



CLINICAL REVIEW

Sleep disturbances in bereavement: A systematic review

Marieke Lancel^{a, b, *}, Margaret Stroebe^{a, c}, Maarten C. Eisma^a^a Department of Clinical Psychology & Experimental Psychopathology, University of Groningen, Groningen, the Netherlands^b Psychiatric Sleep Center Assen, Mental Health Services Drenthe, the Netherlands^c Department of Clinical Psychology, Utrecht University, Utrecht, the Netherlands

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SUMMARY

Severe, persistent and disabling grief occurs among a sizable minority experiencing bereavement, with diagnostic manuals newly including complicated grief (CG) disorders. Sleep disturbances/disorders have been established as worsening affective and stress-related conditions. However, the role of sleep difficulties in bereavement and CG has not received similar scientific attention. We therefore conducted a systematic review with narrative syntheses on this topic to clarify the role of sleep in bereavement (PROSPERO: CRD42018093145). We searched PubMed, Web of Science and PsychInfo for peer-reviewed English-language articles including (at least one) bereaved sample and sleep disturbance measure. We identified 85 articles on 12,294 participants. We answered seven pre-defined research questions demonstrating: high prevalence of sleep disturbances in bereavement; positive associations of grief intensity with sleep difficulties; preliminary indications of risk factors of post-loss sleep disturbance; higher prevalence of sleep disturbances in CG, enhanced by psychiatric comorbidity (i.e., depression); and initial evidence of causal relationships between (complicated) grief and sleep. Grief therapy partly improves sleep difficulties, yet no intervention studies have specifically targeted sleep problems in bereaved persons. Causal relationships between sleep and grief require further examination in intensive longitudinal investigations, including randomized trials, thereby clarifying whether treating sleep problems enhances CG treatment effects.

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Introduction

The most frequent complaint of people with a mental disorder is disturbed sleep. While often considered a secondary symptom, experiencing sleep problems may be a core feature of affective and stress-related disorders, such as depression and posttraumatic stress disorder (PTSD). First, sleep disturbances constitute a considerable risk factor for the development of such disorders [1]. Second, sleep disturbances often remain after successful treatment of these disorders [2,3]. Furthermore, effective treatment of insomnia improves sleep, prevents the development of depression [4], and ameliorates depression and PTSD symptom severity [5,6]. These findings suggest that focusing on sleep problems could provide an important new pathway to effectively treat common mental disorders.

Bereavement constitutes a major stressful life-event that is related to physical and mental health problems [7], including the aforementioned mental disorders, and severe, persistent and disabling grief, termed complicated grief (CG) [8]. Prolonged grief disorder (PGD), characterized by CG responses, is newly included in the 11th edition of the International Classification of Diseases [9]. Core symptoms of PGD are persistent and severe yearning for the deceased and/or preoccupation with the deceased, combined with symptoms indicative of intense emotional pain. There are indications that both bereavement and CG are associated with sleep disturbances [10], and that these often persist after successful CG treatment [11]. However, the possible role of sleep in actually aggravating or prolonging grief, or even causing psychopathology in bereavement, appears to have received little attention. To our knowledge there is no systematic review yet clarifying whether the role of disturbed sleep in bereavement and particularly in CG is similar to that in related (and often comorbid) disorders of PTSD and depression.

Therefore, the main goal of this article is to provide a comprehensive, up-to-date, systematic review of the scientific evidence and to establish the state of knowledge about the reciprocal

* Corresponding author. Grote Kruisstraat 2/1, 9712TS, Groningen, the Netherlands. Fax: +31 503635380.

E-mail address: m.lancel@rug.nl (M. Lancel).

relationship between grief and sleep difficulties/disorders. More specifically, we set out to examine the following questions (should the database permit): 1. Types and prevalence of sleep disturbances/disorders: What kinds of sleep problems occur more often among bereaved than non-bereaved persons? 2. Level of grief and sleep problems: What is the association between grief intensity and sleep problems? 3. Risk factors for sleep problems: Which variables (e.g., sociodemographic or loss-related characteristics) increase the likelihood of sleep problems in bereaved persons? 4. Complications in the grieving process and sleep problems: What is the association between CG and sleep difficulties/disorders? 5. Causality: If there is a sleep problem-CG association, what do we know about the direction of causality? 6. Relations with other disorders: If there is a significant relation between sleep problems and CG, is it explained by other physical and mental health problems (mood- and anxiety disorders, drug abuse, somatic disorders)? 7. Intervention efficacy: What is known about the efficacy of therapeutic interventions on sleep problems among those treated for CG, and vice-versa? After systematically presenting the results regarding these questions, we assess the state of current knowledge, identifying gaps in the literature and making concrete recommendations to guide future research and clinical intervention.

