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Factors Associated With Treatment Response in an Internet-Based Intervention for Prolonged Grief Disorder After Cancer Bereavement

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Internet-based psychological interventions have proven effective in the treatment of prolonged grief disorder (PGD). Yet, some patients do not benefit from treatment in a clinically significant way. We aimed to examine predictors of symptom reduction in an Internet-based intervention for PGD after cancer bereavement, in order to identify possible treatment mechanisms and discern directions for future intervention design. A secondary analysis of data from a randomized wait-list controlled trial on an Internet-based intervention for PGD after cancer bereavement was conducted. Multiple regression models were used (1) to test for the influence of pretreatment PGD, working alliance, avoidance and gender on PGD symptom reduction; and (2) to explore further predictors of treatment success with a best subset selection protocol. The regression models explained 18% (Model 1) and 34% (Model 2) of variance in symptom reduction. Participants with more favorable symptom change had more severe pretreatment PGD scores and better working alliance. Those with lower social support and less posttraumatic growth experienced more PGD symptom change. In conclusion, therapeutic alliance is an important factor that should be monitored and fostered. Findings regarding social support and posttraumatic growth need further replication and clarification.

Keywords: Internet-based intervention; prolonged grief disorder; clinical trials; cognitive-behavioral therapy; treatment response

THE EFFICACY OF INTERNET-BASED INTERVENTIONS was shown for a variety of mental disorders and related matters (Carlbring et al., 2018; Kuester et al., 2016). Besides cost-effectiveness, flexibility, and increased anonymity, they offer high accessibility (Aboujaoude et al., 2015). This makes them ideal for the treatment of newly established diagnoses, such as prolonged grief disorder (PGD; Wagner et al., 2020). Included into the 11th revision of the International Classification of Diseases (ICD-11; World Health Organization, 2020), PGD is a new diagnostic entity that affects 9.8% of the bereaved (Lundorff et al., 2017) and constitutes a considerable burden for those affected.

Interventions employing structured writing tasks following the Pennebaker (1997) paradigm have been widely used in the treatment of PGD (Kersting et al., 2013; Treml et al., 2021b) and

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other stress-related conditions (Knaevelsrud et al., 2014, 2017; Knaevelsrud & Maercker, 2007; Sayer et al., 2015; Wagner & Maercker, 2007). Internet-based interventions that rely on written communication require very little technical literacy and provide high flexibility, as they are asynchronous (i.e., no appointment is required for patients to work on modules); yet individual therapist feedback can be provided within a reasonable time frame and therapeutic alliance can be built (Berger, 2017).

While Internet-based interventions, and especially asynchronous text-based interventions, reach medium to large effect sizes in the treatment of PGD (Wagner et al., 2020), a considerable number of patients do not benefit from treatment in a clinically significant way: while mean changes in outcome scores indicate an improvement, some participants experience no improvement or improvement that remains below a meaningful threshold. In a study on Internet-based exposure and behavioral activation for prolonged grief 53% and 54% of patients, respectively, did not show reliable change (Eisma et al., 2015). In studies with a structured writing paradigm for prolonged grief after pregnancy loss and suicide bereavement, 28% (Kersting et al., 2013) and 44% (Treml et al., 2021b), respectively, still scored above the Inventory of Complicated Grief (ICG) cutoff.

Identifying factors that explain the apparent variance in symptom improvement may provide insights into treatment mechanisms and influential preexisting factors, and therefore inform future intervention design and tailoring.

Several factors have been examined as predictors of treatment success in Internet-based interventions for situations other than bereavement: Female gender is related to higher adherence (Beatty & Binnion, 2016) and to symptom change in social anxiety (Chen et al., 2020), indicating that some interventions might be biased to better cater to women than men. Although possibly connected to Internet literacy, neither age nor education predicted outcomes in Internet-based interventions for other conditions (Beatty & Binnion, 2016; Nissen et al., 2021). Working alliance is ubiquitously associated with treatment response in a wide variety of psychotherapeutic approaches (Flückiger et al., 2018), including Internet-based interventions (Kaiser et al., 2021). Severity of baseline symptoms has been identified as a predictor of change, for example, in anxiety and depression (Edmonds et al., 2018; Mathiasen et al., 2018; Nissen et al., 2021) or social anxiety (El Alaoui et al., 2015; Nordgreen et al., 2012). Research concerning the predictive value of baseline severity of related mental health constructs (e.g., baseline depression in an intervention for PGD) is scarce.

