Upward and Downward Counterfactual Thought After Loss: A Multiwave Controlled Longitudinal Study

Maarten C. Eisma
University of Groningen

Kai Epstude
University of Groningen

Henk A.W. Schut
Utrecht University

Margaret S. Stroebe
Utrecht University and University of Groningen

Adriana Simion
University of Groningen

Paul A. Boelen
Utrecht University and ARQ National Psychotrauma Centre

Counterfactual thoughts, mental simulations about how a situation may have turned out differently (i.e., "if only …, then …"), can reduce mental health after stressful life-events. However, how specific counterfactual thought types relate to post-loss mental health problems is unclear. We hypothesized that self-referenced upward counterfactuals (i.e., "If only I had done …, then the current situation would be better") may serve as cognitive avoidance, thereby perpetuating loss-related distress. Conversely, downward counterfactuals (i.e., "If … had happened, then the current situation could have been [even] worse") may facilitate benefit finding, thereby reducing distress. In a longitudinal

survey, self-referent, other-referent, and nonreferent upward counterfactuals, and nonreferent downward counterfactuals were assessed at baseline. Prolonged grief and depression symptoms were assessed at baseline, and 6- and 12-month follow-ups. Multiple regression analyses assessed associations between counterfactual thoughts and symptom levels in 65 recently bereaved people who generated counterfactual thoughts about the loss-event. Moderator analyses assessed the unicity of significant effects in the previous step, by comparing these effects in 59 people generating loss-related counterfactuals with those in 59 propensity-score matched participants generating counterfactuals about other negative life-events. Multivariate analyses showed that nonreferent upward counterfactuals were uniquely strongly positively associated with prolonged grief and depression symptoms concurrently. Self-referent upward counterfactuals were uniquely positively associated with prolonged grief and depression symptoms longitudinally. Moderator analyses confirmed that thinking about how one's (in)actions could prevent a death uniquely exacerbated prolonged grief and depression severity. Prolonged grief treatment may be improved by targeting self-blame and guilt.

BEREAVEMENT CAN BE ACCOMPANIED by intense rumination about the causes and consequences of a loss, which perpetuates post-loss mental health problems (e.g., Boelen et al., 2006; Morina, 2011; van der Houwen et al., 2010: for a review: Eisma & Stroebe, 2017). Rumination encompasses recurrent counterfactual thoughts, which are defined as mental simulations about how the present situation may have evolved differently (Epstude & Roese, 2008; Roese & Epstude, 2017). In these mental simulations of alternative outcomes, a person attempts to undo, alter, or mutate some factual antecedent of a negative event and contemplate a potential alternative outcome. The essence of counterfactual thought is captured by reflections such as "if only… then…" (Fleming & Robinson, 2001). Following the death a child in a car accident, a parent for instance might think: "If only I had paid more attention while driving, then my son would still be alive." Counterfactual thoughts related to the (in)actions of oneself or others commonly occur after bereavement, with one study showing that after losing a child or partner in a motor vehicle accident 48% of bereaved people still entertained "if only…" scenarios in their minds 4 and 7 years after the loss. These thoughts, in turn, were related to greater experienced distress (Davis et al., 1995).

To date, few quantitative studies systematically investigated the role of counterfactual thought in adaptation to bereavement (for a review: Fleming & Robinson, 2001), yet surveys support its relevance in post-loss adaptation. Repetitive thought about how the loss could have been prevented is concurrently positively associated with anxiety, depression, prolonged grief, posttraumatic stress, and insomnia symptoms (e.g., Doering et al., 2018; Eisma et al., 2014; Sveen et al., 2019), and longitudinally positively associated with prolonged grief and depression symptoms (Eisma, Schut, et al., 2015). More generally, engaging in more thoughts about how a negative event may have been prevented is related to higher depression levels (e.g., Roese et al., 2009; see: Broomhall et al., 2017, for a meta-analysis).

When considering the role of counterfactuals following bereavement, it appears critical to gain a fuller understanding of the effects of different types of counterfactual thoughts that people may experience. Upward counterfactuals—mental simulations of how a situation could have turned out better—have been studied most in bereaved people (e.g., Davis et al., 1995; Eisma, Schut, et al., 2015). Downward counterfactuals—mental simulations about how a situation could have turned out worse—have to our knowledge received no empir-

ical attention from grief researchers. An example of an upward counterfactual is the aforementioned mother thinking about what one could have done to prevent a car accident that resulted in her son's death. An example of a downward counterfactual would be the same person considering that while she lost her son, at least she did not also lose her daughter, who was also in the car that day. These different counterfactual types may have different affective consequences, which may also depend on the specific negative event that they focus on.

In normal circumstances, counterfactual thought helps individuals to reflect on how the past unfolded and how they or others contributed to it (e.g., Epstude & Roese, 2008; Markman & McMullen, 2003). Upward counterfactuals mostly serve a preparatory function: individuals learn from past situations and adjust their behavior in the future. Downward counterfactuals, on the other hand, mostly serve affective functions: individuals reflect on how the situation could have turned out (even) worse and therefore feel better about the actual outcome (White & Lehman, 2005).

When it comes to the functionality of counterfactuals, a crucial determinant is the so-called "opportunity principle" (Roese & Summerville, 2005). Reflecting on past situations is only functional if the situation can be changed or is likely reoccur in the future. The death of a loved one is by definition unchangeable and nonrecurrent. Grief theorists have suggested that recurrent upward counterfactual thought in these cases may serve to cognitively avoid painful aspects of the loss, hampering the grieving process (Stroebe et al., 2007; for an overview of literature demonstrating these links for grief-related rumination, which encompasses upward counterfactuals: Eisma & Stroebe, 2017). Downward counterfactuals, on the other hand, may help in recognizing positive consequences of the loss (i.e., benefit finding). This, in turn, may in turn facilitate meaning making (cf. Kray et al. 2010), which is assumed to aid adaptation to bereavement (Neimeyer et al., 2010). Accordingly, we can hypothesize upward and downward counterfactuals to have opposing effects on the grieving process. If this holds true, then this has implications for existing clinical treatments targeting rumination in people with severe post-loss distress (e.g., Eisma, Boelen, et al., 2015; Wenn et al., 2019), that is, guiding clients towards reducing upward counterfactuals could be more effective when combined with increasing downward counterfactuals.