Method

Pre-registration

This study was pre-registered at PROSPERO's international registry of systematic reviews, registration number CRD42018093145 (https://www.crd.york.ac.uk/PROSPERO/display_record.php?RecordID=93145). A PRISMA checklist is shown in Appendix A.

Search strategy

We searched PsychInfo, Web of Science and PubMed using the keywords grief OR mourning OR bereav* AND sleep* OR "insomnia" OR "sleep apnea" OR "snoring" OR "restless legs" OR "circadian disorder" OR "nightmare" on March 20th 2019. Our final search returned 904 articles, and, after removing duplicates, 523 articles were retained. Screening and selection of papers was done independently by two researchers. Differences in opinion were discussed until mutual consensus was reached. Following title and abstract screening, 114 articles were retained. After full-text screening 85 articles were selected. Fig. 1 shows a PRISMA flowchart.

Inclusion and exclusion criteria

Articles were further included if they were quantitative, peer-reviewed, English-language, scientific journal articles, to safeguard study quality, interpretability and comparability of study results. We considered only research on bereaved samples (i.e., people who have experienced the death of a significant other, e.g., family member, friend) and not people who experienced other loss types (e.g., missing relative). At least one measure of sleep problems needed to be included in the study. Moreover, 20 was used as a minimum sample size of bereaved persons, so that included studies were (at least) powered to detect strong correlations between constructs ($r = .80$) [12].

Data extraction procedure

The following information was double-extracted by two researchers: study country, sample characteristics (e.g. age, gender),

loss-related characteristics (e.g. number of bereaved vs. non-bereaved, time since loss, relationship to the deceased, cause of loss), study design, grief measure characteristics and levels, sleep-related variables (e.g. sleep quality indicators, insomnia, nightmares), other mental and physical health problems (e.g. depression, anxiety, PTSD, drug abuse), and specific results that provide an answer to one (or more) of our research questions. Differences in results of the data extraction were discussed until consensus was reached. We used no formal assessment of study quality, as our review covered a wide range study designs (e.g., surveys, laboratory experiments, randomized controlled trials (RCTs)); there is no existing quality assessment tool that can provide reliable and valid assessment of study quality for investigations with many different research designs. For similar reasons (heterogeneity of study designs, characteristics, and outcomes), we did not conduct meta-analyses.

Results

Background information

We estimated that the 85 selected articles reported on 12,294 bereaved participants (a final figure cannot be given, as various articles stemmed from the same research project, with differing Ns). Table S1 summarizes study characteristics and main findings. The majority of articles ($n = 63$, 74%) reported on cross-sectional studies; most were surveys. Twenty-four articles (28%) reported (also) on longitudinal studies and again, were predominantly surveys. In addition, nine studies (11%) involved laboratory investigations (mostly providing sleep laboratory data). Treatment trials were either the sole focus or an integral part of 6 (7%) studies.¹

Grief was assessed using a version of the Inventory of Complicated Grief [97] in 17 (20%) of the papers and a version of the Texas Inventory of Grief [98] in 10 (12%) of the papers. In five papers (6%), grief was measured through a single item or a few questions about grief-related feelings. Grief was not assessed at all in 43 (51%) of the studies, but in 20 (24%) of these studies, a bereaved sample was compared with non-bereaved controls. Subjective sleep disturbances/disorders were assessed with validated sleep questionnaires in 29 studies (34%) [a version of the Pittsburgh Sleep Quality Index (PSQI: $n = 25$, 29%) [99], Insomnia Severity Index ($n = 3$, 4%) [100] or Athens Insomnia Scale ($n = 1$, 1%)] [101]; by sleep subscales of validated questionnaires in eight studies (9%); and (also) by one or more non-validated sleep items/questions (e.g. about nightmares, insomnia, sleep disturbances) in 47 (55%) of the studies. Eight studies (9%) used sleep-wake diaries. Objective sleep measurements were employed in 10 studies (12%); 9 with polysomnography (PSG) and one with actigraphy.

Studies were conducted in 13 different countries. A majority (57%) were from the U.S., 26% from European, and 9% from Asian countries. Most of the participants were female (66%). Of 51 papers providing mean ages (62%), only three studies were on people younger than 20 years; the mean age was approximately 52.5 years. There was large variability in loss-related characteristics (time since loss, cause of death, relationship to the deceased). A relatively large proportion of the samples were predominantly ($n = 10$, 12%) or exclusively comprised of spouses/partners ($n = 32$, 38%).

