would like to thank for their efforts regarding recruitment. Specifically, research assistant Marjel Buiters, people from the MH17 Disaster Foundation, Victim Support Netherlands and the MH17 legal aid team, as well as family liaison officers of the Dutch police.

Author contributions

Lieke C.J. Nijborg: Data curation, Formal analysis, Investigation, Visualization, Writing – original draft, Writing – review & editing. **Gerben J. Westerhof:** Investigation, Supervision, Writing – review & editing. **Maarten J.J. Kunst:** Funding acquisition, Investigation, Supervision, Writing – review & editing. **Jos de Keijser:** Funding acquisition, Investigation, Supervision, Writing – review & editing. **Lonneke I.M. Lenferink:** Conceptualization, Formal analysis, Funding acquisition, Investigation, Methodology, Project administration, Resources, Supervision, Writing – original draft, Writing – review & editing.

Disclosure statement

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

Funding

This work was supported by the Dutch Ministry of Justice and Security under Grant [number 20002853]; Stichting Achmea Slachtoffer en Samenleving (SASS) under Grant [number 201230]; and Fonds Slachtofferhulp.

Data availability statement

The pseudonymized dataset, data dictionary, and Mplus output files that support the findings of this study are available on the DANS repository using this link: <https://doi.org/10.17026/SS/HN5O05>

ORCID

Lieke C.J. Nijborg  <http://orcid.org/0009-0003-8425-2693>

Gerben J. Westerhof  <http://orcid.org/0000-0002-0993-1448>
Maarten J.J. Kunst  <http://orcid.org/0000-0002-2790-9260>
Jos de Keijser  <http://orcid.org/0000-0003-1229-3042>
Lonneke I.M. Lenferink  <http://orcid.org/0000-0003-1329-6413>

References

- American Psychiatric Association. (2022). *Diagnostic and statistical manual of mental disorders*. American Psychiatric Association Publishing.
- Armour, M. P. (2002a). Experiences of covictims of homicide: Implications for research and practice. *Trauma, Violence, & Abuse*, 3(2), 109–124. <https://doi.org/10.1177/15248380020032002>
- Armour, M. P. (2002b). Journey of family members of homicide victims: A qualitative study of their posthomicide experience. *American Journal of Orthopsychiatry*, 72(3), 372–382. <https://doi.org/10.1037/0002-9432.72.3.372>
- Bennett Cattaneo, L., & Goodman, L. A. (2010). Through the lens of therapeutic jurisprudence: The relationship between empowerment in the court system and well-being for intimate partner violence victims. *Journal of Interpersonal Violence*, 25(3), 481–502. <https://doi.org/10.1177/0886260509334282>
- Boelen, P. A., & Lenferink, L. I. M. (2022). Prolonged grief disorder in DSM-5-TR: Early predictors and longitudinal measurement invariance. *Australian & New Zealand Journal of Psychiatry*, 56(6), 667–674. <https://doi.org/10.1177/00048674211025728>
- Bolier, L., Haverman, M., Westerhof, G. J., Riper, H., Smit, F., & Bohlmeijer, E. T. (2013). Positive psychology interventions: A meta-analysis of randomized controlled studies. *BMC Public Health*, 13(1), 119. <https://doi.org/10.1186/1471-2458-13-119>
- Buiters, M. Y., Boelen, P. A., Kunst, M. J. J., Gerlsma, C., de Keijser, J., & Lenferink, L. I. M. (2022). The mediating role of state anger in the associations between intentions to participate in the criminal trial and psychopathology in traumatically bereaved people. *International Journal of Law and Psychiatry*, 85, 101840. <https://doi.org/10.1016/j.ijlp.2022.101840>
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Lawrence Erlbaum Associates.
- Connolly, J., & Gordon, R. (2015). Co-victims of homicide: A systematic review of the literature. *Trauma, Violence, & Abuse*, 16(4), 494–505. <https://doi.org/10.1177/1524838014557285>
- Craig, C. D., Sossou, M.-A., Schnak, M., & Essex, H. (2008). Complicated grief and its relationship to mental health and well-being among Bosnian refugees after resettlement in the United States: Implications for practice, policy, and research. *Traumatology*, 14(4), 103–115. <https://doi.org/10.1177/1534765608322129>
- Dababneh, N., Margraf, J., Zhang, X. C., & Brailovskaia, J. (2024). The protective role of positive mental health on prolonged grief disorder, anxiety and depression among bereaved refugees: Cross-sectional mediation models. *Current Psychology*, 43(18), 16412–16420. <https://doi.org/10.1007/s12144-023-05602-0>
- da Costa, D. H., Njaine, K., & Schenker, M. (2017). Repercussions of homicide on victims' families: A literature review. *Ciência & Saúde Coletiva*, 22(9), 3087–3097. <https://doi.org/10.1590/1413-81232017229.18132016>