Several factors, while not yet examined in the context of Internet-based interventions for PGD, showed associations with PGD severity and trajectory: Losing a child (Boelen & Lenferink, 2021), a close relationship to the deceased (Coelho et al., 2021), high dependency, (Mancini et al., 2015) and low preparedness for the death (Lobb et al., 2010) are associated with a higher risk for PGD. Severity of PGD symptoms was linked to time since loss, relationship to the deceased (Kersting et al., 2011), separation anxiety (Boelen, 2013), childhood trauma (Lobb et al., 2010), and social support (Al-Gamal et al., 2019). Results on the association of PGD with posttraumatic growth and related constructs are inconclusive (Lobb et al., 2010). The dual process model of grief (Stroebe & Schut, 1999) proposes loss- and restoration-oriented processes as a central mechanism of healthy grief, and their avoidance as a mechanism in the development of PGD. Depressive and anxious avoidance is linked to the severity of PGD symptoms (Boelen & van den Bout, 2013), and avoidance as measured by the Impact of Event Scale—Revised (IES-R) was shown to predict lower treatment success in a face-to-face intervention for grief (Bryant et al., 2017).

While previous research has shed light on possible correlates of symptom change in Internet-based interventions, it has not yet been examined whether these associations hold true in the context of PGD. Further research is also required concerning factors unique to PGD, such as grief-specific avoidance and factors pertaining to the relationship to the deceased. While the role of these factors in the development of PGD has been established, information on those factors' influence on Internet-based treatment outcomes is still scarce.

We aim to examine predictors of treatment response in a secondary analysis of data from a randomized controlled trial on an Internet-based intervention for prolonged grief after cancer bereavement. The examined intervention had a large and stable effect on prolonged grief symptoms; yet 56% of the sample did not reach clinically significant improvement (Kaiser et al., 2022). Exploratory analyses are performed to examine predictors of treatment success. Drawing on previous research on predictors of change in Internet-based interventions and grief-specific interventions, we formed the post hoc hypotheses that in the analyzed intervention (a) women experience more symptom improvement than men, (b) participants with more severe PGD symptoms