It is also useful to consider the role of the "actor" in counterfactual thoughts here. Upward counterfactuals after the loss of a significant other are often

related to the self, and such self-referent upward counterfactuals are linked to increased distress (Davis et al., 1995). However, counterfactuals after bereavement can also relate to the (in)actions of others (other-referent counterfactuals: "If only the doctor had acted sooner, she would still be alive"), or no one specifically (nonreferent counterfactuals: "If only he had not been delayed by traffic, he would not have died in the accident"). Upward counterfactuals are closely associated with or may be interpreted as attributions of blame (Branscombe et al., 2003). Therefore, self-referent counterfactuals may strengthen negative cognitions on self-blame, which have been shown to be associated with prolonged grief reactions (Boelen & Lensvelt-Mulders, 2005). Blaming others (or no one), however, could have different effects on mental health problems after stressful life-events (cf. Greene, 2018). It's noteworthy here that nonreferent counterfactuals (as measured in our study) are not situational attributions. There is no specific target in these thoughts. They simply describe thoughts on how the event could have turned out differently.

In research on counterfactuals, it is possible to either examine the properties of one specific thought, or to examine individual's general proclivity towards having different kinds of counterfactuals. In the present study, we opted for the latter approach (Rye et al., 2008), by using a questionnaire to examine the generation of different counterfactual thoughts in response to a self-chosen negative event. This procedure makes it possible to gain insight in the potential differences in effects of specific types of counterfactuals between bereaved people who generate such thoughts about the loss-event versus those who generate these in reference to other events.

In the current study, we sought to shed light on the complex interrelation of different types of counterfactual thoughts and the affective consequences of bereavement. In particular, we aimed to provide a first test of the context-dependent functionality of counterfactuals. When bereaved people generated counterfactuals about the loss-event, we expected that upward counterfactuals would be maladaptive, whereas generating downward counterfactuals would be adaptive. Specifically, we expected that self-referent upward counterfactuals may act as cognitive avoidance and would thus be positively associated with prolonged grief and depression symptoms concurrently and longitudinally (e.g., Eisma & Stroebe, 2017; Stroebe et al., 2007). Alternatively, self-referent counterfactual thoughts may increase feelings and cognitions related to self-blame (e.g., Branscombe et al., 2003; Boelen and

Lensvelt-Mulders, 2005), which might worsen prolonged grief and depression symptoms after bereavement. Downward counterfactuals, on the other hand, may help find benefits and meaning in the loss (Kray et al., 2010) and, accordingly, were expected to be negatively related to prolonged grief and depression symptoms concurrently and longitudinally. We also explored the associations of other-referent and nonreferent upward counterfactuals with these post-loss mental health outcomes, but formulated no specific hypotheses regarding the direction of these effects.

Methods

PROCEDURE

Adults from the general population could participate if they had lost a first-degree family member (i.e., parent, child, sibling, partner) in the past 3 years. Most participants were recruited via the content network of Google. Additionally, participants were recruited via announcements on websites for organizations for bereaved people and websites with information about grief. People who were interested in participating in the study could link through to a website specifically designed for this project, where information about the study was provided. People who chose to participate were asked to fill out their contact details on the website. Within a week after providing this information, they received an information letter (e.g., on voluntariness of participation, data handling, advantages and disadvantages of participation), an informed consent form, the first questionnaire and a prepaid return envelope. Second- and third-wave questionnaires were sent by post at 6 and 12 months after the baseline measurement, respectively. The current study was conducted in agreement with Dutch juridical legislation for social scientists and professional ethical regulations of the World Medical Association Declaration of Helsinki.

SAMPLE

The original sample consisted of 282 adults (88% female). All participants had lost a first-degree relative in the past 3 years. Of the 282 participants who filled out the first questionnaire, 227 (80%) filled out the questionnaire after 6 months and 186 (66%) filled out the questionnaire after 1 year. No differences were found on loss and background variables or symptom levels of depression and complicated grief between dropouts and people who participated at all three measurement moments (for a prior study on this dataset using the mental health measures as dependent variables: Eisma et al., 2013). For full original sample characteristics see Table 1.

Table 1

Baseline Sample Characteristics of the Original Sample (N = 282) the Loss-Related Counterfactual Sample (N = 64) and the Matched Groups of People Generating Loss-Related Counterfactuals (N = 59) and Non-Loss-Related Counterfactuals (N = 59)

	Original sample	Loss CF sample	Matched Loss CF sample	Matched Non-loss CF sample
Demographic variables				
Gender (*N* (Valid %))				
Female	253 (90)	59 (91)	54 (92)	57 (97)
Age in years (Mean, *SD*)	49.9 (11.5)	46.7 (11.6)	47.4 (11.7)	47.9 (12.4)
Level of education (*N* (Valid %))				
Primary school	9 (3)	2(3)	2 (3)	2 (2)
Secondary school	92 (33)	23(35)	22 (37)	15 (25)
Vocational school	70 (25)	14(22)	13 (22)	16 (27)
College or university	107 (38)	25(39)	21 (36)	25 (42)
Other	4 (2)	1(2)	1 (2)	1 (2)
Loss-related variables				
Deceased is (*N* (Valid %))				
Partner	119 (42)	24 (37)	23 (39)	28 (48)
Child	55 (20)	17 (26)	16 (27)	11 (19)
Parent	67 (24)	13 (20)	12 (20)	11 (19)
Sibling	41 (5)	11 (17)	8 (14)	9 (15)
Cause of loss (*N* (Valid %))				
Natural causes (e.g., illness)	234 (83)	47 (72)	45 (76)	49 (83)
Accident	27 (10)	11 (17)	10 (17)	5 (9)
Suicide	19 (7)	7 (11)	4 (7)	4 (7)
Murder	2 (1)	0 (0)	0 (0)	1 (2)
Loss was (*N* (Valid %))				
Expected	98 (35)	20 (31)	19 (32)	18 (31)
Unexpected	164 (58)	40 (62)	37 (63)	37 (63)
Different (i.e. both)	20 (7)	5 (8)	3 (5)	4 (7)
Months since loss (Mean, *SD*)	17.9 (9.5)	15.9 (8.9)	16.3 (8.6)	16.3 (9.7)

Note. CF = counterfactuals. Category percentages may not add to 100% due to rounding.

