RESEARCH ARTICLE

Rumination, worry and negative and positive affect in prolonged grief: A daily diary study

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Abstract

After bereavement, a significant minority experiences severe, persistent, and disabling grief, termed prolonged grief or complicated grief. Prolonged grief treatments may be enhanced by improving understanding of malleable risk factors in post-loss psychological adaptation. Repetitive negative thought (e.g., rumination, worry) constitutes such a risk factor. Rumination and worry are both theorized to be maladaptive through interrelations with affect, yet this assumption has not been systematically investigated in the bereaved. We aimed to fill this gap in knowledge with a baseline survey and 10-day daily diary investigation among a bereaved sample. Survey between-subject analyses ($N = 113$) demonstrated that trait rumination and worry, trait negative affect and prolonged grief symptoms are positively related to each other and negatively related with trait positive affect. Within-subject multilevel analyses of diaries ($N = 62$) demonstrated that trait rumination and trait worry relate positively to daily negative affect and negatively to daily positive affect. Daily rumination and worry showed similar relationships with daily negative and positive affect. A stronger relationship emerged between daily rumination and daily negative affect in people with higher prolonged grief symptom levels. Findings consistently support interrelations between repetitive negative thought, affect, and prolonged grief symptoms. Rumination appears particularly detrimental in people with severe grief reactions. Results align with research demonstrating the effectiveness of targeting repetitive negative thought in prolonged grief treatments. Additionally, our study demonstrates the potential feasibility and usefulness of using daily diaries to study behaviours of relevance to post-loss adaptation in everyday life.

KEYWORDS
affect, complicated grief, coping, emotion regulation, rumination, worry

1 | INTRODUCTION

The death of a loved one is a common yet stressful life event. While most people adapt to bereavement without professional intervention, a minority experiences severe physical and mental health problems. Physical health consequences include maladaptive immunological responses, sleep disturbances and increased mortality (Knowles et al., 2019; Lancel et al., 2020; Stroebe et al., 2007). Mental health

consequences encompass depression; anxiety; substance abuse; post-traumatic stress disorder; and severe, persistent and disabling grief, termed complicated grief or prolonged grief (PG) (Zisook et al., 2014).

Such disturbed grief reactions have recently been incorporated in the International Classification of Diseases 11 in the form of Prolonged Grief Disorder (PGD, ICD-11: World Health Organization, 2020). To meet PGD criteria, one needs to experience persistent and pervasive longing for the deceased and/or persistent and pervasive cognitive preoccupation with the deceased, combined with *any* of 10 additional grief reactions assumed indicative of intense emotional pain for at least 6 months after bereavement. A related but distinct condition, also termed PGD, will be included in the text revision of the Diagnostic and Statistical Manual of Mental Disorders 5 (DSM-5-TR: American Psychiatric Association, 2020). Despite conceptual differences between various proposed grief disorders and instruments assessing these conditions (Eisma & Lenferink, 2017), we will generally refer to disturbed grief reactions with the term PG throughout this manuscript.

PG is estimated to be experienced by approximately 10% of all people experiencing a natural loss (Lundorff et al., 2017), with higher estimates for those who experience unnatural and sudden loss (Kristensen et al., 2012). Comorbidity of PG with other disorders such as depression and posttraumatic stress disorder is common, and it is further associated with suicidal ideation and reduced quality of life (Boelen & Prigerson, 2007), and stigmatization (Johnson et al., 2009). Clearly, it is important to develop interventions to effectively treat this stress-related condition. Various effective treatments for PG exist (e.g., Boelen et al., 2007; Bryant et al., 2014; Rosner et al., 2014; Shear et al., 2005), yet the average effect size of PG treatments is moderate, suggesting room for improvement (for meta-analysis: Johannsen et al., 2019). Repetitive thought, the process of thinking attentively, repetitively or frequently about oneself or one's world (Segerstrom et al., 2003), may be a particularly effective treatment target for a wide range of mental health problems (Querstret & Cropley, 2013). Recent randomized controlled trials have suggested that exposure therapy and metacognitive therapy may be effective treatments for repetitive negative thought and PG symptoms (Eisma et al., 2015; Wenn et al., 2019). To achieve optimal treatment outcomes, it appears critical to better understand the working mechanisms of repetitive negative thought in PG.

Two oft-studied repetitive thought styles are rumination and worry. Rumination and worry are both abstract, verbal thinking styles and transdiagnostic risk factors for mental health problems (for reviews, see Aldao et al., 2010; Watkins, 2008). Yet they are also conceptually distinct, as they differ in thought content, temporal orientation and motivation. Whereas rumination is focused on past negative events and affect, with the primary motive to better understand one's inner world, worry is focused on future uncertain events with potential negative outcomes, with a primary motive to prevent bad things from happening (for a detailed comparison, see Nolen-Hoeksema et al., 2008). Goal theorists conceptualize rumination as a discrepancy-focused thinking style, aimed at reducing the difference between the present situation and a wanted but yet unattained alternative situation

> **Key Practitioner Message**
> - People with higher prolonged grief levels engage in more rumination and worry and experience more negative and less positive affect
> - More trait and daily rumination and worry relate to more daily negative affect and less daily positive affect
> - Prolonged grief severity moderated the relationship between daily rumination and daily negative affect
> - Taken together with prior research, repetitive negative thought appears an important treatment target in prolonged grief therapy

(Martin & Tesser, 1996). Since the absence of a loved one is the most salient discrepancy among the bereaved, grief-related rumination focuses on analysing the causes and consequences of the death (Eisma et al., 2014). Worry, on the other hand, serves to prevent bad things from happening in the future by increasing control over uncertain situations (Freeston et al., 1994). Since bereavement is often accompanied by uncertain situations caused by secondary stressors (e.g., practical issues relating to the loss, concerns about the emotional reactions of others and taking on new life roles and tasks), and uncertainty elicits worry (cf. Ladouceur et al., 2000), bereaved people are expected to worry about such secondary stressors (Eisma et al., 2017).