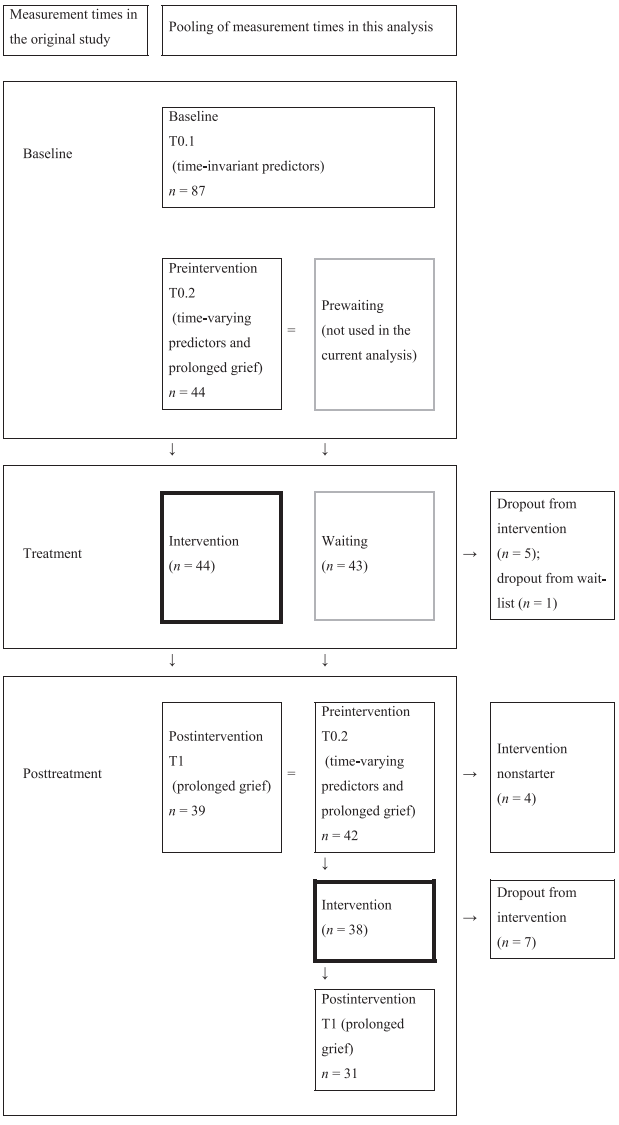

FIGURE 1 Participant flow of analyzed data. *Note.* Baseline and preintervention were pooled to T0.

experience a greater reduction of symptoms throughout treatment, (c) favorable therapeutic alliance predicts more improvement in PGD symptoms, and (d) high pretreatment avoidance scores predict less improvement in PGD symptoms. Additionally, we set out to conduct further exploratory analyses of available baseline data regarding factors that showed associations with PGD in previous research, but were not yet examined with regard to their association with treatment outcomes in Internet-based interventions.

Methods

PROCEDURE

The current analysis is a secondary analysis of data collected in a randomized wait-list controlled trial (Hoffmann et al., 2018). The primary purpose of the original trial was to examine the effectiveness of a web-based intervention for prolonged grief that consisted of structured writing tasks with therapist feedback. The intervention proved effective in reducing symptoms of prolonged grief (Kaiser et al., 2022). In this secondary analysis, data from both the intervention group (IG) and wait-list control group (WCG) were jointly analyzed to identify factors that influence treatment success. The WCG received the intervention after a 5-week waiting period and is here considered a delayed intervention group. The WCG and the IG were assessed both directly before (T0) and after (T1) the intervention. The study process is depicted in Figure 1.

PARTICIPANTS

Interested individuals could apply for the study via the project website. Participants were eligible for the study if they were 18 years or older, spoke Ger-

man, had Internet access, were bereaved due to cancer for at least 6 months, and showed symptoms of prolonged grief (≥25 in the ICG). While the ICG is not designed to capture and test for the current diagnostic criteria of PGD (Treml et al., 2020), it provides a measure of severity of prolonged grief and a cutoff that enables screening those that have probable PGD (Treml et al., 2020). Participants are therefore not diagnosed with PGD but exhibit a significantly severe grief reaction ≥6 months after bereavement due to cancer.

Exclusion criteria were current psychotherapy or changes in psychopharmacological treatment within 6 weeks prior to study admission, severe depression, psychosis, posttraumatic stress disorder (PTSD) due to an event other than the loss, substance use disorder, suicidal ideation, dissociative tendency, and cognitive or physical impairments, which would impair treatment participation (Kaiser et al., 2022).

Overall, $N = 70$ participants provided written informed consent and pre- and postintervention data ($n = 39$ from IG, and $n = 31$ from WCG), and were included in the analyses. Because difference scores were computed to reflect symptom change, this analysis is a completer analysis.

Due to the optional nature of monitoring assessments, 16 participants did not provide a working alliance measurement ($n = 9$ from the IG and $n = 7$ from WCG) and are therefore excluded from all models containing working alliance. Those models were fitted on a sample size of $n = 54$.

INTERVENTION

The intervention *online-trauertherapie* (online grief therapy) had a duration of 5 weeks and consisted of 10 structured writing tasks and individualized therapist feedback. The writing tasks are assigned to three modules (Hoffmann et al., 2018): The module Self-Confrontation involves thoroughly describing the most distressing memory concerning the loss with an emphasis on emotional, bodily, and cognitive qualities of the experience. The goal is to reduce avoidance behavior and to help participants form a coherent narrative. The module Cognitive Reappraisal enables a change of perspective by asking participants to write letters to a hypothetical friend who is in the same situation as themselves. It aims to activate resources and dispute maladaptive thought patterns. In the last module, Social Sharing, participants were asked to write (but not send) a letter to a real person who is or was involved in the loss. This aimed at summarizing learnings from the program and at communicating one's experiences and needs.