MEASURES

In the first questionnaire demographic and loss-related information, counterfactual thoughts, and prolonged grief and depression symptoms were assessed. After 6 and 12 months prolonged grief and depression symptoms were reassessed.

Background Information

A self-constructed questionnaire assessed the characteristics of the participant (age, gender, and education level) and characteristics of the deceased and the loss (kinship to the deceased, time since the loss, cause of death, and expectedness of the death).

Counterfactual Thoughts

Counterfactual thoughts were measured with the Counterfactual Thinking for Negative Events Scale (CTNES: Rye et al., 2008; Dutch version: van de Ven & Zeelenberg, 2015). The CTNES consists of four subscales: upward self-referent counterfactual thought (e.g., "I think about how much better things would have been had I acted differently"), upward other-referent counterfactual thought (e.g., "If only other people (or another person) would have acted

differently, this situation would have turned out better"), upward nonreferent counterfactual thought (e.g., "I think about how much better things could have been"), and downward nonreferent counterfactual thought (e.g., "I think about how much worse things could have been"). Every subscale consists of four statements. Participants indicated how often they experience certain thoughts in response to self-chosen negative reference event on 5-point scales, ranging from *never* (1) to *very often* (5). The subscales of the CTNES showed good internal consistency in the current sample (upward self-referent, α = .78, upward other-referent, α = .84, upward nonreferent, α = .82, downward nonreferent, α = .82). After filling in the CTNES, each participant was asked to indicate in response to what event they generated their counterfactuals. We then coded these responses into "loss event" if it directly referred to the death of a loved one, or "non-loss event" if it referred to another event.

Prolonged Grief Symptoms

Prolonged grief symptoms were assessed with the Inventory of Complicated Grief Revised (ICG-R:

Prigerson & Jacobs, 2001; Dutch version: Boelen et al., 2003). The Dutch version comprises 29 descriptions of symptoms of pathological grief. Respondents indicated on 5-point Likert scales ranging from *almost never* (0) to *always* (4) how often or how intensely they experienced these symptoms. Example items are: "I feel myself longing and yearning for the deceased" and "I feel that I have trouble accepting the death." The reliability of the ICG-R was excellent in the present sample, α = .95.

Depression Symptoms

Depression symptoms were measured with the depression subscale of the Hospital Anxiety and Depression Scale (HADS: Zigmond & Snaith, 1983; Dutch version: Spinhoven et al., 1997). The depression subscale of the HADS consists of seven statements representing depressive symptoms. Example items are (both reverse-scored): "I feel cheerful" and "I still enjoy the things I used to enjoy." Participants indicated how often or to what extent they have had these experiences in the past week on 4-point scales (varying anchors). The depression subscale of the HADS showed good internal consistency in the current sample, α = .89.

Statistical Analyses

First, we established which participants kept the death-event in mind when filling out the CTNES (i.e., we selected those participants who chose to report on counterfactuals about the loss) and described their characteristics. Zero-order correlations were calculated between all types of counterfactuals (i.e., self-referent, other referent and nonreferent upward counterfactuals, and nonreferent downward counterfactuals) and prolonged grief and depression symptoms in this subsample. Before the main analyses, we checked the assumptions of regression analyses by visually inspecting scatterplots for linearity, PP-plots for normality of errors, and residual plots for homoscedasticity. Multicollinearity was examined by calculating associations between predictors and VIF values. We included a check for outliers, by calculating Mahalobis distances.

For the main analysis, six multiple regression analyses were conducted within this group (i.e., people who kept the death-event in mind when filling out the CTNES) to assess the predictive value of different types of counterfactual thought on baseline, 6 and 12 months symptom levels of prolonged grief and depression. In both regression analyses with baseline symptoms as dependent variables, all four types of counterfactuals were entered simultaneously as independent variables into the regression model. In four hierarchical

regression analyses predicting 6 and 12 month symptom levels, baseline symptoms entered as the independent variable in a first block, and all counterfactual types entered as independent variables in a second block.

After establishing the predictive value of different types of counterfactuals for symptom levels, we aimed to establish the unicity of significant effects in the previous analyses with a post-hoc analysis. To do so, we applied a propensity-score matching (PSM) procedure, in which we set out to match each participant who reported on counterfactuals related to death ("loss CF group") with a similar participant who reported on counterfactuals unrelated to death ("non-loss CF group"). Distinguishing between these groups enabled us to control for potential systematic differences between participants in both groups on baseline characteristics (other than the choice to generate counterfactuals for a loss-event or non-loss event). Thus, PSM was used with the aim of estimating causal effects in the absence of randomized data. The first step of the analysis was estimating the propensity score (i.e., the probability of each participant to be assigned to the loss CF group, conditional on all baseline sociodemographic and loss-related characteristics). After obtaining the propensity score, participants were matched using 1:1 nearest neighbor matching through a logistic model. As recommended by Thoemmes (2012), a caliper of .15 of the standard deviation of the logit of the propensity score was used. The baseline characteristics (i.e., covariates) used were age, relationship with the deceased, time since loss, and expectedness of the loss. Gender was excluded from the analyses, because it did not improve the matching procedure outcome. Balance between the "loss CF group" and the "non-loss CF group" was established by inspecting the overall balance test (which should be nonsignificant; Hansen & Bowers, 2008), relative multivariate imbalance (which should show a decrease between unmatched and matched groups; Iacus et al., 2009), and a summary of unbalance (which should show no covariates to differ more than $d = .25$ on the matched groups).