Systematic reviews and meta-analyses have generally demonstrated positive associations between rumination, worry and mental health problems (Naragon-Gainey et al., 2017; Seligowski et al., 2014). Additionally, rumination and worry are both concurrently and longitudinally associated with post-loss psychopathology, including PG symptoms (e.g., Boelen, 2010; Eisma et al., 2014, 2017; Morina, 2011; Nolen-Hoeksema et al., 1994, Nolen-Hoeksema et al., 1997: for a review, see Eisma & Stroebe, 2021). In a recent survey, both cognitive processes were uniquely concurrently associated with post-loss PG and depression symptoms, but rumination related more strongly to PG symptoms than worry did (Eisma et al., 2020).

Theories on worry and rumination commonly assume that the interrelations between these cognitive styles and affect are critical in understanding their negative consequences. For example, the response styles theory (RST) holds that rumination makes negative thought content more accessible, thereby increasing negative affect (NA) (Nolen-Hoeksema et al., 2008). Moreover, rumination can increase self-focus and heighten salience of discrepancies between desired and unattained goals, leading to a cascade in which rumination and NA mutually amplify each other (Watkins & Roberts, 2020). Similarly, a classic theory on worry holds that it constitutes a cognitive avoidance strategy because it reduces cognitive access to affect-laden imagery, thereby preventing emotional processing (Borkovec et al., 1998: for a related theory, see Newman & Llera, 2011). Since PG is characterized by a variety of loss-related affective disturbances, for example, guilt, anger and sadness (ICD-11; World Health Organization, 2020), it seems prudent to investigate the interrelations of

these thought styles, general affective disturbances and PG. This may help further understanding the working mechanisms through which rumination and worry affect adjustment to bereavement.

Few studies in the bereavement area have examined whether higher levels of rumination and worry relate to experiencing more NA and less positive affect (PA) (for a notable exception, see Boyraz & Efstathiou, 2011). However, many cross-sectional surveys and laboratory experiments in nonbereaved samples have confirmed associations between these constructs in the expected directions (for reviews, see Thomsen, 2006; Schubert et al., 2020). Nevertheless, these types of studies come with certain drawbacks. For example, surveys usually assess general tendencies to engage in certain behaviours across a longer time span (e.g., previous month) which can increase retrospective biases. Similarly, while (experimental) laboratory research can provide results high on internal validity, such results could be low on external validity, as such research has its limits regarding taking into account the dynamic and diverse context that influences variability in behaviour in real life (Reis, 2014). Moreover, inferences drawn from these methods are based on between-person differences, whereas psychological processes generally fluctuate over time and within individuals. Therefore, researchers are increasingly using methods that allow for the repeated assessment of behaviours, affect and cognitions, over a number of days, either once daily (Gunthert & Wenze, 2014), or multiple times a day (Shiffman et al., 2008). This enables researchers to describe these psychological processes as they occur in natural contexts, reducing the influence of retrospective biases and selectivity in reporting, taking into account temporal and within-person fluctuations of behaviour, increasing the external validity of their findings (Reis, 2014).

A few of such studies have focused on bereaved samples (e.g., examining PA, stress and anxiety, and coping with stressors: Ong et al., 2004, Ong et al., 2005; Ryckebosch-Dayez et al., 2016). Yet none examined the psychological characteristics of people with varying levels of PG severity or the interrelations between repetitive negative thought styles and affect within these groups. Outside bereavement research, excellent examples are available of research examining between and within-person associations between repetitive negative thought and affect in nonclinical and clinical samples using intensive day-to-day data collection methods (e.g., Connolly & Alloy, 2017; Moberly & Watkins, 2008a, 2008b; Newman et al., 2019; Ruscio et al., 2015). For example, Moberly and Watkins (2008a) examined the association between trait and momentary state rumination and NA making eight daily assessments for 7 days in a nonclinical student sample. Main findings included that state rumination and NA were positively associated concurrently and that positive relationships existed between state rumination at one moment and state NA at a future moment, and vice versa. Relatedly, Newman et al. (2019) investigated relationships between worry characteristics and anxiety in an 8-day ecological momentary assessment study in which people were assessed hourly 10 times each day. Higher past-hour worry duration was related to feeling more keyed up at the same time points and to experiencing more state anxiety at subsequent time points, indicating that worry may cause anxiety.

In the present study, we set out to shed light on the between-person and within-person associations of rumination and worry, PA and NA, and PG symptoms, in a diary investigation. Our study consisted of a baseline survey and a 10-day daily diary. Based on prior research demonstrating between-subject associations between repetitive negative thought and affective responses in nonbereaved populations (for reviews, see Thomsen, 2006; Schubert et al., 2020), we predicted that there would be positive baseline associations between trait worry, trait rumination, trait NA and PG symptoms and that trait PA would in turn relate negatively to these variables (H1).

Our hypotheses regarding the daily diary are based on prior work on rumination and NA in nonbereaved samples (Moberly & Watkins, 2008a, 2008b). However, since both worry and rumination are theoretically relevant to and linked with psychological adaptation to bereavement (Eisma & Stroebe, 2021) as well as affect (McLaughlin et al., 2007), we were more comprehensive in consideration of both the independent variables (including both trait and daily worry and rumination) and the dependent variables (including daily NA and PA). Specifically, we predicted that trait rumination and trait worry at baseline would be associated with more daily NA and less daily PA reported in a subsequent diary (H2). We expected more daily rumination and worry would similarly be associated with more daily NA and less daily PA (H3). In line with the theoretical notion that the effects of repetitive negative thought on affect would be detrimental in people experiencing PG reactions, we further tested if PG symptom levels moderated the aforementioned effects. That is, we expected these effects to be more pronounced in people with higher PG symptom levels (H4).

