Research paper

Psychopathology in a treatment-seeking sample of homicidally bereaved individuals: Latent class analysis

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ABSTRACT

Background: Violently bereaved individuals are at increased risk of developing severe and comorbid disorders. Comorbidity may increase psychiatric symptom severity and suicide risk and decrease psychosocial functioning compared with having one disorder. We aimed to identify subgroups of individuals with similar symptom patterns, describe prevalence rates and overall levels of prolonged grief disorder (PGD), posttraumatic stress disorder (PTSD), major depressive disorder (MDD), and generalized anxiety disorder (GAD) per class, and explore associations between class membership and personal and homicide related variables.
Methods: We investigated the comorbidity of symptoms of PGD, PTSD, MDD, and GAD in a sample of 923 treatment-seeking homicidally bereaved individuals by deploying latent class analysis.
Results: Three subgroups were identified: (i) a moderate distress, low depression class (12.4%), (ii) a high distress, moderate depression class (42.7%), and (iii) a high distress and high depression class (45.0%). Prevalence rates and total scores of the questionnaires followed the pattern of iii $\geq$ ii $\geq$ i (ps $\leq$ .001). Being female and having experienced prior life stress distinguished between all classes (ps $\leq$ .05). Limitations: The data-driven analytic approach and reliance on self-reported routine outcome monitoring data limit the generalizability and validity of the study. Strengths include the large sample size and the inclusion of four measures in a treatment-seeking, violently bereaved sample.
Conclusions: Classes were most clearly distinguishable based on symptom severity, indicating high comorbidity following bereavement by homicide. This argues for an integrated treatment that targets different complaints simultaneously rather than successively.

1. Introduction

Violently bereaved individuals are at increased risk of developing severe and prolonged psychological distress (e.g., Boelen et al., 2015; van Denderen et al., 2015) compared to other bereaved populations (e. g., Djelantik et al., 2020; Kristensen et al., 2009). Violent loss can cause both separation distress connected to the loss of attachment bonds, and traumatic distress due to the adverse circumstances of the death (van

Denderen et al., 2016) and is most commonly associated with prolonged grief disorder (PGD) (also known as Persistent Complex Bereavement Disorder), posttraumatic stress disorder (PTSD), depression and generalized anxiety (Djelantik et al., 2017; Lenferink et al., 2017; Nickerson et al., 2014; Schaal et al., 2012).

Although some PGD, PTSD, depression and anxiety symptoms overlap, the symptom clusters represent related, but distinguishable constructs (Boelen and van den Bout, 2005; Boelen, 2013; Dillen et al.,

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2009). PGD and depression share similar reactions such as feelings of sadness and guilt and loss of interest in activities. However, PGD is distinct in symptoms such as longing for and preoccupation with the deceased (World Health Organization, 2018). Characteristics of PTSD include intrusion and avoidance symptoms, negative alterations in thoughts and feelings and arousal, and reactivity symptoms (American Psychological Association, 2013), while a main characteristic of bereavement-related generalized anxiety is excessive worry about the loss and confrontation with one's own mortality (Shear and Skritskaya, 2012). PTSD typically includes threat-related anxiety, whereas PGD includes mainly separation anxiety (Lichtenthal et al., 2004).

PGD, PTSD, depression, and anxiety frequently co-occur in bereaved samples (Brown et al., 2001; Fisher et al., 2020). Patients with co-morbid disorders report greater psychiatric symptom severity, suicide risk, and symptomatic distress and poorer psychosocial functioning, compared with patients with one single disorder (Cyranowski et al., 2012). Psychotherapy can effectively reduce symptomatology following bereavement, however, there is evidence that a slight majority of bereaved patients undergoing psychotherapy does not fully recover (Boelen and Smid, 2017).

Treatment outcomes differ for subgroups of patients who display different patterns of comorbidity (Smid et al., 2015). To be able to tailor interventions to the needs of these subgroups, it is important to identify relevant subgroups (Rosner, 2015). Individuals bereaved by homicide constitute a specific example of violently bereaved in which symptom severity is high and disorders frequently co-occur (Soydas et al., 2020). Therefore, this population makes an interesting sample to explore co-morbidity patterns. Latent class analysis (LCA) identifies subgroups of individuals who share similar characteristics, based on predefined indicators (e.g., presence of symptoms) (Djelantik et al., 2017; Eisma et al., 2019).

To this date, only one study investigated subgroups of treatment-seeking individuals affected by trauma and loss (i.e., various death causes). That study identified a resilient class, a class of patients with prominent PTSD and depression symptoms, a class of patients with prominent PGD and PTSD symptoms, and one class of patients with prominent PGD, PTSD and depression symptoms (Djelantik et al., 2019). It would be interesting to investigate whether similar subgroups can be distinguished in a sample with solely homicidally bereaved treatment-seeking individuals.