Next, we ran moderation analyses using the PROCESS tool for SPSS (Hayes, 2013) in which we conducted regression analyses of the significant effects between independent and dependent variable relationships in the previous analyses, using matched "group" (i.e., loss CF group vs. non-loss CF group) as a moderator of these effects. Baseline symptoms were entered as a covariate in the longitudinal analyses. We expected that the previously detected significant effects would be stronger in the loss CF group than in the non-loss CF group,

Table 2
Associations Between Counterfactuals and Prolonged Grief Symptoms at Baseline, and 6- and 12-Month Follow-up

Prolonged grief	T1			T2			T3		
	ΔF	ΔR^2	β	ΔF	ΔR^2	β	ΔF	ΔR^2	β
Step 1				135.40**	.73		61.83**	.60	
T1 symptoms						.82**			.83**
Step 2	7.85**	.34		3.00*	.06		2.42†	.08	
Downward nonreferent CF			-.13			.10			.16
Upward self-referent CF			.02			.25**			.28*
Upward other-referent CF			.12			-.02			-.06
Upward nonreferent CF			.46**			-.03			-.12

Note. CF = counterfactuals. ** = $p < .01$, * = $p < .05$, † = $p < .10$. Beta's are from the final models only.

and that effects can thus be attributed to generating counterfactual thoughts about (immutable and non-recurrent) loss-events versus other negative events.

All analyses were conducted using SPSS 25.0 (IBM Corporation, 2011). Propensity score matching was conducted in SPSS 25.0, with the additional R-plugin and the PSMATCHING3.04 package. A two-sided significance level of $\alpha = .05$ was used for all analyses.

Results

PRELIMINARY ANALYSES

Sample Characteristics
Our primary analyses focused on 65 people who had used the loss as a reference event when filling out the CTNES. Their demographic and loss-related characteristics are shown in Table 1.

Correlations Between Counterfactual Types and Symptom Levels at T1
Zero-order correlation analyses at T1 showed that self-referent, other-referent and nonreferent upward counterfactuals were all concurrently positively associated with prolonged grief symptoms, $r(63) = .33, p = .008$, $r(63) = .35, p = .005$, $r(63) = .57, p < .001$, respectively. Nonreferent downward counterfactuals were negatively associated with prolonged grief symptoms $r(63) = -.27, p = .033$. Only nonreferent upward counterfactuals were significantly positively associated with depression symptoms, $r(63) = .47, p < .001$. While other correlations between counterfactuals and depression symptoms were in the expected direction they were small in size and nonsignificant (all $|rs| < .24$, all $ps > .058$).

Assumption Checks
Four significant zero-order correlations emerged between counterfactual types at T1: self-referent counterfactuals were positively associated with other-referent upward counterfactuals, $r(63) = .57, p < .001$, and with nonreferent upward counterfactuals, $r(63) = .50, p < .001$. Other-referent upward counterfactuals were positively associated with nonreferent upward counterfactuals, $r(63) = .47, p < .001$. Downward counterfactuals were negatively associated with nonreferent upward counterfactuals, $r(63) = -.30, p = .014$. Moreover, tolerance values were higher than .10, and VIF factors lower than 10. Together, this indicates that multicollinearity was not an issue (Pallant, 2013). Visual inspection of scatterplots did not indicate violations of the assumption of linearity. Critical values for Mahalanobis distance were not exceeded confirming that no outliers were present (Tabachnick & Fidell, 2007). PP-plots and residual plots showed mild violations of normality and homoscedasticity assumptions for some relationships under investigation (see Appendix A), but neither violation is problematic. Our samples were sufficiently large to protect against the effects of mild non-normality (Ernst & Albers, 2017), and limited heteroscedasticity leads to unbiased and robust estimates as long as the variance is finite (Chatterjee & Hadi, 2006).

MAIN ANALYSES

Associations Between Counterfactuals and Prolonged Grief Symptoms
Table 2 displays the regression analyses of counterfactuals on prolonged grief symptoms. Three models were run. First, baseline prolonged grief symptoms were predicted by all counterfactual types, resulting in a significant model test, $F(4, 60) = 7.85, p < .001, R^2 = .34$. Nonreferent upward counterfactual thought showed a unique significant relationship with baseline prolonged grief symptoms (β = .46, $p = .001$).

Next, T2 prolonged grief symptoms were predicted, yielding a significant final model, $F(5, 46) = 33.82, p < .001$. In Step 1, baseline prolonged grief symptoms explained 73% of variance in T2 prolonged grief symptoms (β = .82, $p < .001$). In Step 2, counterfactual thought types predicted 6%

Table 3

Associations Between Counterfactuals and Depression Symptoms at Baseline, and 6- and 12-Month Follow-up

Depression	T1			T2			T3		
	ΔF	ΔR^2	β	ΔF	ΔR^2	β	ΔF	ΔR^2	β
Step 1				68.50**	.58		20.23**	.33	
T1 symptoms						.81**			.63**
Step 2	4.85**	.25		2.65*	.08		3.78*	.19	
Downward nonreferent CF			-.08			.11			.15
Upward self-referent CF			.01			.25*			.43**
Upward other-referent CF			-.15			.08			.07
Upward nonreferent CF			.51**			-.20			-.21

Note. CF = counterfactuals. ** = $p < .01$, * = $p < .05$. Beta's are from the final models only.

of additional variance in T2 prolonged grief symptoms. Self-referent upward counterfactuals were the only thought type significantly related to prolonged grief symptoms (β = .25, p = .008).

Lastly, T3 prolonged grief symptoms were predicted, and the final regression model was significant, $F(5, 37) = 16.01$, $p < .001$. In Step 1, baseline depression symptoms predicted 60% of variance in T3 prolonged grief symptoms (β = .83, $p < .001$). In Step 2, counterfactual thought styles predicted 8% of additional variance in T3 prolonged grief symptoms. Again, of all thought types, only self-referent upward counterfactuals were significantly related to prolonged grief symptoms (β = .28, p = .028).