Patients received individual feedback from their therapist and could contact their therapist when they had questions or remarks. Previous research shows that asynchronous web-based contact is suited to foster therapeutic alliance (Berger, 2017), and in the current intervention, mean alliance values of 3.37 ($SD = 72$, range = 1–5) were found.

MEASUREMENTS

Prolonged grief was assessed as the main outcome of the intervention study with the ICG (Lumbeck et al., 2012; Prigerson et al., 1995). At T0, an internal consistency of $\alpha = .83$ was achieved. Scores at T0 were included in the current analysis as a predictor. The difference between T0 and T1 scores was included as the dependent variable.

All further measurement tools included in the current analysis are listed in Table 1, which also constitutes an exhaustive list of all constructs used as predictors. Time-invariant factors, such as gender or education, were assessed upon inclusion into the study (i.e., before randomization), time-varying predictors (e.g., prolonged grief, social support) were assessed immediately before the start of the intervention. Working alliance was assessed during the intervention after Sessions 4, 8, and 10 (Weeks 2, 4, and 5), and a mean score was established for each participant to reflect alliance over the course of the whole intervention. The Working Alliance Inventory Short Form is an instrument that has been well established for use in web-based contexts (Berger, 2017; Flückiger et al., 2018; Wilmers & Munder, 2008).

Statistical Analyses

All statistical analyses were conducted in R. All analyses regarding predictors of treatment response were conducted as a completer analysis because change in ICG scores could only be calculated for completers.

Descriptive Analyses

To describe the sample, preintervention means and standard deviations or numbers and percentages for a selection of variables are presented in Table 2. Participant flow is depicted in Figure 1. *T* tests were conducted to check for group differences between IG and WCG at pretreatment on any relevant variables.

Predictors of Treatment Response

Model 1. The predictors for which a post hoc hypothesis was formed (gender, preintervention ICG, working alliance, and avoidance) were examined for associations with the outcome (change in ICG scores) as follows:

Table 1
Measurement Tools Used for All Predictors

Construct	Instrument; original source, German source	Subscales	Internal consistency
Time-invariant constructs			
Age	Own question		
Gender	Own question		
Education	Own question		
Help seeking	Own question		
Relation to deceased	Own question		
Time since loss	Own question		
Closeness to deceased	Own question		
Quality of relationship to the deceased	Quality of Relationships Inventory (QRI), adapted; Pierce et al. (1991); Reiner et al. (2012)	Depth	$\alpha = .77$
		Conflict	$\alpha = .86$
Childhood abuse and neglect	Childhood Trauma Questionnaire (CTQ); Bernstein et al. (2003); Wingenfeld et al. (2010)	Sum score	$\alpha = .65$
Time-variant constructs			
Prolonged grief	Inventory of Complicated Grief (ICG); Lumbeck et al. (2012); Prigerson et al. (1995)		$\alpha = .83$
Depression	Patient Health Questionnaire (PHQ-9); Löwe et al. (2002); Spitzer (1999)		$\alpha = .84$
Posttraumatic stress	Impact of Event Scale—Revised (IES-R); Maercker and Schützwohl (1998); Weiss and Marmar (1997)	Intrusion	$\alpha = .79$
		Avoidance	$\alpha = .78$
		Hyperarousal	$\alpha = .76$
Anxiety	Generalized Anxiety Disorder Screener (GAD-7); Löwe et al. (2008); Spitzer et al. (2006)		$\alpha = .82$
Health-related quality of life	Short-Form Health Survey (SF-12); Mental Health Bullinger et al. (1995); Ware et al. (1996)		$\alpha = .86$
Posttraumatic growth	Posttraumatic Growth Inventory (PGI); Maercker and Langner (2001); Tedeschi and Calhoun (1996)		$\alpha = .91$
Avoidance	Depressive and Anxious Avoidance in Prolonged Grief Questionnaire (DAAPGQ); Boelen and van den Bout (2013); Treml et al. (2021a)	Depressive avoidance	$\alpha = .89$
		Anxious avoidance	$\alpha = .80$
Separation anxiety	Adult Separation Anxiety Questionnaire (ASA-27); Manicavasagar et al. (2003), own translation		$\alpha = .91$
Circumstances surrounding the death	Perception of circumstances surrounding the death and preparedness; Barry (2002); Treml et al. (2017)		$\alpha = .70$
Social support	Berlin Social Support Sales (BSSS); Schwarzer and Schulz (2000); originally German	Perceived support	$\alpha = .96$
		Received support	$\alpha = .90$
Dependency	Depressive Experience Questionnaire Dependency (DEQ); Beutel et al. (2004); Blatt et al. (1979)		$\alpha = .78$
Self-efficacy	Skala zur Allgemeinen Selbstwirksamkeitserwartung (SWE); Jerusalem and Schwarzer (1981), originally German		$\alpha = .89$
Stigma	Grief Experience Questionnaire (GEQ); Stigmatization Bailley et al. (2000), own translation from previous project		$\alpha = .88$
Working alliance	Working Alliance Inventory Short Form (WAI-S), mean of Sessions 4, 8, and 10; Tracey and Kokotovic (1989); Wilmers and Munder (2008)		$\alpha = .90$