Previous LCAs investigating broader samples of violently bereaved have included various combinations of PGD with PTSD or depression. One communal finding of these studies is a high distress class, in which PGD is present together with either PTSD or depression (Boelen et al., 2016; Eisma et al., 2019; Heeke et al., 2017b; Lenferink et al., 2017; Nickerson et al., 2014). Including PGD, PTSD, and depression as well as indicators of functional impairment together in one study will provide valuable information about the co-occurrence of a broader range of psychopathology following violent loss. Furthermore, because anxiety is a known outcome following violent loss, it would be of great interest to investigate whether or not a subgroup exists, characterized especially by anxiety next to symptoms of PGD, PTSD and depression. In addition, to predict membership of the classes, it is of importance to fortify existing knowledge on predictors of class membership and to extend this knowledge to the population of homicidally bereaved individuals.

Accordingly, the current study aimed to investigate the comorbidity of symptoms of PGD, PTSD, Major Depressive Disorder (MDD) and Generalized Anxiety Disorder (GAD) by (i) deploying LCA to identify subgroups of homicidally bereaved persons on the basis of dichotomously scored symptoms of PGD, PTSD, MDD and GAD; (ii) describing the prevalence rates of clinically relevant PGD, PTSD, MDD, and GAD for the emerging classes, and testing the difference between classes in terms of overall PGD, PTSD, MDD and GAD severity and functional impairment; and (iii) exploring associations between class membership and personal and homicide related variables. Because of the violent nature of the loss and the clinical nature of the sample, comorbidity is expected to be high. For our first aim, following the findings of the LCA in a treatment-seeking population by Djelantik et al. (2019), we expected to identify three to four classes that are distinguishable in terms of the *nature* of their symptoms (with classes evidencing high scores on some but not all symptom dimensions), rather than *severity* (with classes characterized by increasing scores across all symptom dimensions). Concerning our second aim, we expected to find a class with more pervasive symptoms on all disorders and in which functional impairment is high, and to find a class with predominantly PGD symptoms. Due to the treatment-seeking sample used in this study, we did not expect to find a resilient class, but, instead, a class with relatively low symptom severities. Since this is the first study to perform an LCA in a homicidally bereaved, treatment-seeking sample and to include GAD symptoms, alongside PGD, PTSD and MDD, we did not formulate more specific hypotheses regarding the makeup of the classes. Concerning our last aim, based on previous studies, we expected female gender, younger age, closer kinship to the victim, and functional impairment to be predictive of membership of the class showing the highest co-occurrence of symptoms across disorders (Boelen et al., 2016; Eisma et al., 2019; Heeke et al., 2017b; Lenferink et al., 2017; Nickerson et al., 2014).

2. Methods

2.1. Participants and procedure

.Participants were adult homicidally bereaved individuals from the UK, who were reached out to by homicide support agencies that provide practical, judicial, and emotional support to homicide survivors. Upon request by the bereaved individual or suggestion by the homicide support agency, a referral could be made for specialist therapeutic services. Data for the current study were collected by ASSIST Trauma Care, one of the agencies offering this service and operating across England and Wales Following referral, the patient could choose for a short ('early') intervention consisting of psycho-education and strengthening coping strategies only, or engage in traumatic-grief focused cognitive behavioral therapy (TGF-CBT) in accord with the clinical guidelines of the National Institute for Health and Care Excellence (NICE) for mental health care (National Collaborating Centre for Mental Health, 2005; World Health Organization, 2018). For diagnostic and evaluation purposes, the Impact of Event Scale (IES; described in more detail below), tapping PTSD, was administered at intake and at end of treatment. Later, measures tapping PGD, MDD, GAD and functional impairment were added to enable a more comprehensive evaluation of treatment effects. Data of those who engaged and completed the TGF-CBT between January 2011 and December 2017 were made available to the researchers with consent of the patients. In the current study, 923 homicidally bereaved adults were included who had completed the TGF-CBT and who completed at least one questionnaire at intake. See Supplementary Figure 1 for a flowchart of patients included in this study. Since patients did not actively seek treatment, they have also been referred to as 'treatment starting' in prior research (Soydas et al., 2020). However, since patients committed themselves to following a full trauma-focused therapy, in the current study, we refer to them as 'treatment-seeking'.

2.2. Ethical standards

This study was reviewed by the Ethics Review Board of the Faculty of Social and Behavioral Sciences of Utrecht University (filed under number 19-241). Because data were collected as part of routine outcome monitoring (ROM) for diagnostic purposes, and not primarily for research, the study was exempted from further evaluation from a medical ethics committee. All participants were informed that their answers could anonymously be used for research and those who agreed signed a written consent form.