Associations Between Counterfactuals and Depression Symptoms

Table 3 displays the regression analyses of counterfactuals on depression symptoms. Three models were run. First, relationships between all counterfactual types and depression symptoms were examined, yielding a significant model test, $F(4, 60) = 4.85$, p = .002, explaining 25% of variance. Upward nonreferent counterfactuals were uniquely and significantly associated with depressive symptoms (β = .51, p = .001).

Second, depression symptoms at T2 were predicted in a hierarchical regression analysis, yielding a significant final model, $F(5, 46) = 17.62$, $p < .001$. In Step 1, baseline depression symptoms predicted 58% of variance in T2 depression symptoms (β = .81, $p < .001$). In Step 2, counterfactual thought styles predicted 8% of additional variance in T2 depression symptoms. Self-referent upward counterfactuals were uniquely and significantly related to T2 depression symptoms (β = .25, p = .035).

Third, depression symptoms at T3 were predicted in another hierarchical regression analysis, and the final model was significant, $F(5, 37) = 8.16$, $p < .001$. In Step 1, baseline depression symptoms predicted 33% of variance in T3 depression

symptoms (β = .63, $p < .001$). In Step 2, counterfactual thought styles predicted 19% of additional variance in T3 depression symptoms. Again, self-referent upward counterfactuals were exclusively significantly related to T3 depression symptoms (β = .43, p = .007).

POST-HOC ANALYSES
Propensity Score Matching
Since PSM cannot be performed with any type of missing data, participants were excluded from the analysis if they had missing values on covariates or the CTNES for the PSM analysis. After removing these cases ($N = 4$ in the loss CF group, $N = 47$ in the non-loss CF group), the initial sample consisted of 61 participants in the loss CF group and 170 in the non-loss CF group. After matching, both loss CF group and the non-loss CF group comprised 59 participants each, with 111 control and two loss CF cases being unmatched and no cases being discarded. The propensity-score matching thus resulted in a matched sample of 59 people who had filled out the CTNES related to the loss, and 59 people who had filled out the CTNES regarding another negative life-event. The overall balance test was non-significant, $\chi^2(5) = 0.59$, p = .939, relative multivariate imbalance showed a decrease from .86 to .73 from before to after matching, and no imbalance on any covariate was found (no |d| > .25). The matching procedure was thus successful in creating equivalent groups, that differ only on the reference event for counterfactual reporting (i.e., loss event vs. non-loss event).

Matched Groups as a Moderator of Associations Between Counterfactual Types and Prolonged Grief and Depression Symptoms
As mentioned, we followed up all significant effects from the multiple regressions with interaction analyses with each separate previously significant predictor as independent variable, matched groups as the moderator, and symptom levels of prolonged

grief and depression as dependent variables. In longitudinal analyses we again used baseline symptoms as a control variable. Two significant interactions emerged in these post-hoc interaction analyses. Matched groups moderated the effects of self-referent upward counterfactuals on prolonged grief symptoms at T2, $\Delta F(1, 90) = 7.04$, $b = 1.62$, $p = .009$, $\Delta R^2 = .02$. Simple slope analyses demonstrated that self-referent upward counterfactuals were significantly associated with T2 prolonged grief symptom levels in the loss-related counterfactual group ($b = 1.41$, $p = .002$), but not in the non-loss-related counterfactual group ($b = -0.22$, $p = .61$). Matched groups also moderated the effects of self-referent upward counterfactuals on depression symptoms at T3, $\Delta F(1, 76) = 6.05$, $b = 0.44$, $p = .016$, $\Delta R^2 = .04$. Simple slopes analyses showed that self-referent upward counterfactuals were significantly associated with T3 depression symptom levels in the loss-related counterfactual group ($b = 0.49$, $p < .001$), but not in the non-loss-related counterfactual group ($b = 0.05$, $p = .69$). All four other interaction terms were nonsignificant (all ps > .28, all R^2s ≤ .01), indicating that the previously detected effects of counterfactual thoughts on symptom levels were not significantly different between the matched groups.

However, significant main effects for the positive associations between nonreferent upward counterfactuals and concurrently experienced prolonged grief and depression symptoms did emerge ($b = 0.49$, $p < .001$), and ($b = 3.97$, $p < .001$), respectively. This effect thus held in both groups. Such consistent main effects were not detected across both matched groups for the relationships between self-referent upward counterfactuals on prolonged grief and depression symptoms in the longitudinal moderation analyses.

Discussion

The aim of the present study was to establish the cross-sectional and longitudinal associations between different types of upward and downward counterfactuals and prolonged grief and depression symptoms after bereavement. Main findings from zero-order correlation analyses were that all types of (i.e., self-referent, other-referent, nonreferent) upward counterfactuals about loss-events were concurrently positively associated with prolonged grief symptoms. Downward counterfactuals about the loss-event were concurrently negatively correlated with prolonged grief symptoms. Patterns of findings for analyses using depression symptoms as a dependent variable were less clear-cut; only nonreferent upward counterfactual thought was concurrently positively associated with depression symptoms. Next, in multiple regression models,

including all types of counterfactuals as predictors of prolonged grief and depression symptoms, only nonreferent upward counterfactuals about loss were uniquely and positively associated with baseline symptom severity, whereas self-referent counterfactual thought about the loss was a unique and strong longitudinal predictor of symptom severity. Post-hoc moderator analyses demonstrated that counterfactual thoughts about how oneself could prevent a loss-event (vs. another event) uniquely predicted prolonged grief and depression symptoms longitudinally (albeit not consistently so).

Taken together, findings suggest that mentally "undoing death," in particular in relation to actions oneself could (not) have taken, is a problematic coping strategy that perpetuates post-loss mental health problems. Repetitively reflecting on the death and its circumstances shortly after a loss may reflect a natural initial attempt to deal with a stressful life-event. Attributing the occurrence of the event to one's own (in)actions could help regain a sense of control after beliefs about fairness and predictability of one's world have been shattered (Fleming & Robinson, 2001). By imagining how the situation could have been better, individuals may momentarily even feel relief (Kray et al., 2010). However, in light of an immutable reality, persistence of such thoughts ultimately prevents acceptance of painful aspects of the loss and exacerbate distress (Eisma & Stroebe, 2017; Stroebe et al., 2007).