Table 2
Characteristics of the Analyzed Sample

Variable	*M*/*N*	*SD*/%	Scale anchors
Demographic characteristics			
Age	48.0	8.8	
Gender			
Female	58	82.9%	
Male	12	17.1%	
School education			
Low	4	5.7%	
Intermediate	18	25.7%	
High	48	68.6%	
Characteristics of the loss			
Time since loss (months)	31.4	43.5	
Deceased was a . . .			
Parent	31	44.3%	
Child	7	10.0%	
Partner	27	38.6%	
Other person	5	7.1%	
Preintervention mental health			
Prolonged grief	37.70	9.99	19–95
Depression	19.49	5.01	9–36
Mental health	33.66	10.01	scaled to *M* = 50, *SD* = 10
Posttraumatic stress			
Avoidance	18.99	5.01	8–32
Intrusion	20.41	4.19	7–28
Hyperarousal	16.74	4.80	7–28

Note. *M* = mean; *SD* = standard deviation.

A correlation matrix with bivariate Spearman correlation coefficients is reported in Table 3. This more conservative nonparametric measure was used instead of Pearson correlations, because one predictor (preintervention ICG values) had a non-normal distribution.

A multiple regression was conducted after checking assumptions with the R package Global Validation of Linear Models Assumptions (Peña & Slate, 2006). Change in ICG scores was used as the outcome and all four predictors were included to assess the amount of variance explained by all hypothesized predictors and to examine the impact of each variable in multivariate conditions (Model 1; see Table 4). Since preintervention ICG is included as a predictor, all multivariate results are controlled for preintervention symptom severity. All predictors except gender were scaled and centered, but ICG change was not. A sensitivity analysis with G*Power 3.1 revealed that a medium-sized effect of down to $f^2 = 0.24$ can be detected ($\alpha = .05$, power = .80).

Model 2. Further analyses were conducted with several constructs that may possibly be of influence (see Table 1). We aimed to provide a multiple regression model that contains a useful set of predictors. Since the number of possible predictors is large ($k = 31$), we conducted model selection via the best subset selection algorithm. This algorithm returns the k best models of each size between 1 (one predictor) and k (all 31 predictors). Preintervention ICG was forced into each model as a control variable. The most suitable of the k models (i.e., the model size) is then selected by the researcher by weighing two metrics (BIC, Mallows Cp) and interpretability of the models. The aim was to provide a final model with a high percentage of explained variance and good interpretability without overfitting (Model 2, see Table 5).

A correlation matrix with bivariate Spearman correlation coefficients for all predictors that were included in either Model 1 or Model 2 is reported in Table 3.