2.3. Measures

2.3.1. Prolonged Grief

The Inventory of Complicated Grief (ICG) (Prigerson et al., 1995) was used to measure self-reported symptoms of PGD consistent with Prigerson et al. (2009) and additional markers of disturbed grief. The ICG has 19 items, e.g., "I cannot accept the death of the person who died". Participants are instructed to indicate how often they experienced the symptoms in the past month on 5-point scales ranging from 0 (*never)* to 4 (*always*). As suggested by Prigerson et al. (1995), a score of 26 was used as cut-off for clinically relevant PGD. Internal consistency in the current study was good (α = .86).

2.3.2. Posttraumatic stress

The IES (Horowitz et al., 1979) was used to measure self-reported symptoms of posttraumatic stress as defined in the DSM-IV (American Psychiatric Association, 2000). Participants are asked to indicate how frequently they experienced each of the 15 symptoms, such as "I had dreams about it", during the past seven days. The items are scored on 4-point scales with anchors 0 (*not at all*), 1 (*rarely experienced*), 3 (*sometimes experienced*), and 5 (*often experienced*). Item scores were summed to yield a total traumatic stress score. Following Horowitz et al. (1979), a score of 26 or higher was used as a cut-off for clinically relevant scores. Internal consistency of the scale in the current study was acceptable (α = 0.78).

2.3.3. Major depression

The Patient Health Questionnaire depression scale (PHQ-9) (Kroenke and Spitzer, 2002) was used to measure self-reported symptoms of major depression. Participants are asked how much they have been bothered by nine problems during the last two weeks (e.g., "feeling down, depressed, or hopeless"). Items are rated on a 4-point scale ranging from 0 (*not at all*) to 3 (*nearly every* day). Total scores can be used to qualify the level of depression, with a score of 15 or higher indicating at least a moderately severe depression (Kroenke and Spitzer, 2002). In the current study, Cronbach's alpha was good (α = 0.85).

2.3.4. Generalized anxiety

The Generalized Anxiety Disorder Scale (GAD-7) (Spitzer et al., 2006) was used to measure self-reported symptoms of generalized anxiety. Participants are asked how often during the last two weeks they had been bothered by seven anxiety symptoms (e.g., "Trouble relaxing") on a 4-point scale ranging from 0 (*not at all*) to 3 (*nearly every day*). Total scores can range from 0 - 21, with a score of 10 or higher indicating at least moderate generalized anxiety (Spitzer et al., 2006). Internal consistency in the current study was good (α = 0.84).

2.3.5. Functional impairment

The Work and Social Adjustment Scale (WSAS) (Mundt et al., 2002) measures how much a particular problem (in this case: having lost a loved one to homicide) impairs participants in carrying out certain day-to-day tasks (e.g. "Because of my [problem] my ability to work is impaired"). The questionnaire contains five items scored on a scale of 0 (*not at all*) to 8 (*very severely*). A score above 20 suggests significant functional impairment which is associated with moderately severe or worse psychopathology (Mundt et al., 2002). Cronbach's alpha of the WSAS was good (α = 0.81).

2.3.6. Personal and homicide related variables

We examined whether class membership was associated with personal and homicide related characteristics. Age (in years), gender (0 = Male, 1 = Female), and so-termed 'prior life stress' as indicated by previous mental health treatment and/or prior life stress (0 = No, 1 = Yes) constituted the personal variables. Homicide related information included the following variables: relationship to the deceased, as defined by having lost a partner or a child (0 = No, 1 = Yes); whether the

participant witnessed the homicide (0 = No, 1 = Yes); whether the homicide had occurred less than six months ago (0 = No, 1 = Yes); whether the funeral had already taken place at the point of data collection (0 = No, 1 = Yes); and whether a verdict had been spoken at the point of data collection (0 = No, 1 = Yes).

2.4. Statistical analyses

2.4.1. Aim 1: Identification of classes of bereaved individuals

We conducted LCA using Mplus version 8.1.6 (Muthén and Muthén, 2011) to identify classes based on dichotomous indicators. A dichotomous indicator variable for each symptom was calculated (symptom endorsed/not endorsed). For PTSD, the item was considered as 'endorsed' with a score of 3 or higher (Djelantik et al., 2019). For PGD, MDD and GAD, a symptom was considered endorsed when scored 2 or higher (Bobevski et al., 2018; Djelantik et al., 2019).

Model fitting was terminated when fit indices started to point at poorer fitting class solutions. The best-fitting model was selected based upon several criteria. Firstly, we examined the goodness-of-fit statistics, including the loglikelihood (LL), (sample-size adjusted) Bayesian Information Criterion ((SA-)BIC), Akaike's Information Criterion (AIC), the entropy R^2 index, *p*-values of the Vuong-Lo-Mendell-Rubin test (VLMRt) and Bootstrap Likelihood Ratio test (BLRt). Lower LL, (SA-)BIC and AIC values and higher entropy values indicate better fit. A significant VLMRt and BLRt (i.e., *p*-values < .05) indicate whether the estimated model fits the data better than the model with one class less (Nylund et al., 2007). Lastly, parsimony and interpretability were considered in identifying the optimal class solution (cf. Vermunt and Magidson, 2002).