An alternative explanation for the finding that self-referent counterfactuals intensify prolonged grief and depression symptoms is that they may increase feelings of self-blame, regret, and guilt (Branscombe et al., 2003; Broomhall & Phillips, 2018; Mandel & Dhami, 2005). These experiences have been hypothesized to exacerbate loss-related distress, and self-blame and guilt have been concurrently and longitudinally related to prolonged grief and depression levels following bereavement (e.g., Boelen et al., 2006; Li et al., 2019; Stroebe et al., 2014). Future large-scale longitudinal research and experiments are needed to elucidate the interrelations between counterfactual thoughts, associated emotions and cognitions, and psychological recovery from bereavement.

We found some indications of beneficial effects of downward counterfactuals. Recurrent consideration of how things could have turned out (even) worse is concurrently negatively related to prolonged grief symptoms (but not depression symptoms). This could be interpreted in line with the idea that downward counterfactuals facilitate benefit finding, and thereby meaning-making (Kray et al.,

2010). However, downward counterfactuals were not related to symptoms of depression and prolonged grief symptoms concurrently or longitudinally in multivariate analyses. This corresponds with results from a longitudinal study demonstrating that perceptions of finding benefits in bereavement did not predict symptom severity over a 6-month period (Eisma et al., 2019, but see: Davis et al., 1998, for contradictory findings). Future research could examine this issue in more detail. For example, one line of research could be to establish whether the experimental finding that generation of counterfactuals increases perceptions of meaning through finding benefits in past life choices (Kray et al., 2010) also holds in people coping with bereavement. Recent research using a controlled experimental setup demonstrated that downward counterfactuals do have the potential to diminish the negative valence of autobiographical memories (De Brigard et al., 2019; see also De Brigard and Parikh, 2019). While these results in combination with our findings show preliminary indications that intervention based on stimulating this type of thinking might be helpful to reduce distress, it is clear that in context of bereavement more work needs to be done to examine if, and under what circumstances, this would be effective.

Our results align with the established effectiveness of targeting repetitive negative thought within psychotherapy for affective disorders (for a review: Querstret & Cropley, 2013), and within psychotherapy for prolonged grief specifically, for instance, by using exposure-based treatments (Eisma, Boelen, et al., 2015; Eisma, Schut, et al., 2015) or metacognitive therapy (Wenn et al., 2019). Since counterfactual thought has been causally linked with self-blame and guilt (e.g., Branscombe et al., 2003; Broomhall & Phillips, 2018; Mandel & Dhami, 2005), our findings also suggest the usefulness of application of cognitive restructuring techniques to target negative cognitions and irrational beliefs related to these experiences (e.g., Boelen et al., 2007; Kubany & Manke, 1995; for a recent illustration of constructivist techniques to reduce loss-related counterfactual thoughts: Neimeyer et al., 2019).

The present study is the first longitudinal investigation to consider the effects of both upward and downward counterfactuals in adaptation to bereavement. Its main strengths are a multiwave longitudinal design and the use of probability-score case-controlled matching to establish if the reported effects are unique to the (spontaneous) generation of specific counterfactuals about the loss (vs. another event). However, some limitations are notable.

First, in this voluntary response sample, higher-educated people and women were overrepresented, posing a threat to generalizability. However, an overrepresentation of female participants is common in grief research, and may be explained by the fact that women are more likely to become widowed (Arbuckle and de Vries, 1995) and have a stronger need to express their emotions compared to men (Stroebe et al., 2001). Relatedly, grief levels in this sample ranged from nonclinical to clinical. Future research should aim to establish if these effects hold in samples with more lower-educated people, more men, and bereaved people with PGD diagnoses. Replicating this work within a representative population-based cohort study could be worthwhile.

Second, while our study yielded several unique findings, with substantial effect sizes, our relatively limited sample size may have prevented detection of smaller but meaningful effects. For example, a small zero-order correlation ($r = .23$) between downward counterfactuals and depression symptoms did not reach significance. Third, while we could establish the temporal precedence of effects of counterfactual thought on psychopathology levels, we could not establish if such relationships are reciprocal. Conducting longitudinal surveys that would allow for cross-lagged analyses would therefore be useful. Similarly, as we could not firmly establish causality with our analyses (due to the inability to rule out effects of third variables) we recommend the use of experiments to assess whether upward self-referent counterfactuals about loss increases negative mood and grief-related emotions (e.g., yearning). Lastly, our measure of prolonged grief symptoms, the ICG-R, is commonly used, but does not fully capture most recent criteria for pathological grief disorders, such as prolonged grief disorder in the International Classification of Diseases-11 (World Health Organization, 2018). Further research is therefore needed to establish if similar results are obtained when using measures that comprehensively assess most recent prolonged grief disorder criteria.
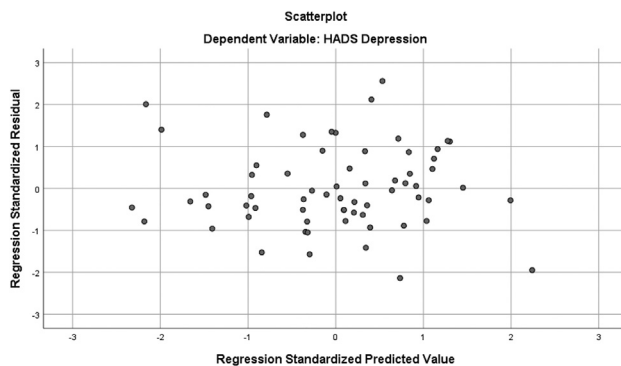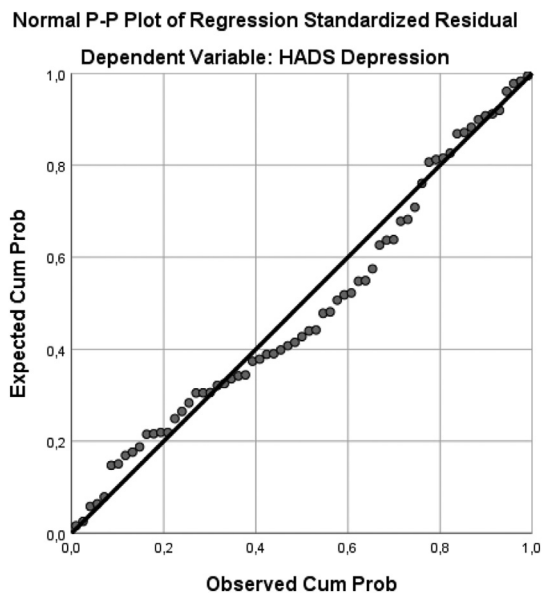
CONCLUSIONS