Results

SAMPLE DESCRIPTION

The mean age of the 70 participants was 48 years (*SD* = 8.8, range = 26–79), and 83.0% were female. About half of the participants were in a

Table 3
Correlation Matrix of All Variables in Model 1 or Model 2

	ICG change	Gender	Preintervention ICG	Avoidance	Working alliance	Perceived social support	Posttraumatic growth
ICG change		−.033	−.323**	−.152	−.239	.185	.161
Gender	−.033		.289*	−.131	−.015	.160	.004
Preintervention ICG	−.323**	.289*		.223	.036	−.047	−.073
Avoidance	−.152	−.131	.223		.012	−.000	−.269*
Working alliance	−.239	−.015	.036	.012		.149	.375**
Perceived social support	.185	.160	−.047	−.000	.149		.381**
Posttraumatic growth	.161	.004	−.073	−.269*	.375**	.381**	

Note. ICG = Inventory of Complicated Grief.
* $p < .05$.
** $p < .01$. *** $p < .001$.

relationship (44.0%) and/or had children (49.0%). Most participants had received a high (12+ years, 69.0%) or intermediate (10–12 years, 26.0%) education. The loss occurred on average 31.4 months before the start of treatment ($SD = 43.5$, range = 6–319 months). The deceased was in most cases a parent (47.7%) or partner (34.9%). Participant characteristics are summarized in Table 2. The IG had significantly lower posttraumatic growth before the intervention than the WCG ($p = .008$). This difference was deemed irrelevant for the current analysis because (a) groups were not compared but pooled together, and (b) preintervention posttraumatic growth was directly included into some calculations and therefore controlled for. Treatment groups did not differ on any other variables.

Participants reported to be very close to their lost ones ($M = 4.9$, $SD = 0.3$ on a scale of 1–5). From before to after the intervention an average change in the ICG score of $\Delta ICG = -10.2$ points ($SD = 8.78$) occurred, indicating a reduction of symptoms. There was no difference between IG and WCG in symptom change ($p = .24$).

PREDICTORS OF TREATMENT RESPONSE

Model 1

Of the four predictors, only preintervention ICG had a significant bivariate association with ICG change (see Table 3). A multiple linear regression with the four predictors was performed. No assumptions were violated. The results are displayed in Table 4, and indicate that while controlling for gender, avoidance, and working alliance, the association between ICG change and preintervention ICG remains significant. No other predictor had a significant association with ICG change in either bivariate correlation or multiple regression. The multivariate model explains 18% of the variance in ICG change.

Model 2

A best subset algorithm was run with all 31 variables. A model with $k = 4$ variables provided the smallest BIC and Mallows Cp (Model 2, $R^2 = .34$, see Table 5). It included preintervention grief (forced), working alliance, perceived social support, and posttraumatic growth. No assumptions were violated. The model indicates that a greater reduction in grief symptom severity was experienced by those who had more severe preintervention grief, a better working alliance, less perceived social support, and less posttraumatic growth.

A correlation matrix with all variables included in Model 1 or 2 shows bivariate correlations (see Table 3).

Table 4
Regression Analysis With Hypothesized Variables (Model 1)

Effect	*b*	*SE*	95% CI		β	*p*
			Lower	Upper		
Gender (female)	−1.391	2.992	[−7.255,	4.473]	−.060	.644
Preintervention grief	−0.237	0.107	[−0.447,	−0.027]	−.270	.031*
Working alliance	−2.203	1.393	[−4.933,	0.527]	−.181	.12
Avoidance	−0.163	0.203	[−0.561,	0.235]	−.093	.425

Note. SE = standard error; $N = 54$; $R^2 = 0.18$; adjusted $R^2 = 0.11$; $p = .044$. A negative estimate indicates that higher values in the predictor variable predict a stronger reduction of prolonged grief symptoms.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 5
Regression Analysis Best Subset Selection (Model 2)