2.4.2. Aim 2: Prevalence rates and summed items of the questionnaires across the latent classes

After selecting the optimal class solution, we inspected whether classes differed in terms of the number of participants scoring above and below established clinical cut-offs for PGD, PTSD, MDD, and GAD. Following this, class membership was regressed on overall levels of PGD, PTSD, MDD, and GAD using distinct 3-step analyses implemented in Mplus (Asparouhov and Muthén, 2012). Additionally, class membership was regressed on functional impairment scores. Following the 3-step approach, odds ratios (ORs) were computed for each symptom measure, while taking the classification error into account. Missing values on the indicators were handled using full information maximum likelihood (FIML) estimation and on the correlates with listwise deletion, both are implemented in Mplus.

2.4.3. Aim 3: Associations between class membership and personal and homicide related variables

In the last step, we again used distinct 3-step analyses, calculated ORs and handled missing values with FIML and listwise deletion in Mplus. We examined whether membership differed as a function of gender, age, prior life stress, being a witness, being a parent or partner to the victim, recentness of the homicide, funeral status and verdict status.

3. Results

3.1. Participants

Descriptive characteristics of the total sample are presented in Table 1. Of the 509 participants who completed all four measures, 283 (55.6%) scored above cut-off scores on all four measures, 82 (16.1%) scored above cut-off for PGD, PTSD, and GAD, and 62 (12.2%) scored above cut-off for PGD and PTSD. Further, 69 participants (14.8%) scored above cut-off for only one disorder or had other combinations of these disorders. Finally, 13 participants (2.6%) did not meet criteria for any of the disorders.

Table 1
Sample characteristics (N=923).

	M/Median (SD)/ (IQR)	n (%)	n missing (%)
Personal variables			
Female gender		696 (75.41)	0 (0.00)
Age (range: 18 – 86 years)	43.46 (14.45)		112 (12.13)
Experienced prior life stress		364 (39.52)	2 (0.22)
Homicide related variables			
Time since bereavement (range: 0 - 782 months)	5.0 (2.0-12.0)		14 (1.52)
Witnessed the homicide		178 (19.28)	0 (0.00)
Lost a child or partner		483 (52.33)	0 (0.00)
Homicide happened recently (< 6 months)		466 (51.27)	14 (1.52)
Funeral took place before therapy		854 (92.83)	3 (0.33)
Verdict took place before therapy		304 (37.36)	118 (12.78)
Symptom measures			
PGD	43.69 (13.96)	512 (89.04)	348 (37.70)
PTSD	50.35 (13.51)	860 (95.13)	19 (2.06)
MDD	15.92 (6.81)	459 (60.24)	161 (17.44)
GAD	13.92 (5.53)	594 (77.85)	160 (17.33)

Note. GAD = generalized anxiety disorder; IQR = interquartile range; MDD = major depressive disorder; PGD = prolonged grief disorder; PTSD = post-traumatic stress disorder.

3.2. Aim 1: Identification of classes of bereaved individuals

Table 2 shows the fit statistics of the LCA models up to six classes. The fit indices yielded ambiguous results. All class solutions generated significant BLRt values. The BIC pointed towards a four-class model, the SA-BIC and AIC towards a six-class model, and the VLMRt towards a three-class model solution. The entropy was acceptable for all models and the class size was acceptable for models with one- to five-class solutions. We then explored a decrease in gain in model fit by visually inspecting the LL and BIC values across models. A decrease in gain indicates a marginal and non-substantive gain in information, which suggests that the minimal number of classes with substantive meaning is reached at this point (Masyn, 2013). According to the LL, the BIC and the SA-BIC values, the three-class solution was the most parsimonious model with acceptable model fit, which was also in line with VLMRt. We then visually inspected the plots of the six models (see Supplementary Figures 2 - 7) and concluded that the two- and three-class solution yielded informative patterns. Finally, considering the informative value of the plots, parsimony and interpretability simultaneously, the three-class solution was retained (see Figure 1).

3.2.1. Three-class solution

Symptom prevalence rates for the total sample and conditional probabilities and the 95% CI of symptoms for each of the three classes, are presented in Supplementary Table 1. The estimated symptom probabilities for each class are also depicted in Fig. 1. Values ≥ .60 were considered as representing a 'high' probability of symptom presence in the class, values ≤ .59 and ≥ .15 as a 'moderate' probability and values ≤ .15 as a 'low' probability (cf. Eisma et al., 2019; Galatzer-Levy et al., 2013).