Notwithstanding these limitations, the present findings provide strong evidence that recurrently mentally "undoing the loss," by thinking about what oneself could have done to prevent a death, perpetuates loss-related distress. Future research should aim to replicate and extend current findings, using larger samples, and different designs, to further clarify the relationships under investigation, and the working mechanisms driving these relationships. Our results further suggest that it could be potentially fruitful to specifically target self-blame and guilt in prolonged grief treatments for

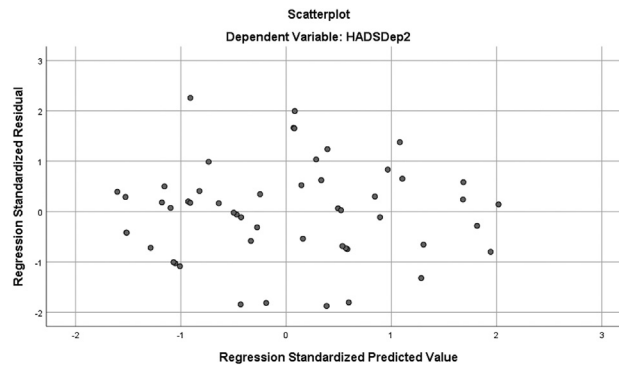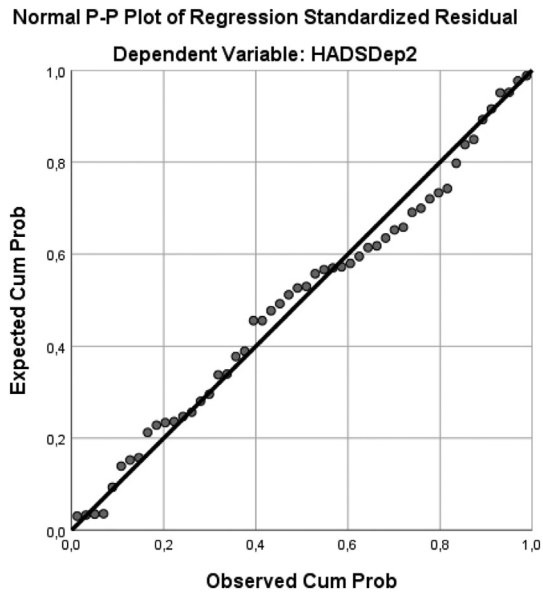people for whom such themes are the topic of recurrent preoccupations.

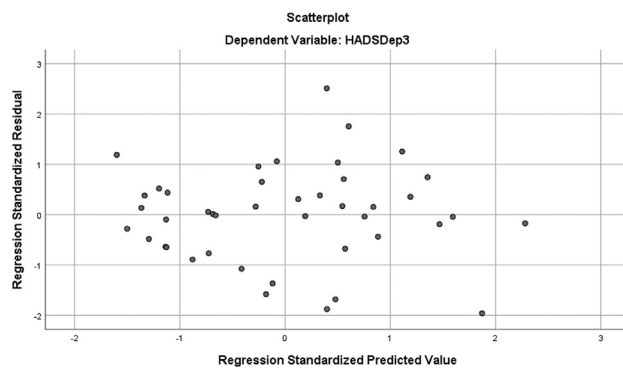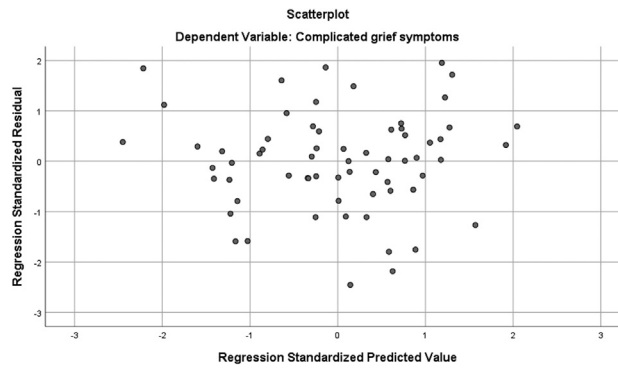## Appendix A. PP-plots and error plots for main analyses

PP-plots and error plots for counterfactuals predicting T1 depression symptoms

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: HADS Depression

Scatterplot
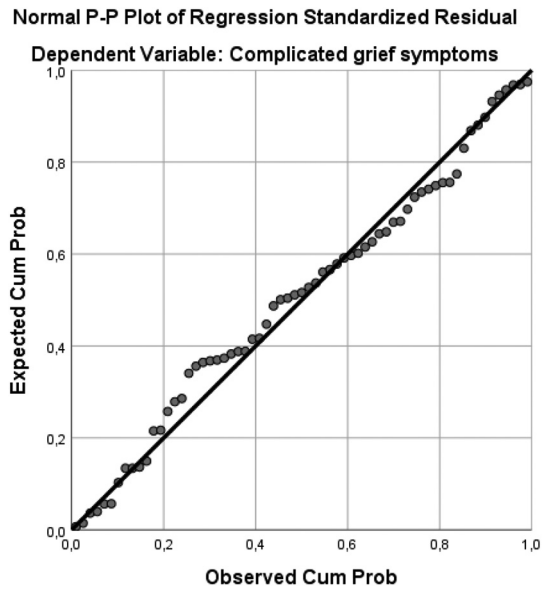
Dependent Variable: HADS Depression