2 | METHODS

2.1 | Procedure

A local ethics committee approved the study. Dutch-speaking adults bereaved of a family member or friend could participate. Participants were recruited through online advertisements on social media platforms (e.g., Facebook) and forums and websites for bereaved individuals. Additionally, participants in a previous study on coping with bereavement who had provided consent to be contacted about future studies were invited via e-mail. Advertisements and e-mail messages contained a web-link to an online information page explaining the aims and procedure of the study. After providing online informed consent, participants filled in their personal contact information and an online questionnaire. People who completed the baseline questionnaires were sent a printed study booklet and a prepaid return envelope by post within three working days. The main reason for using printed materials is that bereaved samples are on average older than the general population and we thus expected a substantial number of older participants. Mobile phone-based assessment methods could therefore pose practical challenges for participants. The booklet consisted of three parts: a detailed description on how to fill in the diary, the actual diary, and a follow-up questionnaire. Additionally, a web-link to a YouTube instruction video, containing detailed information

on how to fill in the diary, was e-mailed to each participant. Once the 10-day diary was completed, participants sent back the booklets. Participants who returned the diary received a monetary reward of 20€.

2.2 | Participants

One hundred and thirteen participants (95% female) ranging from 19 to 71 years of age ($M = 44.12$, $SD = 13.2$) completed the baseline questionnaires. A majority had experienced a natural loss (85%) of a partner (43%) or parent (34%), on average 24 months ago ($SD = 44.35$, median = 16 months, range 0.75–432 months). The participants' mean score for PG symptoms established with the Traumatic Grief Inventory-Self Report (TGI-SR) was 52.98 ($SD = 15.5$) which was near the cut-off score of 54 for a probable diagnosis of PG (Boelen & Smid, 2017). Fifty-five individuals scored above this cut-off ($M = 65.9$, $SD = 9.2$), whereas 58 participants scored below this cut-off ($M = 40.6$, $SD = 8.2$). Depressive symptoms were on average 'mild',

TABLE 1 Descriptive statistics for participant and loss-related characteristics for the baseline sample and diary sample (total and by PG status)

	Baseline		Diary		
	Total (N = 113)	Baseline only (N = 49)	Diary completers (N = 62)	Probable PG (N = 28)	No probable PG (N = 34)
Participant characteristics					
% female	95	96	94	86	100
Age in years [M (SD), range]	44.12 (13.2) 19–71	43.63 (11.78) 22–65	44.0 (14.1), 19–67	45.7 (14.1), 23–67	42.6 (14.1), 19–65
Educational level [N (%)]					
Primary school	1 (1)	1 (2)	0 (0)	0 (0)	0 (0)
Secondary school	24 (21)	9 (18)	15 (24)	6 (18)	9 (32)
Vocational school	37 (33)	20 (41)	17 (27)	6 (18)	11 (39)
College/University	51 (45)	19 (39)	30 (49)	22 (64)	8 (29)
Loss-related characteristics					
Relationship with deceased [N (%)]					
Partner	44 (39)	14 (29)	28 (45)	13 (46)	15 (44)
Child	20 (18)	11 (23)	9 (15)	5 (18)	4 (12)
Parent	33 (29)	19 (38)	14 (23)	5 (18)	9 (26)
Sibling	6 (5)	2 (4)	4 (6)	2 (7)	2 (6)
Other	10 (9)	3 (6)	7 (11)	3 (11)	4 (12)
Cause of death [N (%)]					
Natural causes (e.g., disease)	96 (85)	42 (86)	52 (84)	22 (79)	30 (88)
Accident	5 (4)	3 (6)	2 (3)	0 (0)	2 (6)
Murder	1 (1)	0 (0)	1 (2)	1 (3)	0 (0)
Suicide	11 (10)	4 (8)	7 (11)	5 (18)	2 (0)
Death was [N (%)]					
Expected	22 (19)	10 (20)	11 (18)	1 (3)	10 (30)
Unexpected	53 (47)	20 (41)	32 (51)	21 (75)	11 (32)
Other (i.e., both or neither)	41 (33)	19 (39)	19 (31)	6 (22)	13 (38)
Time since loss in months [M (SD), range]	24.13 (44.35), 0.75–432	25.64 (60.90), 0.75–432	22.9 (26.3), 1–204	24.9 (37.0), 1–204	21.2 (12.1), 1.5–41
Prolonged grief symptoms [M (SD), range]	52.98 (15.50), 21–90	54.35 (15.72), 25–89	52.0 (15.5), 21–90	65.9 (9.3), 54–90	40.6 (8.8), 21–53
Depressive symptoms [M (SD), range]	12.64 (10.40), 0–40	13.59 (11.59), 0–38	11.9 (9.5), 0–40	17.9 (9.9), 2–40	6.9 (5.4), 0–18

Note: Participants with diary data ($N = 62$) are a subsample of participants with baseline data ($N = 113$). Due to insufficient diary data, 2 of the initial 64 diary completers were not included in analyses. The cut-off score for probable PG was ≥54 (cf., Boelen & Smid, 2017). Cut-off scores for depressive symptoms (cf., Lovibond & Lovibond, 1995): *mild* (10–13), *moderate* (14–20), and *severe or extremely severe* (21+).
Abbreviation: PG, prolonged grief.

FIGURE 1 Flow diagram of the number of participants (values in bold) through the study
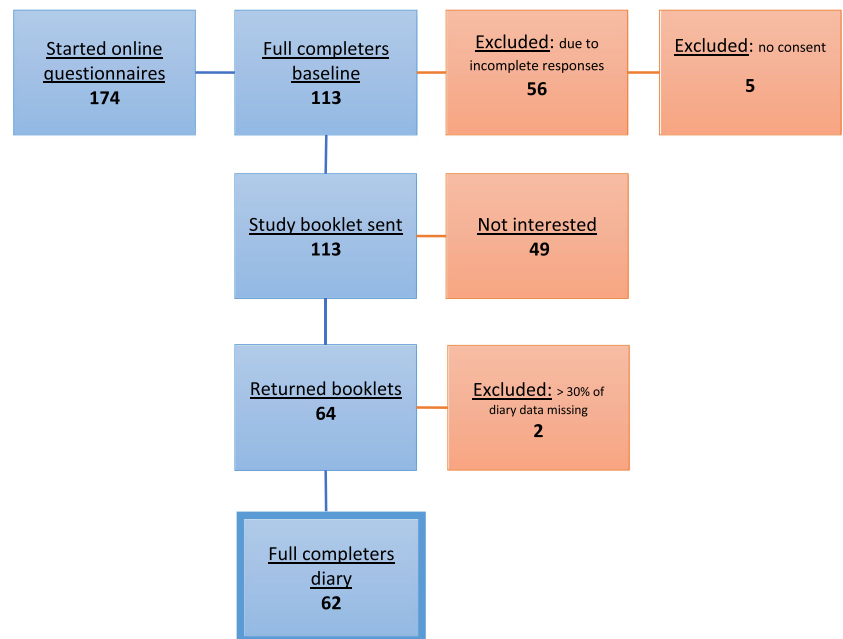
that is, higher than 87% of the general population ($M = 12.64$, $SD = 10.40$; cf., Lovibond & Lovibond, 1995). For all sample characteristics, see Table 1. Sixty-four participants completed the subsequent diary (57%; see Figure 1 and the section 'Diary Compliance' for information regarding baseline survey and diary participation).