Overall, classes seem to differ more clearly in terms of symptom severity rather than symptom profiles. The first class was characterized by a moderate probability of endorsement for most PGD, PTSD and GAD symptoms, and by a low probability for most MDD symptoms and was called the 'moderate distress, low depression class' (Class 1; 12.4%). The second class was characterized by a high probability of most symptoms of PGD, PTSD and GAD and a moderate probability for most MDD symptoms and was named the 'high distress, moderate depression class' (Class 2; 42.7%). Lastly, the third class was characterized by a high probability of endorsement of all symptom clusters and was called the 'high distress and high depression class' (Class 3; 45.0%).

3.3. Aim 2: Prevalence rates and summed items of the questionnaires across the latent classes

In the moderate distress, low depression class, 65.5% scored above the cut-off score for PGD and for PTSD, whereas 17.1% scored above cut-off for GAD and 3.8% for MDD. In the high distress, moderate depression class, 98.7% and 90.6% scored above the clinical cut-off score for PTSD and PGD, respectively. For GAD this was true for 75.8% and for MDD for 41.7%. In the high distress and high depression class, almost all participants scored above cut-off scores on all symptom measures (between 97.8 – 100%). Lastly, 13.1% scored above the cut-off of functional impairment in the first class, 40.9% in the second class, and 77.9% in the third class.

Supplementary Table 2 shows means plus standard deviations (SDs) of the summed scale scores of the PGD, PTSD, depression, and GAD scales and functional impairment. In distinct analyses, we examined whether these scores differed between classes. As shown in Table 3, levels of PGD, PTSD, depression, GAD and functional impairment were all significantly higher (p < .001) in the high distress and high depression class compared to both other classes, and were also higher in the high distress, moderate depression class as compared to the moderate distress, low depression class.

3.4. Aim 3: Personal and homicide related correlates of class membership

Table 4 shows the parameter estimates for the personal and homicide related variables when added separately to the 3-class model following the three-step approach. We calculated the OR for all variables to estimate the strengths of their association with the three classes.

Participants in the high distress and high depression class differed significantly from the moderate distress, low depression class with respect to six out of eight variables. Compared to the moderate distress, low depression class, participants in the high distress and high
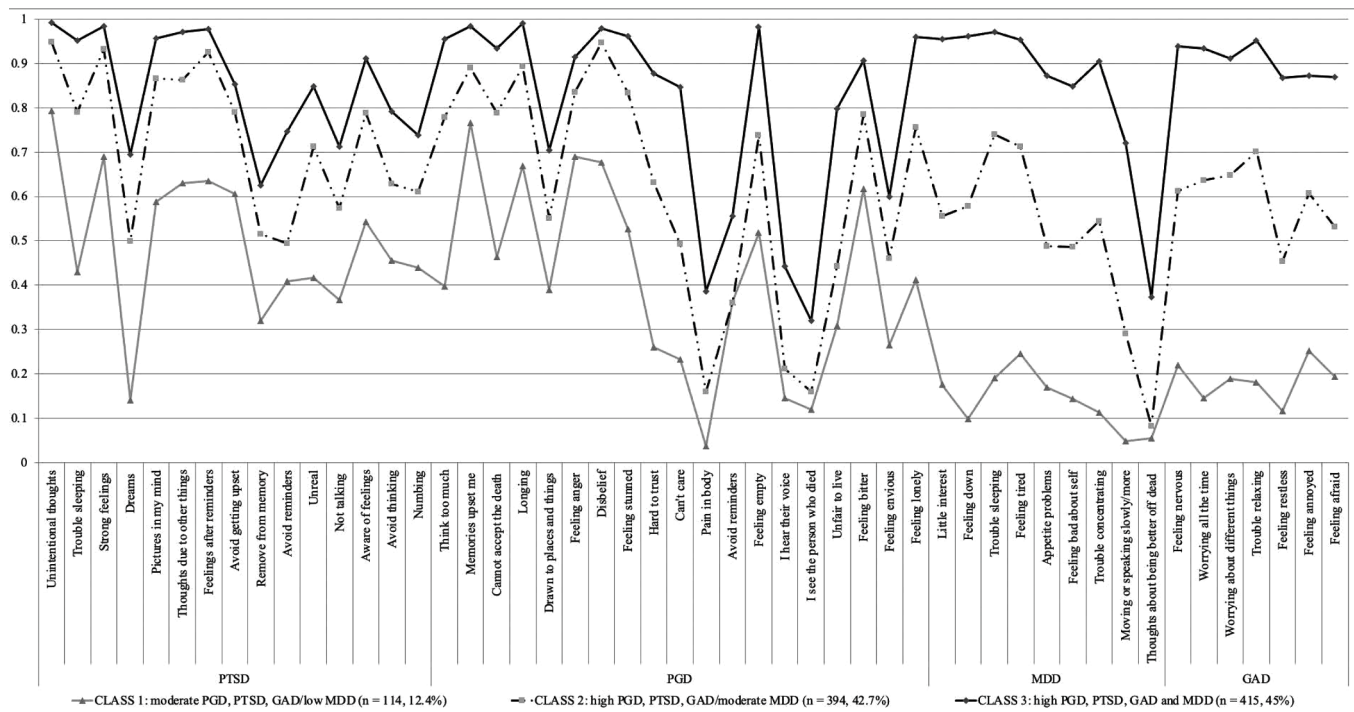
Table 2
Goodness of fit statistics for 1-6 class solutions (N = 923).