- 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, 853698. <https://doi.org/10.3389/fpsy.2022.853698>
- Dutch Safety Board. (2015). *MH17 Crash*. Dutch safety board. <https://www.government.nl/topics/mh17-incident/investigation-by-the-dutch-safety-board>
- Englebrecht, C. M., Mason, D. T., & Adams, M. J. (2014). The experiences of homicide victims' families with the criminal justice system: An exploratory study. *Violence and Victims*, 29(3), 407–421. <https://doi.org/10.1891/0886-6708.VV-D-12-00151>
- Franken, K., de Vos, S., Westerhof, G. J., & Bohlmeijer, E. T. (2019). *De mental health continuum short-form (MHC-SF): Een handleiding voor behandelaars in de geestelijke gezondheidszorg [The Mental Health Continuum Short-Form (MHC-SF): A guide for mental health practitioners]*. Hageraars, J. A. P., & McCutcheon, A. L. (Eds.). (2002). *Applied latent class analysis*. Cambridge University Press. <https://www.cambridge.org/core/books/applied-latent-class-analysis/30C364913C52083262DD7CE5A2E05685>
- 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*, 8(sup6), 1583524. <https://doi.org/10.1080/20008198.2019.1583524>
- Iasiello, M., van Agteren, J., & Muir-Cochrane, E. C. (2020). Mental health and/or mental illness: A scoping review of the evidence and implications of the dual-continua model of mental health. *Evidence Base*, 2020(1), 1–45. <https://doi.org/10.21307/eb-2020-001>
- Iasiello, M., van Agteren, J., Schotanus-Dijkstra, M., Lo, L., Fassnacht, D. B., & Westerhof, G. J. (2022). Assessing mental wellbeing using the mental health continuum—short form: A systematic review and meta-analytic structural equation modelling. *Clinical Psychology: Science and Practice*, 29(4), 442–456. <https://doi.org/10.1037/cps0000074>
- Jöreskog, K. G. (1969). A general approach to confirmatory maximum likelihood factor analysis. *Psychometrika*, 34(2), 183–202. <https://doi.org/10.1007/BF02289343>
- Joshanloo, M. (2020). Factorial/discriminant validity and longitudinal measurement invariance of MHC-SF in Korean young adults. *Current Psychology*, 39(1), 51–57. <https://doi.org/10.1007/s12144-017-9742-1>
- Keyes, C. L. M. (1998). Social well-being. *Social Psychology Quarterly*, 61(2), 121–140. <https://doi.org/10.2307/2787065>
- Keyes, C. L. M. (2002). The mental health continuum: From languishing to flourishing in life. *Journal of Health and Social Behavior*, 43(2), 207–222. <https://doi.org/10.2307/3090197>
- Keyes, C. L. M. (2005). Mental illness and/or mental health? Investigating axioms of the complete state model of health. *Journal of Consulting and Clinical Psychology*, 73(3), 539–548. <https://doi.org/10.1037/0022-006X.73.3.539>
- Keyes, C. L. M. (2009). *Brief description of the mental health continuum short form (MHC-SF)*. <http://www.sociology.emory.edu/ckeyes/>
- Keyes, C. L. M., Wissing, M., Potgieter, J. P., Temane, M., Kruger, A., & van Rooy, S. (2008). Evaluation of the mental health continuum—short form (MHC-SF) in setswana-speaking South Africans. *Clinical Psychology & Psychotherapy*, 15(3), 181–192. <https://doi.org/10.1002/cpp.572>
- Kline, R. B. (2016). *Principles and practice of structural equation modeling* (4th ed.). The Guildford Press.
- Kokou-Kpolou, C. K., Moukouta, C. S., Masson, J., Bernoussi, A., Cénat, J. M., & Bacqué, M.-F. (2020). Correlates of grief-related disorders and mental health outcomes among adult refugees exposed to trauma and bereavement: A systematic review and future research directions. *Journal of Affective Disorders*, 267, 171–184. <https://doi.org/10.1016/j.jad.2020.02.026>