2.3 | Measures

All study measures were part of a larger survey and diary. We only present the measures relevant to the present investigation below.

2.3.1 | Demographics and loss-related information

At baseline, the participant's age, gender (male, female or other) and educational level (primary school, high school, vocational school, college or university) were assessed. The following loss-related characteristics were assessed: relationship to the deceased (partner, child, parent, sibling or other), time since the loss in months, cause of death (natural cause, accident, murder or suicide) and expectedness of the loss (expected, unexpected, 'both expected and unexpected' or 'neither expected nor unexpected').

2.3.2 | Trait rumination

Grief-related rumination in the past month was assessed with the Utrecht Grief Rumination Scale (UGRS; Eisma et al., 2012, Eisma et al., 2014). Participants indicated how often they had experienced ruminative thoughts on a 5-point Likert scale scores ranging from 1 (*never*) to 5 (*very often*). All item scores summed to create a total

rumination score. An example item is 'In the past month I thought about why the loss happened to me and not someone else.' Notably, true trait measures of grief-related rumination do not exist, yet there are strong indications that monthly grief rumination is a better longitudinal predictor of loss-related distress than general trait rumination (for a review, see Eisma & Stroebe, 2021). For reading ease, UGRS scores are labelled 'trait rumination'. Internal consistency of the UGRS was excellent ($\alpha = .93$).

2.3.3 | Trait worry

General tendencies to engage in worry were assessed with a shortened 5-item version of the Penn State Worry Questionnaire (PSWQ) (Meyer et al., 1990: Dutch shortened version: Topper et al., 2014). Participants rated to what extent these statements were typical to them on a 5-point Likert scale ranging from 1 (*not at all typical for me*) to 5 (*very typical for me*). An example item is 'Many situations made me worry'. The Cronbach's alpha was .91 indicating excellent internal consistency.

2.3.4 | Trait NA and PA

General NA and PA were assessed using the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988; Dutch version: Peeters et al., 1996). Ten items assessed NA, and nine items assessed PA (item 'attentive' of the PANAS was not included due to human error). Items were rated on a 5-point Likert Scale ranging from 1 (*Very slightly or Not at all*) to 5 (*Extremely*). Final scores represented a mean score for NA and a mean score for PA. Both subscales had very good to excellent internal consistency ($\alpha_{negative} = .88$ and $\alpha_{positive} = .91$).

2.3.5 | PG symptoms

We assessed PG symptoms using the self-report version of the Traumatic Grief Inventory-Self Report (Boelen & Smid, 2017;Boelen et al., 2018). Participants indicated to what extent they had experienced grief symptoms in the previous month on a scale from 1 (*Never*) to 5 (*Always*). An example item is 'I had trouble to accept the loss'. All 18 items were summed to form a total score. For descriptive statistics (see Table 1), a cut-off score of 54 or higher was used to classify people experiencing probable PG (vs. no PG). Reliability of the TGI-SR was excellent ($\alpha = .95$).

2.3.6 | Depressive symptoms

For descriptive purposes, we assessed symptoms of depression in the previous 7 days using the Depression Anxiety and Stress Scale (DASS-21; Lovibond & Lovibond, 1995; Dutch version: de Beurs et al., 2001). Items were scored on a 4-point Likert scale ranging from 0 (*Never/Not at all*) to 3 (*Most of the time/Very much*). All seven items of the depression subscale were summed to create a total depression symptom score. An example item is 'I felt that I had nothing to look forward to'. The total score was doubled so that it can be compared to scores to the original 42-item DASS. Internal consistency of the DASS depression scale was excellent ($\alpha = .91$).

2.3.7 | Diary

For a period of 10 consecutive days, participants filled in a paper diary twice daily. Participants were requested to fill in the first part in the morning after they woke up, and the second part before they went to bed. The first part assessed daily NA and PA. The second part again assessed daily PA and NA and additionally daily worry and rumination.

2.3.8 | Daily affect

Participants indicated their NA and PA in the morning and evening of the 10-day diary period on a scale from 0 (*Not at all*) to 6 (*Extremely*) (aan het Rot et al., 2015; Diener & Emmons, 1984). The event-level mean score of the unhappy, frustrated, worried/anxious, depressed/blue and angry/hostile items formed the total NA score. Similarly, the event-level mean scores of the items happy, pleased, joyful and enjoyment/fun formed a total PA score.

2.3.9 | Daily rumination and worry

Based on Hartley et al. (2014), we assessed daily rumination and daily worry at the end of each day. Regarding rumination, participants indicated to what degree they (1) thought about the reasons for their problems on that day and (2) thought about the reasons for their

feelings on that day. Participants also indicated to what degree they worried on that day. All three items were scored on a Likert scale ranging from 0 (*Not at all*) to 4 (*Very much*). The mean of both rumination items (Pearson's $r = .77$; $p < .0001$) represented a person's daily rumination.