Model	LL	BIC	SA-BIC	AIC	VLMRT p – value	BLRt p – value	Entropy	Smallest class size
1 Class	-20209	40759	40601	40518	-	-	-	-
2 Classes	-18381	37452	37132	36965	< .001	< .001	0.838	386
3 Classes	-17915	36868	36386	36135	< .001	< .001	0.829	114
4 Classes	-17674	36735	36090	35755	.329	< .001	0.816	121
5 Classes	-17516	36767	35960	35541	.708	< .001	0.811	100
6 Classes	-17382	36846	35877	35373	.247	< .001	0.812	64

Note. AIC = Akaike's Information Criterion; BLRt = Bootstrap Likelihood Ratio Test; LL = Loglikelihood; SA-BIC = Sample-Size Adjusted Bayesian Information Criterion; VLMRt = Vuong-Lo-Mendell-Rubin Likelihood Ratio Test.

Fig. 1. Plot of the three-class solution.
Note. GAD = generalized anxiety disorder; MDD = major depressive disorder, PGD = prolonged grief disorder; PTSD = posttraumatic stress disorder.

Table 3
Parameter estimates for the latent class model with correlates of baseline symptom levels of PGD, PTSD, depression and GAD and functional impairment.

	High distress and high depression class vs moderate distress, low depression class					High distress, moderate depression class vs moderate distress, low depression class					High distress and high depression class vs high distress, moderate depression class				
	B	*SE*	*p*	*95% CI*	*OR*	*B*	*SE*	*p*	*95% CI*	*OR*	*B*	*SE*	*p*	*95% CI*	*OR*
PGD	0.37	0.04	< .001	0.30, 0.45	1.45	0.15	0.03	< .001	0.10, 0.20	1.16	0.22	0.03	< .001	0.16, 0.28	1.25
PTSD	0.30	0.02	< .001	0.25, 0.34	1.35	0.16	0.02	< .001	0.12, 0.19	1.17	0.14	0.01	< .001	0.12, 0.16	1.15
MDD	1.35	0.11	< .001	1.14, 1.57	3.86	0.68	0.09	< .001	0.50, 0.85	1.97	0.68	0.06	< .001	0.56, 0.80	1.97
GAD	0.99	0.07	< .001	0.85, 1.14	2.70	0.46	0.05	< .001	0.35, 0.56	1.58	0.53	0.05	< .001	0.43, 0.63	1.70
FI	0.27	0.03	< .001	0.22, 0.33	1.31	0.12	0.02	< .001	0.08, 0.16	1.13	0.15	0.02	< .001	0.11, 0.19	1.16

Note. CI = confidence interval; FI = functional impairment; GAD = generalized anxiety disorder; MDD = major depressive disorder; PGD = prolonged grief disorder; PTSD = posttraumatic stress disorder.

Table 4
Parameter estimates for the latent class model with each of the sociodemographic and homicide related correlates as well prior life stress.

	High distress, high depression class vs moderate distress, low depression class					High distress, moderate depression class vs moderate distress, low depression class					High distress, high depression class vs high distress, moderate depression class				
	B	*SE*	*p*	*95% CI*	*OR*	*B*	*SE*	*p*	*95% CI*	*OR*	*B*	*SE*	*p*	*95% CI*	*OR*
Sociodemographic characteristics															
Female gender	1.83	0.25	< .001	1.34, 2.32	6.23	1.28	0.25	< .001	0.80, 1.76	3.60	0.55	0.22	.011	0.13, 0.97	1.73
Age	-0.02	0.01	.034	-0.04, 0.00	0.98	-0.02	0.01	.057	-0.04, 0.00	0.98	0.00	0.01	.920	-0.01, 0.01	1.00
Experienced prior life stress	1.51	0.27	< .001	0.98, 2.05	4.54	0.69	0.29	.017	0.12, 1.25	1.98	0.83	0.17	< .001	0.49, 1.17	2.29
Homicide related characteristics															
Homicide happened recently (< 6 months)	0.50	0.23	.027	0.06, 0.95	1.66	0.35	0.24	.145	-0.12, 0.81	1.41	0.16	0.17	.347	-0.17, 0.49	1.17
Deceased was a child or partner	0.50	0.23	.029	0.05, 0.94	1.64	0.32	0.24	.171	-0.14, 0.78	1.38	0.17	0.17	.301	-0.16, 0.50	1.19
Witnessed the homicide	0.73	0.33	.028	0.08, 1.38	2.07	0.52	0.35	.138	-0.17, 1.20	1.68	0.21	0.21	.306	-0.19, 0.62	1.24
Funeral took place before therapy	0.67	0.44	.128	-0.19, 1.52	1.95	-0.05	0.41	.901	-0.85, 0.75	0.95	0.72	0.35	.043	0.02, 1.41	2.05
Verdict took place before therapy	-0.07	0.19	.690	-0.44, 0.29	0.93	-0.08	0.25	.743	-0.58, 0.41	0.92	-0.07	0.19	.690	-0.44, 0.29	0.93