PP-plots and error plots for counterfactuals predicting T2 depression symptoms

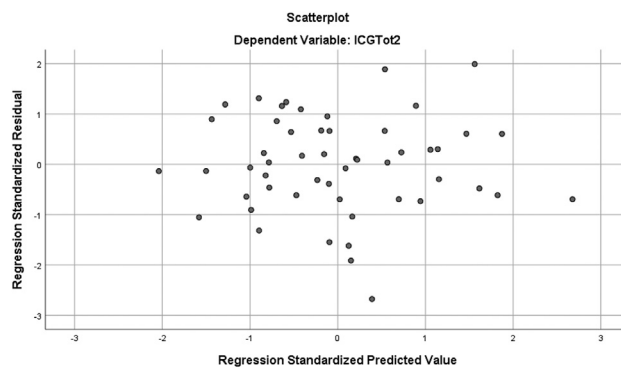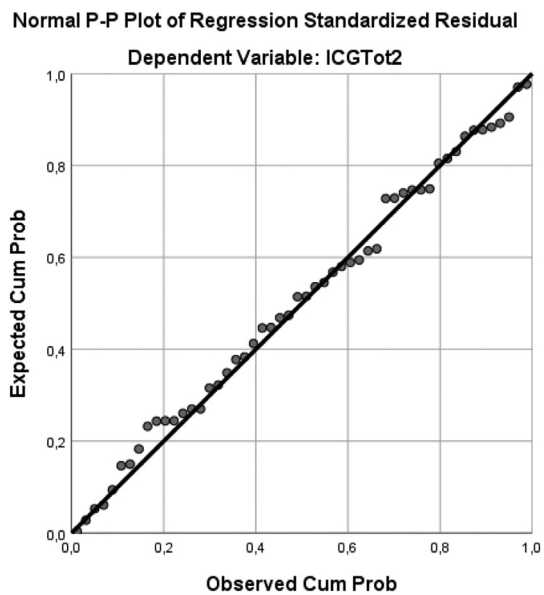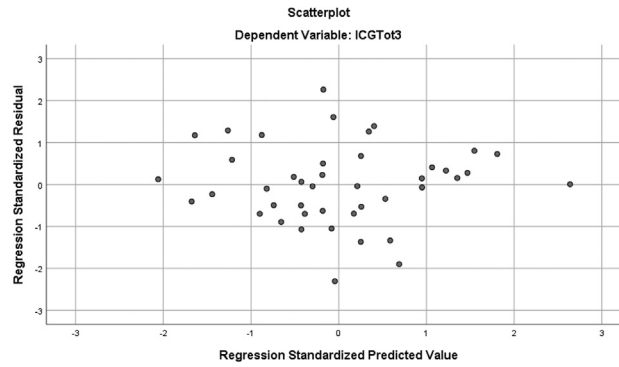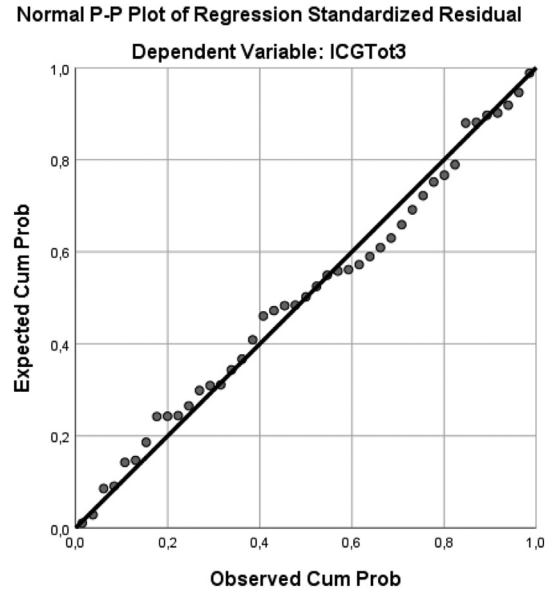PP-plots and error plots for counterfactuals predicting T3 depression symptoms

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: HADSDep3

Scatterplot
Dependent Variable: HADSDep3
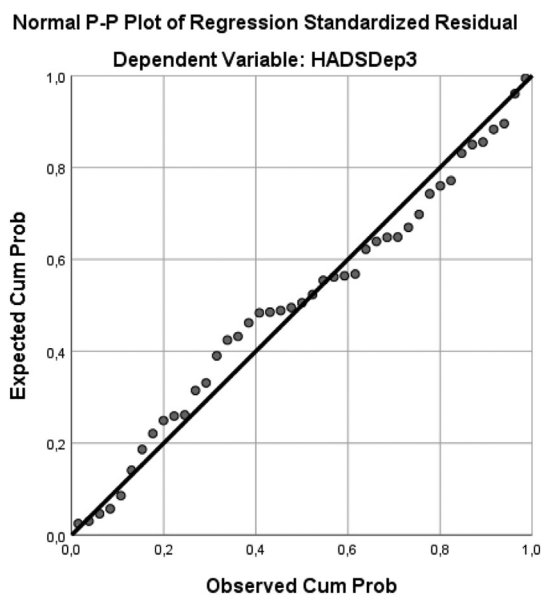
PP-plots and error plots for counterfactuals predicting T1 prolonged grief symptoms

Normal P-P Plot of Regression Standardized Residual

Dependent Variable: Complicated grief symptoms

Scatterplot

Dependent Variable: Complicated grief symptoms

PP-plots and error lots for counterfactuals predicting T2 prolonged grief symptoms

Normal P-P Plot of Regression Standardized Residual
Dependent Variable: ICGTot2

Scatterplot
Dependent Variable: ICGTot2

PP-plots and error plots for counterfactuals predicting T3 prolonged grief symptoms

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