2.3.10 | Diary compliance

At the end of the diary period, we asked participants to indicate (1) how often they filled in the diary at the requested times [0 (*Never*) to 4 (*Always*)], (2) how accurately they answered the questions [0 (*Very inaccurately*) to 4 (*Very accurately*)] and (3) how difficult or easy they found filling in the diary [0 (*Very difficult*) to 4 (*Very easy*)]. Of the 64 participants who completed the diary, two were excluded from subsequent analyses as more than 30% of their event-level data were missing (i.e., ≥ 6 of morning and evening data entries out of a possible 20). The majority of participants (77%) did not have any missing data entries, while 14% missed one entry, and 5% missed two entries. Main analyses were performed on 62 individuals.

2.4 | Data analyses

All analyses were performed in SAS version 9.4 (SAS Institute: Cary, NC).

In preliminary analyses, we compared the subsample of individuals who completed the diary to participants only completing the baseline survey on several sociodemographic and loss-related characteristics and trait worry, trait rumination, and depression and PG symptoms, to rule out a potential sampling bias. We performed these analyses using two samples *t*-tests (for age, time since loss, PG symptoms, trait rumination, trait worry and depressive symptoms) or Fisher's exact tests (for education, relationship to the deceased, cause of death and expectedness of the loss). We also tested the validity of our daily rumination and worry variables by calculating Pearson's correlations between trait and mean daily rumination and trait and mean daily worry. We used frequency tables to examine compliance to the diary instructions.

To test H1, analyses were performed on the baseline sample of 113 individuals. We examined associations between trait and state rumination, worry, NA and PA, and PG symptoms with Pearson's correlations (see Table 2). All correlations were calculated on the between-person level (i.e., person-level means of state variables).

To test H2–H4, analyses were performed on the subset of participants who successfully completed the diary. Using PROC MIXED, we analysed the multilevel-structured diary data with maximum likelihood estimation. We examined associations between trait and state rumination and worry, on the one hand, and state NA and PA, on the other hand, across the diary period while taking the multilevel structure into account. Thus, we did not examine these associations from 1 day or measurement point to the next (e.g., time-series analyses), but across days. Daily NA and PA represented the event-level dependent

TABLE 2 Pearson's correlations for main study variables (H1)

Variable	M (SD)	N	1	2	3	4	5	6	7	8	9
1. Trait rumination	44.66 (12.57)	113	—								
2. Trait worry	14.99 (5.45)	113	0.54*	—							
3. Trait negative affect	2.42 (0.78)	113	0.66*	0.70*	—						
4. Trait positive affect	3.06 (0.80)	113	−0.44*	−0.52*	−0.54*	—					
5. PG symptoms	52.98 (15.50)	113	0.78*	0.54*	0.70*	−0.61*	—				
6. Mean daily rumination	1.72 (0.74)	62	0.58*	0.59*	0.71*	−0.47*	0.56*	—			
7. Mean daily worry	1.67 (0.76)	62	0.53*	0.64*	0.72*	−0.47*	0.53*	0.86*			
8. Mean daily negative affect	1.16 (1.05)	62	0.52*	0.47*	0.65*	−0.50*	0.58*	0.79*	0.68*	—	
9. Mean daily positive affect	2.28 (1.05)	62	−0.44*	−0.51*	−0.53*	0.69*	−0.53*	−0.63*	−0.66*	−0.52*	—

Note: All correlations were calculated on between-person level (i.e., person-level means of state variables).
Abbreviation: PG, prolonged grief.
*$p < .0001$.

variables. We ran models with morning and evening affect ratings as separate time points rather than taking the mean of both ratings per day (i.e., we did not aggregate the daily affect ratings). Using only evening ratings of affect in our analyses did not significantly alter outcomes. The latter analyses are therefore not reported in this manuscript.

Main analyses were firstly run with trait rumination or trait worry (both person-level variables; see Models 1 and 2 in Table 3) or daily rumination or daily worry (both event-level variables; see Models 4 and 5 in Table 3) as predictors of daily affect (i.e., separate models). Subsequently, we ran models with both trait rumination and trait worry together as predictors (see Model 3 in Table 3) of daily affect or both daily rumination and daily worry as predictors (see Model 6 in Table 3) of daily affect, to assess the relative strength of these associations. As a subsequent step, we added PG symptoms as a moderator of the associations between trait rumination and trait worry and daily affect and of the associations between daily rumination and daily worry and daily affect (see 'Models including interaction term' in Table 3). The models included no person-level covariates, as gender and age did not significantly predict daily affect (when tested as separate single predictors of daily affect; results of these analyses are not shown).

For these analyses, person-level variables PG symptoms, trait rumination and trait worry were grand-mean centred to have an interpretable intercept. Specifically, by subtracting the sample mean PG symptom score from a person's PG symptom score, we created a variable that represented a person's PG symptom level in comparison to the mean symptom level of the entire sample. In other words, a positive centred PG symptom score represented a person with higher PG symptom levels and a negative centred PG symptom score a person with lower PG symptom levels compared to others in the sample. Comparably, the centred trait worry score represented a person who worries more (i.e., positive score) or less (i.e., negative score) compared to other individuals in the sample and the centred trait rumination score represented a person who ruminates more (i.e., positive score) or less (i.e., negative score) compared to other individuals in the sample.

The event-level variables daily rumination and daily worry were person-mean centred to adjust for between-person differences in daily rumination and daily worry, respectively. Specifically, each person's mean daily rumination score was subtracted from each event-level daily rumination score. The new centred scores represented deviations from the person's average daily rumination. In other words, it represented days when a person ruminated more (or less) than usual. Similarly, the centred daily worry scores represented days when a person worried more (or less) than usual.

The significance level was set at an alpha of .05. Effect sizes are expressed using Cohen's *d*. Significant interaction effects were tested by estimating simple intercepts and slopes for between-person scores that were 1 *SD* above and below the sample mean of each predictor (as recommended by Aiken et al., 1991).

3 | RESULTS

3.1 | Preliminary analyses

We tested if diary completers differed from those who only completed the baseline questionnaire. They did not significantly differ, neither in participant or loss-related characteristics nor on trait worry, trait rumination, PG symptoms or depressive symptoms (all *p* values > .17, see Table S1).