Note. CI = confidence interval.

depression class were more likely to be female (83.4% vs. 47.4%; OR = 6.23), to be of younger age (42.9 vs. 46.6 years; OR = 0.98), to have experienced prior life stress (50.6% vs. 20.2%; OR = 4.54), to have experienced the homicide less than six months earlier (53.7% vs. 42.1%; OR = 1.66), to have lost a partner or child (55.4% vs. 43.9%; OR = 1.64) and to have witnessed the homicide (21.7% vs. 12.3%; OR = 2.07).

Compared to the moderate distress, low depression class, participants in the high distress, moderate depression class were more likely to be female (75.1% vs 47.4%; OR = 3.60) and to have experienced prior life stress (33.3% vs 20.2%; OR = 1.98). Lastly, participants in the high distress and high depression class compared to the high distress, moderate depression class were also more likely to be female (83.4% vs 75.1%; OR = 1.73), to have experienced prior life stress (50.7% vs 33.3%; OR = 2.29), and to have had a funeral held before the start of therapy (8.9% vs 5.1%; OR = 2.05). An overview of all personal and homicide related characteristics across classes can be found in supplementary Table 3.

4. Discussion

In this study, we investigated the comorbidity of symptoms of PGD, PTSD, MDD, and GAD in a large sample of homicidally bereaved individuals who sought treatment. Our first aim was to identify subgroups on the basis of self-rated symptoms of PGD, PTSD, MDD, and GAD by deploying LCA. The results of the LCA indicated that classes were more clearly distinguishable in terms of scores on all symptoms rather than in terms of symptom profiles (e.g., high PGD, low PTSD), indicating high comorbidity following bereavement.

Specifically, three subgroups were identified: (1) a moderate distress, low depression class (12.4%), characterized by a moderate probability of presence of symptom clusters of PGD, PTSD and GAD, and a low probability of presence of MDD symptoms, (2) a high distress, moderate depression class (42.7%) characterized by a high probability of presence of PGD, PTSD and GAD symptom clusters and a moderate probability of presence of MDD symptoms, and (3) a high distress and high depression class (45%) with a high probability of presence of PGD, PTSD, GAD, and MDD symptom clusters.

Our second aim was to describe the prevalence rates and test the difference between classes in terms of levels of overall PGD, PTSD, GAD, and MDD and functional impairment. The percentage of individuals scoring above cut-off relates to the classes as Class 3 > Class 2 > Class 1. This is in accordance with the total scores on the measures including functional impairment, which relate to the classes in the same way (3 > 2 > 1). These findings support that the classes are distinguishable in a meaningful way.

Our third and final aim was to explore associations between class membership and personal and homicide related variables. Partly in par with our expectations, being female and having experienced prior life stress, as indicated by previous mental health treatment and/or prior life stress, distinguished between all classes. This fortifies previous findings in which past experiences were predictive of more extensive and severe mental health complaints (Tsai et al., 2016). Younger age, recentness of the homicide, having lost either a child or partner and being a direct witness to the homicide distinguished between the most and less severe class but did not distinguish between the other class combinations. This is also partly in line with previous research and suggests that these variables may help to identify individuals at risk of severe mental health complaints following a homicide (Soydas et al., 2020). In this study, personal factors predicted class membership more consistently than homicide related characteristics such as the funeral or verdict having taken place.

We did not replicate the findings of other LCAs in violently bereaved samples, where classes were mainly distinguishable in terms of symptom profiles with classes dominated by e.g., solely PGD or PTSD, and combinations such as PGD and PTSD, or PGD, PTSD and MDD (Eisma et al., 2019; Heeke et al., 2017a; Lenferink et al., 2017). In the only other LCA

including PGD using a clinical sample, PTSD was present in all symptom classes, but in combination with PGD, depression, or both (Djelantik et al., 2017). This incongruence may be explained by the broader sample that was used in the study by Djelantik et al. (2017), consisting of individuals who had lost a loved one due to various causes of death.