Effect	*b*	*SE*	95% CI		β	*p*
			Lower	Upper		
Preintervention grief	−0.216	0.091	[−0.394,	−0.038]	−.246	.021*
Working alliance	−3.799	1.339	[−6.423,	−1.175]	−.311	.007*
Perceived social support	3.002	1.285	[0.483,	5.521]	.264	.024*
Posttraumatic growth	0.131	0.061	[0.011,	0.251]	.262	.034*

Note. *SE* = standard error; $N = 54$, $R^2 = 0.34$; adjusted $R^2 = 0.29$; $p < .001$. A negative estimate indicates that higher values in the predictor variable predict a stronger reduction of prolonged grief symptoms.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

In an exploratory analysis, we examined predictors of treatment success in an Internet-based intervention for PGD after cancer bereavement. Pretreatment PGD severity emerged as a significant predictor of symptom change, results on working alliance were mixed, and no significant association with gender or avoidance was found. Further analyses revealed that posttraumatic growth and social support may be relevant factors.

We first examined a set of predictors for which an association with treatment success was hypothesized post hoc based on previous studies (gender, preintervention grief, avoidance, working alliance). Of those, only preintervention grief proved to have a significant association with symptom reduction. No effect of gender, working alliance, or avoidance could be detected in this model. The model explained 18% of variance in symptom reduction. In an additional analysis, 31 predictors (including the aforementioned four and sociodemographic information, circumstances of the loss, preintervention mental health, and several interpersonal factors, such as social support or working alliance) were examined in a best subset selection algorithm in order to discern a useful set of predictors that explains further variance in treatment response. The most useful model contained preintervention grief, working alliance, perceived social support and posttraumatic growth as predictors and explained 34% of variance in symptom reduction.

Preintervention symptom severity, here the severity of grief, proved to be a significant predictor of treatment response in both models: Those with more severe pretreatment symptoms experienced a stronger reduction in symptoms. This is in accordance with previous studies on symptoms of anxiety and/or depression (Edmonds et al., 2018; El Alaoui et al., 2015; Mathiasen et al., 2018; Nissen et al., 2021; Nordgreen et al., 2012) and may to some extent be explained by regression to the mean. Yet, the results show that even severe initial symptoms do not prevent patients from benefiting from the intervention. Because preintervention grief was included in all multivariate models, all results discussed below are controlled for preintervention symptom levels.

While previous studies indicated an effect of gender (Chen et al., 2020) and avoidance (Bryant et al., 2017) on treatment success, the current analysis does not support these effects for this specific intervention. It may be noted that in the current sample, males were underrepresented, which might have obscured an effect of gender. Avoidance was explicitly addressed in the module

"Self-Confrontation," of the current intervention and may therefore not have exerted a detrimental effect. Also, the more anonymous nature of this Internet-based intervention compared to a face-to-face intervention may have mitigated an adverse effect of avoidance. We therefore argue that a detrimental effect of avoidance on treatment success, if existent, may have been eliminated by the intervention design and content. In fact, the intervention was able to significantly reduce overall symptoms of posttraumatic stress, which include avoidance (Kaiser et al., 2022). Yet, it also has to be noted that the self-report assessment of avoidance may not have captured the full extent of possible avoidant behavior.

Mixed results emerged on working alliance. The correlation of $r = -.24$ with ICG change was not significant, but numerically in the realm of the expected correlation of .20 (Kaiser et al., 2021). It has to be noted that the sample size of $N = 54$ is not suited to reliably detect a correlation of this size. In a multiple regression, working alliance did not show a significant association with ICG change when controlling for gender, preintervention ICG, and avoidance. However, the association became significant when preintervention ICG, perceived social support, and posttraumatic growth were included as control variables, with better working alliance being associated with a larger reduction of symptoms. Working alliance and posttraumatic growth have a significant positive correlation with each other, but opposing effects on ICG change in a multivariate analysis. This may indicate that, if not controlled for, posttraumatic growth may obscure the effect of working alliance on ICG change. Our current analysis provides evidence for an association between working alliance and symptom reduction in the expected positive direction and small size, although the association seems to influenced by other effects.