Associations between trait and mean daily rumination and between trait and mean daily worry were significant and positive, providing some support for the validity of our daily rumination and worry measures (see Table 2).

3.1.1 | Diary compliance

The majority of participants found it easy or very easy to fill in the daily diary (59%; 32% found it neutral and 9% difficult). Ninety-five per cent reported to have filled in the diary at the instructed time almost always or always. Similarly, 93% of participants stated they answered the questions accurately or very accurately.

TABLE 3 Associations between trait rumination and trait worry and daily rumination and worry and daily negative and positive affect (H2, H3) and moderation effects of PG symptoms (H4)

	Dependent variables							
	Daily negative affect				Daily positive affect			
Predictors	β	F	p	d	β	F	p	d
Separate models with main effects only								
Model 1: Trait rumination	.04	22.96	<.0001	1.27	−.03	14.64	<.001	0.99
Model 2: Trait worry	.09	17.77	<.0001	1.09	−.10	22.85	<.0001	1.23
Model 3:Both included in model								
Trait rumination	.03	8.06	.006	0.74	−.02	2.32	.132	0.40
Trait worry	.05	3.79	.057	0.51	−.08	9.21	.004	0.79
Model 4: Daily rumination	.42	99.22	<.0001	0.87	−.51	94.13	<.0001	0.85
Model 5: Daily worry	.44	131.26	<.0001	1.00	−.52	114.79	<.0001	0.94
Model 6: Both included in model								
Daily rumination	.19	12.72	<.001	0.31	−.25	13.88	<.001	0.33
Daily worry	.32	39.48	<.0001	0.55	−.36	31.55	<.0001	0.49
Models including interaction term								
Step 1								
Trait rumination	.04	22.96	<.0001	1.27	−.03	14.64	<.001	0.99
Step 2								
Trait rumination	.01	0.77	.383	0.23	−.001	0.01	.922	0.03
PG symptoms	.03	6.70	.012	0.67	−.04	8.08	.006	0.74
Step 3								
Trait rumination	.01	0.79	.978	0.23	−.01	0.12	.050	0.09
PG symptoms	.03	6.24	.015	0.66	−.03	6.80	.273	0.68
Trait rumination*PG symptoms	.0001	0.03	.874	0.05	−.001	0.84	.362	0.24
Step 1								
Trait worry	.09	17.77	<.0001	1.09	−.10	22.85	<.0001	1.23
Step 2								
Trait worry	.04	2.36	.130	0.40	−.06	5.84	.019	0.63
PG symptoms	.03	13.01	<.001	0.94	−.02	7.26	.009	0.70
Step 3								
Trait worry	.03	1.88	.176	0.36	−.06	5.29	.025	0.60
PG symptoms	.03	12.93	<.001	0.94	−.02	7.07	.010	0.70
Trait worry*PG symptoms	.002	2.69	.106	0.43	−.001	1.14	.291	0.28
Step 1								
Daily rumination	.42	99.22	<.0001	0.87	−.51	94.13	<.0001	0.85
Step 2								
Daily rumination	.42	99.03	<.0001	0.87	−.51	94.04	<.0001	0.85
PG symptoms	.04	27.19	<.0001	1.35	−.04	26.90	<.0001	1.34
Step 3								
Daily rumination	.42	101.65	<.0001	0.88	−.51	93.37	<.0001	0.84
PG symptoms	.04	27.12	<.0001	1.34	−.04	26.92	<.0001	1.34
Daily rumination*PG symptoms	.007	5.56	.019	0.21	.004	0.95	.329	0.09
Step 1								
Daily worry	.44	131.26	<.0001	1.00	−.52	114.79	<.0001	0.94
Step 2								
Daily worry	.44	131.05	<.0001	1.00	−.52	114.67	<.0001	0.93

TABLE 3 (Continued)

Predictors	Daily negative affect				Daily positive affect			
	β	F	p	d	β	F	p	d
PG symptoms	.04	27.24	<.0001	1.34	−.04	26.89	<.0001	1.34
Step 3								
Daily worry	.46	132.96	<.0001	1.01	−.52	113.75	<.0001	0.93
PG symptoms	.04	27.19	<.0001	1.35	−.04	26.92	<.0001	1.34
Daily worry*PG symptoms	.004	2.13	.145	0.13	.004	1.41	.236	0.10

Note: All analyses were performed on 62 individuals. If interaction effects are significant at the .05 level, slope estimates for each relevant comparison are presented in the text.

Abbreviation: PG, prolonged grief.

3.2 | Main analyses

3.2.1 | Associations between trait rumination, worry, NA, PA and PG symptoms (H1)

Based on Pearson's correlations, we found significant positive relationships between trait worry, trait rumination, trait NA, and PG symptoms, and significant negative relationships between all these variables and trait PA (all ps < .0001; see Table 2).

3.2.2 | Associations between trait rumination and worry and daily NA and PA (H2)

Table 3 displays the test statistics for these and subsequent analyses. There were significant effects of trait rumination and of trait worry on both daily NA and daily PA. Individuals with more trait rumination experienced more NA (β = .04, p < .0001) and less PA (β = −.03, p < .001) than individuals with less trait rumination. Similarly, individuals with more trait worry reported more NA (β = .09, p < .0001) and less PA (β = −.10, p < .0001) compared to participants with less trait worry.

To test the relative importance of both cognitive styles in predicting daily affect, we examined the associations of trait rumination and trait worry with NA and PA in models including both independent variables. After controlling for trait worry, trait rumination was still associated with NA (β = .03, p = .006) yet not with PA (β = −.02, p = .132). Conversely, after controlling for trait rumination, trait worry was still associated with PA (β = −.08, p = .004) yet not significantly with NA (β = .05, p = .057).

3.2.3 | Associations between daily rumination and worry and daily NA and PA (H3)

There were significant associations between daily rumination and daily NA and PA and between daily worry and daily NA and PA. When individuals ruminated more than they usually did, they reported more NA (β = .42, p < .0001) and less PA (β = −.51, p < .0001). Similarly, when individuals worried more than they usually did, they felt more NA (β = .44, p < .0001) and less PA (β = −.52, p < .0001).