- Kokou-Kpolou, C. K., Lenferink, L. I. M., Brunnet, A. E., Park, S., Megalakaki, O., Boelen, P. A., & Cénat, J. M. (2022). The ICD-11 and DSM-5-TR prolonged grief criteria: Validation of the traumatic grief inventory-self report plus using exploratory factor analysis and item response theory. *Clinical Psychology & Psychotherapy*, 29(6), 1950–1962. <https://doi.org/10.1002/cpp.2765>
- Kunst, M. J. J., Popelier, L., & Varekamp, E. (2015). Victim satisfaction with the criminal justice system and emotional recovery: A systematic and critical review of the literature. *Trauma, Violence, & Abuse*, 16(3), 336–358. <https://doi.org/10.1177/1524838014555034>
- Lamers, S. M. A., Glas, C. A. W., Westerhof, G. J., & Bohlmeijer, E. T. (2012). Longitudinal evaluation of the mental health continuum-short form (MHC-SF): Measurement invariance across demographics, physical illness, and mental illness. *European Journal of Psychological Assessment*, 28(4), 290–296. <https://doi.org/10.1027/1015-5759/a000109>
- Lamers, S. M. A., Westerhof, G. J., Bohlmeijer, E. T., ten Klooster, P. M., & Keyes, C. L. M. (2011). Evaluating the psychometric properties of the mental health continuum-short form (MHC-SF). *Journal of Clinical Psychology*, 67(1), 99–110. <https://doi.org/10.1002/jclp.20741>
- Lazarsfeld, P. F. (1950). The logical and mathematical foundation of latent structure analysis. In S. A. Stouffer, L. Guttman, E. A. Suchman, P. F. Lazarsfeld, S. A. Star, & J. A. Clausen (Eds.), *Studies in social psychology world war II: Measurement and prediction* (Vol. 4, pp. 361–412). Princeton University Press.
- Lenferink, L. I. M., de Keijser, J., Smid, G. E., Djelantik, A. A. A. M. J., & Boelen, P. A. (2017). Prolonged grief, depression, and posttraumatic stress in disaster-bereaved individuals: Latent class analysis. *European Journal of Psychotraumatology*, 8(1), 1298311. <https://doi.org/10.1080/20008198.2017.1298311>
- 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, 152281. <https://doi.org/10.1016/j.comppsy.2021.152281>
- Lenferink, L. I. M., Nickerson, A., de Keijser, J., Smid, G. E., & Boelen, P. A. (2019). Reciprocal associations among symptom levels of disturbed grief, posttraumatic stress, and depression following traumatic loss: A four-wave cross-lagged study. *Clinical Psychological Science*, 7(6), 1330–1339. <https://doi.org/10.1177/2167702619858288>
- 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*, 31(1), e2922. <https://doi.org/10.1002/cpp.2922>
- Lind, A. E., & Tyler, T. R. (1988). *The social psychology of procedural justice* (M. J. Lerner, Ed.). Springer Science + Business Media, LLC.
- Milman, E., Williams, J. L., Bountress, K., & Rheingold, A. A. (2018). The relationship between experiences with the criminal justice system and mental health outcomes among survivors of homicide. *Violence and Victims*, 33(2), 310–329. <https://doi.org/10.1891/0886-6708.VV-D-16-00124>
- Ministry of Justice and Security. (n.d.). *Vervolging en rechtszaak*. Ministerie van Justitie en Veiligheid. Openbaar Ministerie. Retrieved <https://www.om.nl/onderwerpen/mh17-vliegkamp/vervolging-en-rechtszaak>.
- Muthén, L. K., & Muthén, B. O. (1998). *Mplus user's guide (version eighth edition) [computer software]*. Muthén & Muthén.
- Muthén, L. K., & Muthén, B. O. (2021). *Chi-square difference testing using the Satorra-Bentler scaled Chi-square* [Online post].
- Nijborg, L. C. J., Kunst, M. J. J., Westerhof, G. J., de Keijser, J., & Lenferink, L. I. M. (2024). Grief and delivering a statement in court: A longitudinal mixed-method study among homicidally bereaved people. *European Journal of Psychotraumatology*, 15(1), 2297541. <https://doi.org/10.1080/2008066.2023.2297541>
- Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review*, 41, 71–90. <https://doi.org/10.1016/j.dr.2016.06.004>
- Rechtbank Den Haag. (2022). *ECLI:NL:RBDHA:2022:12216*. De Rechtspraak. <https://deeplink.rechtspraak.nl/uitspraak?id=ECLI:NL:RBDHA:2022:12216>
- Reitsma, L., Mooren, T. T. M., Mouthaan, J., Groen, S. P. N., van Hoof, M.-J., van Dijk, I., Boelen, P. A., & Lenferink, L. I. M. (2024). A latent class analysis on indicators of early prolonged grief disorder and well-being among Dutch adults bereaved during the first year of the COVID-19 pandemic. *Clinical Psychology & Psychotherapy*, 31(5), 1–15. <https://doi.org/10.13140/RG.2.2.29694.77129>
- 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>
- Ryff, C. D. (1989). Happiness is everything, or is it? Explorations on the meaning of psychological well-being. *Journal of Personality and Social Psychology*, 57(6), 1069–1081. <https://doi.org/10.1037/0022-3514.57.6.1069>
- Ryff, C. D. (2014). Psychological well-being revisited: Advances in the science and practice of eudaimonia. *Psychotherapy and Psychosomatics*, 83(1), 10–28. <https://doi.org/10.1159/000353263>
- Thibaut, J. W., & Walker, L. (1975). *Procedural justice: A psychological analysis*. Erlbaum.
- Treml, J., Brähler, E., & Kersting, A. (2022). Prevalence, factor structure and correlates of DSM-5-TR criteria for prolonged grief disorder. *Frontiers in Psychiatry*, 13, 880380. <https://doi.org/10.3389/fpsy.2022.880380>
- Treml, J., Linde, K., Brähler, E., & Kersting, A. (2024). Prolonged grief disorder in ICD-11 and DSM-5-TR: Differences in prevalence and diagnostic criteria. *Frontiers in Psychiatry*, 15, 1266132. <https://doi.org/10.3389/fpsy.2024.1266132>
- Tyler, T. R. (2000). Social justice: Outcome and procedure. *International Journal of Psychology*, 35(2), 117–125. <https://doi.org/10.1080/002075900399411>
- van de Schoot, R., Lugtig, P., & Hox, J. (2012). A checklist for testing measurement invariance. *European Journal of Developmental Psychology*, 9(4), 486–492. <https://doi.org/10.1080/17405629.2012.686740>
- Villaceros, M., Serrano, I., Bermejo, J.-C., Magaña, M., & Carabias, R. (2014). Social support and psychological well-being as possible predictors of complicated grief in a cross-section of people in mourning. *Anales de Psicología*, 30(3), 944–951. <https://doi.org/10.6018/analesps.30.3.154691>
- Waterman, A. S. (1993). Two conceptions of happiness: Contrasts of personal expressiveness (eudaimonia) and hedonic enjoyment. *Journal of Personality and Social Psychology*, 64(4), 678–691. <https://doi.org/10.1037/0022-3514.64.4.678>
- Wemmers, J.-A. M. (2013). Victims' experiences in the criminal justice system and their recovery from crime. *International Review of Victimology*, 19(3), 221–233. <https://doi.org/10.1177/0269758013492755>
- Westerhof, G. J. (2013). The complete mental health model: The social distribution of mental health and mental illness in the Dutch population. In C. L. M. Keyes (Ed.), *Mental well-being: International contributions to the study of positive mental health* (pp. 51–70). Springer Science + Business Media. https://doi.org/10.1007/978-94-007-5195-8_3
- Westerhof, G. J., & Keyes, C. L. M. (2010). Mental illness and mental health: The two continua model across the lifespan. *Journal of Adult Development*, 17(2), 110–119. <https://doi.org/10.1007/s10804-009-9082-y>
- Wexler, D. B., & Winick, B. J. (2008). Therapeutic jurisprudence. In R. K. Ries, D. A. Fiellin, S. C. Miller, & R. Saitz (Eds.), *Principle of addiction medicine* (4th ed., pp. 1–10). Lippincott Williams & Wilkins.