The current results further show that participants with high scores for posttraumatic growth and social support achieve less PGD symptom reduction. Because posttraumatic growth and social support might be classified as resources, these results seem counterintuitive. The effect is not attributable to persons with stronger posttraumatic growth and social support having less severe PGD symptoms at baseline, as the severity of PGD symptoms was controlled for. Internet-based opposed to face-to-face interventions might be less suitable for participants with high posttraumatic growth and social support (e.g., because when social support is readily available, the asynchronous written contact with a therapist might not be attractive enough to elicit high engagement in the treatment process). We also argue that among the different mechanisms of change employed by different intervention approaches, some might be redundant for certain patients. While the main mechanisms employed in this study, exposure and cognitive restructuring, are widely used in interventions for PGD, other approaches include, for example, emotion regulation techniques (Eddinger et al., 2021), or acceptance-focused content (Szuhany et al., 2021). The effectiveness of any treatment mechanism for a given patient may depend on their symptom profile and available resources. In the current intervention, exposure and cognitive restructuring modules may, among other things, serve to increase participants' sense of competence to deal with a stressful situation and connectedness to others (both of which are concepts related to posttraumatic growth, which indeed increased over the course of the intervention (Kaiser et al., 2022)). Bartl et al. (2018) showed that changes in posttraumatic growth mediate PGD symptom reduction over the course of treatment and vice versa. This pathway of PGD symptom reduction may be inaccessible for participants who have no or little room for further posttraumatic growth. The same might be true for social support. Future studies may explore whether different treatment mechanisms and intervention content serve different groups of patients.

Model 2 explains 34% of variance, which indicates that the discussed constructs considerably influence how much a person can benefit from the intervention at hand.

LIMITATIONS

The selection of variables for this analysis was restricted to data available in a trial that had been primarily designed to evaluate the effectiveness of an Internet-based intervention for prolonged grief. An analysis of predictors of PGD symptom severity and change was planned for and governed the choice of assessed variables, albeit as a question of secondary relevance. Therefore, the current analysis must in its core be termed "exploratory." Our findings provide directions for future research and development of future interventions, but our conclusions require further testing and evaluation. All associations should be verified in a hypothesis-driven analysis.

Treatment groups differed in posttraumatic growth before the intervention. Replication of our findings regarding posttraumatic growth and especially of possible interconnections with working alliance seems advisable.

The trial was planned primarily based on the dual-process model (Stroebe & Schut, 1999), which guided the selection of assessed variables.

Grief-related cognitions merit inclusion in future studies (Lechner-Meichsner et al., 2022; Skritskaya et al., 2020) but were not assessed in the current study.

In the original study, participants with severe additional mental health conditions were excluded. This may have led to a systematic exclusion of those who are impacted by their loss in a way so severe that multiple severe mental disorders emerged as a result. Therefore, the current results are valid for those who suffer from mainly PGD, but not other severe mental disorders.

The sample size of $N = 54$ must be deemed small. The current analysis was powered to detect medium-sized effects in a model with four predictors. The best subset selection algorithm is likely to have penalized models larger than that due to the sample size. Future studies with larger sample sizes might detect further small but relevant effects and may clarify inconsistencies regarding the interdependency of working alliance and other factors.

Yet, we argue that the current analysis provides valuable insights into the factors that predict symptom change in an Internet-based grief intervention. Future studies might discern how these mechanisms could be taken into account to develop more effective interventions.

Conclusions

Our asynchronous Internet-based intervention for prolonged grief is most effective for participants with more severe baseline symptoms, good therapeutic alliance, and low posttraumatic growth and social support. This indicates that the intervention is well suited to reduce even severe initial symptoms, and that therapeutic alliance is an important factor that needs to be monitored and fostered. Results on the inverse effect of social support and posttraumatic growth on symptom improvement seem counterintuitive, but might indicate that those with satisfying social support and considerable posttraumatic growth may need different intervention content (e.g., emotion regulation skills). Further research may examine whether and how interventions can be tailored to specifically target resources and skills that actually are in need of improvement.

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