In models comparing the effects of both predictors on NA and PA, all previously significant effects remained significant (see Model 6 in Table 3). Moreover, the direction and significance of these effects remained the same when additionally adding trait rumination and trait worry as covariates (see Table S2).

3.2.4 | PG symptoms as moderator of the associations between trait rumination and worry and daily NA and PA (H4)

PG symptoms did not significantly moderate the associations between trait rumination and daily NA (β = .0001, p = .874) and PA (β = −.001, p = .362). There was also no significant moderation effect of PG symptoms on the associations between trait worry and daily NA (β = .002, p = .106) and PA (β = −.001, p = .291).

3.2.5 | PG symptoms as moderator of the associations between daily rumination and worry and daily NA and PA (H4 continued)

PG symptoms moderated the association between daily rumination and NA (β = .007, p = .019). There were significant positive slopes for individuals with higher PG symptom levels (β = .43, t(524) = 10.20, p < .0001, d = 0.89) and lower PG symptom levels (β = .42, t(524) = 9.91, p < .0001, d = 0.87). For both groups, on days that participants ruminated more than usual, they also experienced more NA. The significant interaction term indicates that this association was significantly stronger for individuals with more PG symptoms than for those with less PG symptoms (β = −.014, t(524) = −2.36, p = .019, d = 0.21; see Figure 2). There was no significant moderation effect of PG symptoms on the association between daily rumination and daily PA (β = .004, p = .329), and on the associations between daily worry and daily PA (β = .004, p = .236) and NA (β = .004, p = .145).
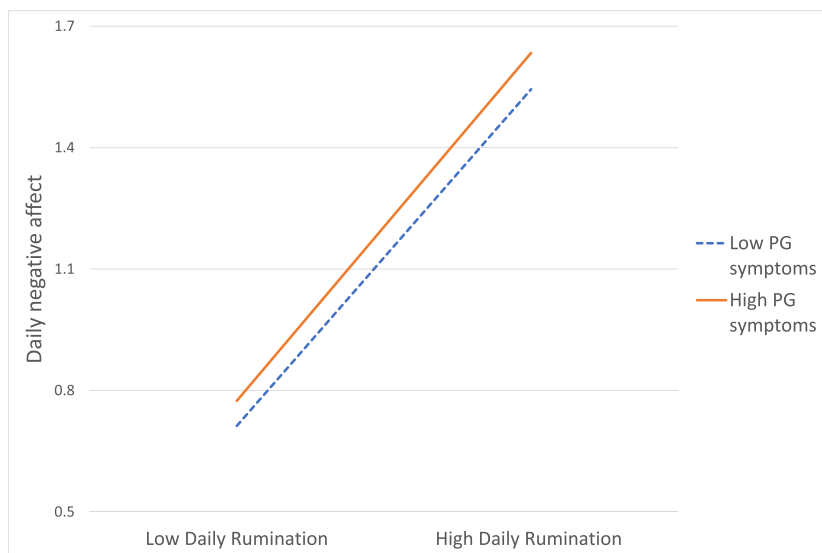
FIGURE 2 Daily negative affect as a function of low (-1 *SD*) and high ($+1$ *SD*) daily rumination in individuals low (-1 *SD*) and high ($+1$ *SD*) on PG symptoms. *Note*: There was a significant moderation effect of PG symptoms ($p = .019$; $d = 0.21$), with a slightly stronger association between daily rumination with daily negative affect for individuals with high ($\beta = .43$, $p < .0001$) versus low PG symptoms ($\beta = .42$, $p < .0001$). PG, prolonged grief

3.3 | Post-hoc sensitivity analyses

Lastly, we reran some of our analyses to examine the effect of content overlap between our measures on our results. Since our measure of PG, the TGI-SR, contained two items assessing intrusive thought (items 1 and 14), and one item assessing negative cognitions on self-blame (item 16), which may lead to content overlap with our rumination measures, we removed these items from the TGI-SR. Similarly, to address potential content overlap between the TGI-SR and our measure of affect, we removed two items assessing anger and sadness from the PANAS. Analyses using these adjusted measures yielded similar results, with no differences emerging in terms of the direction and significance of effects (see Tables S3 and S4).

4 | DISCUSSION

The aim of this study was to clarify the associations of rumination and worry with both NA and PA and PG symptoms. Our research, among a bereaved sample experiencing relatively high mean PG symptom levels, consisted of two integrated parts: a baseline cross-sectional survey and a 10-day daily diary. Overall, most hypotheses were confirmed, and results were consistent. In the cross-sectional survey, trait rumination and trait worry were positively associated with the experience of NA and PG symptoms, whereas PA related negatively to all aforementioned variables (H1). Analyses of diary data further showed that participants with higher trait worry and rumination tendencies reported more daily NA and less daily PA (H2). Notably, in models including both trait rumination and trait worry, rumination was a stronger predictor of NA, whereas worry was a stronger predictor of PA. Additionally, on days that participants ruminated or worried more, they experienced more daily NA and less daily PA (H3), both in separate analyses and analyses including both daily rumination and daily worry as predictors. Thus, this study demonstrated that associations between negative repetitive thought styles and affect exist both on a between-

person and within-person level among bereaved persons. PG symptom levels did not significantly moderate aforementioned effects, with one notable exception: positive associations of daily rumination and daily NA were a little more pronounced in people higher PG symptom levels (H4).