Our findings are more in line with LCAs in trauma exposed samples, where the majority of PTSD studies has supported a three-class solution differing in symptom severity (Ayer et al., 2011; Breslau et al., 2005; Elhai et al., 2011; Lenferink et al., 2018; Steenkamp et al., 2012). This might indicate that when individuals seek help following something as shocking as a homicide, they experience such high general distress, that it is hard to distinguish between symptoms. However, the LCAs in trauma exposed samples have only investigated one construct. It would be interesting to see whether the findings of the current study uphold in future studies using different samples. A latent profile analysis based on PTSD, MDD, and GAD symptoms in trauma-exposed soldiers found similar severity patterns as the current study, with all disorders co-occurring (Contractor et al., 2015). Our findings indicate that the inclusion of anxiety in trauma-exposed samples is important and should not be overlooked. However, to our best knowledge, anxiety has never been included in an LCA on bereaved persons, and therefore our findings are explorative and replication is needed to confirm and extend our findings.

The results corroborate previous findings that depression symptoms are less common, and when they are present, they mainly co-occur with other symptoms such as grief and traumatic stress (Boelen et al., 2016; Djelantik et al., 2017; Lenferink et al., 2017). Our finding that while PGD and PTSD symptoms may be high, depressive symptoms may be not, provides evidence against the finding of previous factor analytic studies that depressive symptoms characterize an aspect of PTSD rather than a separate disorder (Galatzer-Levy et al., 2013; Palmieri et al., 2007) and counters previous notions that grief and depression are largely the same entity (Schaal, 2015; Zisook et al., 2012).

Having had a funeral take place before the start of the therapy distinguished between the high distress and high depression class and the high distress, moderate depression class. A possible explanation could be that attending a funeral adds to the reality of the loss which in turn can result in, e.g., feelings of hopelessness and sadness. Notably, having had a verdict spoken was not predictive of membership of any class. There may have been an association of a non-guilty verdict as compared to a guilty verdict with class membership, but because the not-guilty sample size was small, we could not distinguish between verdicts and thus created one variable 'having a verdict spoken'. Hence, a possible association of a not-guilty verdict with class membership may exist. It would be of interest to explore this possibility further in future research.

4.1. Limitations and strengths

Using a data-driven approach, this study relied on a relatively homogenous, clinical group of mostly white females who lost a loved one to homicide. Therefore, our findings may not generalize to other populations of bereaved individuals. Because context and culture may affect grief reactions (Kleber, 1995; Nickerson et al., 2014), future research requires replication and extension of the current findings to other, non-clinical samples across different cultures and including a larger variety of types of loss. The use of ROM data may have induced an information bias due to, e.g., differences in questionnaire administration or heterogeneity between raters, which may affect the internal validity of the study results. Additionally, data on socio-economic status, ethnicity and religion were absent. We relied on self-report measures so that we were bound to limit our statements to the (co)occurrence of symptoms, rather than disorders. Furthermore, the use of self-report measures may lead to common method variance. It would therefore be of interest to employ mixed methods by including, for example, clinical interviews in future LCA studies. Furthermore, endorsement of items

was generally very high, suggesting that the established cut-off scores of the symptom related questionnaires may be too low for a clinical population, and that self-report questionnaires overestimate symptom severity.

Notwithstanding these considerations, a major strength of the current study is the large sample size, which permits us a certain degree of confidence that our findings will be generalizable across different populations. Additionally, this study is the first to include, next to the more often used measures of grief, PTSD and depression, a measure on anxiety. This broadens our understanding of comorbid symptoms that may arise following homicidal bereavement. This study adds to prior research in that it is the first to focus on a clinical, homicidally bereaved sample.

4.2. Clinical implications

Several clinical implications may be considered. Firstly, results of this study emphasize the severity of the mental distress found in a treatment-seeking bereaved sample after homicidal loss. Prevalence rates of all disorders were high and no resilient class, evidencing low scores across different symptom domains, was found. Our findings provide strong evidence that singularly screening for PGD or PTSD in homicidally bereaved individuals may be insufficient to address the full range and severity of their mental health problems. Present-day interventions following a traumatic loss tend to either focus on grief symptoms or PTSD symptoms. The results of the current study underline the importance for mental health professionals to be aware of the severe and potentially complex nature of co-occurring mental health complaints following homicidal loss and argues for an integrated treatment that targets different complaints simultaneously rather than successively.

Declaration of Competing Interest

All authors involved with in the conduct of this research and/or preparation of the article declare that they have no conflicts of interest.

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jad.2021.05.026.

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