4.1 | Repetitive negative thought and affect

The demonstrated consistent between-person and within-person associations between worry and rumination, on the one hand, and NA, on the other hand, are compatible with multiple theories. For example, the Response Style Theory holds that NA elicits rumination, yet NA is also strengthened by rumination by increasing the availability of negative cognitions, impairing problem solving, interfering with instrumental behaviour, and driving away social support (Nolen-Hoeksema et al., 2008; cf. Watkins & Roberts, 2020). The cognitive avoidance theory of worry would also predict that worry exacerbates NA. While worry could temporarily act to reduce the accessibility of affect-laden imagery, it still exacerbates NA because it impairs emotional processing of these images (Borkovec et al., 1998). Our results on repetitive negative thought and NA extend findings from previous survey research in other samples (for reviews, see Thomsen, 2006; Schubert et al., 2020) and prior studies examining these associations using intensive longitudinal data collection (e.g., Connolly & Alloy, 2017; Moberly & Watkins, 2008a, 2008b; Newman et al., 2019; Ruscio et al., 2015) to the bereaved population. While we are not aware of theoretical models specifically implicating worry or rumination in lowering PA, the associations we found correspond with results from two experiments in nonclinical samples, showing that the elicitation of rumination or worry within experiments both enhanced NA and reduced PA (McLaughlin et al., 2007).

The fact that trait rumination more strongly related to NA than trait worry, whereas worry related more strongly to PA than rumination in multivariate analyses, suggests that the effects of both processes on

affect are interrelated. Indeed, McLaughlin et al. (2007) have suggested that worry could elicit thoughts about past failures and negative experiences, which in turn would elicit rumination, and vice versa. Therefore, the finding that the trait tendency to engage in either process would partially explain the same variance in PA and NA makes sense.

4.2 | Repetitive negative thought, affect and PG

The baseline associations we detected between trait worry and rumination and PG symptoms are consistent with a substantial body of survey research showing concurrent and longitudinal effects of these repetitive thought styles on PG symptoms (for a review, see Eisma & Stroebe, 2021). The fact that PG symptoms related positively to trait NA and negatively to trait PA suggest the centrality of emotional dysregulation as a key element of PG. Indeed, PGD ICD-11 presently includes the persistence of a variety of negative emotions related to the loss (e.g., sadness, guilt and anger), as well as an inability to experience positive mood, as defining symptoms (ICD-11: WHO, 2020). These findings are also consistent with contemporary (coping) models on grief, which hold that people who have trouble dealing effectively with loss-related emotions or who create fewer opportunities to experience positive mood are more likely to experience persistent mental health problems (e.g., Boelen et al., 2006; Shear et al., 2007; Stroebe & Schut, 1999). Correspondingly, improved emotion regulation is a central aim of many psychological interventions for severe grief reactions (Eisma & Stroebe, 2021; Johannsen et al., 2019).

While the associations between repetitive negative thought and daily NA and PA were predominantly strong and consistent, these associations were generally not different between people with higher compared to lower PG symptom levels. Only daily rumination appeared to be more strongly positively associated with daily NA than in people experiencing more PG symptoms. This result supports the idea that rumination plays a role in perpetuation of NA (e.g., Watkins & Roberts, 2020), particularly in people with severe grief reactions. However, the small size of this effect, the lack of consistency in these moderation effects and the fact that we did not control for multiple testing suggests replication is warranted before strong inferences are drawn.

4.3 | Clinical implications

The most notable contribution of our study is that it demonstrates the existence of associations between repetitive negative thought, PA and NA in a bereaved sample on a between- and within-person level. Given these consistent interrelations, and demonstrated causal relations between these factors in prior studies in other populations (e.g., McLaughlin et al., 2007), we tentatively conclude that exercises focused on reducing daily repetitive thought may ameliorate affective disturbances among the bereaved. Our moderator analyses further suggest that particularly rumination may be a promising target within PGD therapies. This aligns with results from randomized trials

demonstrating that treatments employing exercises targeting rumination, including treatments aiming to reduce NA and increase PA, such as behavioural activation, reduce PG symptoms (e.g., Eisma et al., 2015; Wenn et al., 2019).

4.4 | Strengths and limitations

Notable strengths of this study are that it is the largest and longest daily diary study in a bereaved sample to date and the first daily diary investigation on interrelations of repetitive negative thought, affect, and severe grief reactions. Furthermore, our study contributes to a small body of research demonstrating the feasibility of employing intensive longitudinal data collection methods in bereaved samples (e.g., Ong et al., 2004, 2005; Ryckebosch-Dayez et al., 2016), as demonstrated by limited missing data and high compliance rates for completers. We hope that our study will encourage grief researchers to use daily diary methods (or other intensive data collection methods) more frequently in the future. Only by doing so, we can observe psychological processes as they are taking place, within the person, varying over time and situations (Hamaker, 2014).

This study also had some limitations. First, our study sample was a voluntary response sample, and therefore, higher educated women were overrepresented in it. While this is common in bereavement research on emotion regulation (Eisma & Stroebe, 2021), it remains to be established if results generalize to samples with lower education levels and more men. Second, we used a pen-and-paper diary as we judged this more appropriate for research in the bereaved population, as it is on average older than the general population. While daily diaries reduce retrospective bias compared to surveys, they do not eradicate it. In future studies, the use of an app to assess variables in the present moment multiple times per day, which provides opportunities to send direct reminders, may counter this limitation (cf., Burke et al., 2017; Conner & Lehman, 2012). Relatedly, while diary compliance was very good, the return rates of the diaries could be substantially improved, perhaps by sending text messages or e-mailed reminders to participants. Third, our study assessed within-person associations between daily repetitive negative thought and affect, allowing us to take into account the daily variability in these constructs in our analyses. However, we did not clarify the temporal associations between constructs, which is important to elucidate the direction of these effects. Fourth, while our measure of PG was based on Prigerson et al. (2009)'s PGD and DSM-5 (American Psychiatric Association, 2013) PCBD criteria, it does not fully assess ICD-11 or DSM-5-TR PGD criteria. Validated measures to assess these new diagnostic entities should be used in future research.

5 | CONCLUSION

Notwithstanding these limitations, this innovative daily diary study demonstrated the consistent interrelations between rumination, worry, PA and NA and PG symptoms, and illustrated the detrimental

role of rumination within people with severe grief reactions. Future investigations should aim to replicate and extend the present findings, preferably using more advanced assessment methods. Present findings, broadly consistent with a larger empirical literature within and outside the bereavement research field, support a continued clinical focus on repetitive negative thought and affect regulation within PGD treatments.

CONFLICT OF INTEREST

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

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