Studies varied considerably in design quality. We categorized them according to whether they were 1) controlled (i.e., included a non-bereaved control/norm-reference group) and longitudinal, 2) controlled, but non-longitudinal, 3) longitudinal, but not

¹ Due to multi-methods of some studies, as shown in Table S1, the total n 's reported here do not add up to 85, the number of studies.

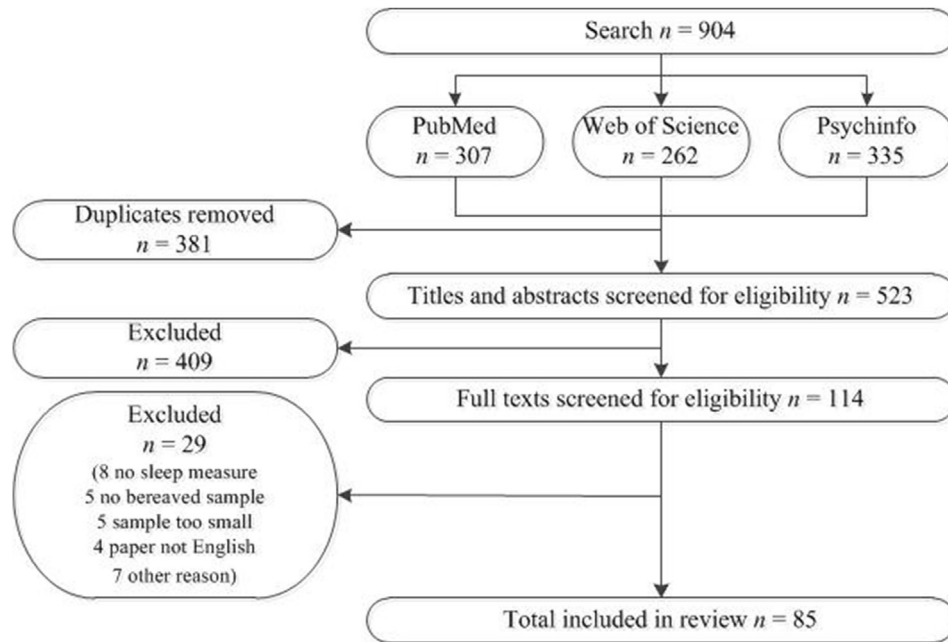


Fig. 1. PRISMA flowchart of study selection.

controlled, or 4) non-controlled and non-longitudinal. We considered the first category to represent the strongest design, those in the second and third moderate, and the fourth category weakest. Ten studies fell into the first category (12%), 27 (32%) into the second, 13 (15%) in the third, and a majority into the fourth ($n = 35$, 41%).¹ We will distinguish between study designs when describing the main results.²

Sleep in bereavement: findings from the review

1. Types and prevalence of sleep disturbances/disorders

Studies using a control/reference group and/or longitudinal design (category 1–3) provided most of our information on bereavement-related sleep problems and sleep disorders, supplemented by a few studies with further descriptive information (category 4). Intervention trials and studies on samples consisting (almost) completely of persons with CG are not included here.

Sleep disturbances

Subjective sleep measures

The vast majority of the 27 well-controlled studies assessing subjective sleep variables reported increased sleep impairments in bereaved compared to non-bereaved controls [[11,17,20–23,26,34,49,61,62,64–66,70,75–77,82,91,93,96; see 29,36,72,80,81] for contradictory results]. Demonstrated sleep impairments, assessed by a variety of sleep measures and sleep-wake diaries, range from unspecified sleep disturbances

[11,17,61,64,65,77,82,93], poorer global sleep quality [21,26,49,62,66,70,76], ‘insomnia’ complaint(s) [20,96], trouble falling asleep [34,70,75,91], problems staying asleep or low sleep efficiency [23,70,75,91] to shorter sleep duration [22,23,70]. Prevalence of sleep problems vary widely according to type of measurement, characteristics of bereavement and time post-loss (see Table S1).

Seven of 10 longitudinal studies which assessed initial sleep problems relatively early after death (i.e., within 6–9 months) and at a later time point, indicate that the sleep disturbances generally decline over time [17,22,23,49,76,79,82; see 24,50,81] for contradictory results]. Three further cross-sectional studies, with retrospective sleep assessment on different time points, have substantiated this temporal pattern [16,31,87]. Interestingly, some studies [e.g., [19,58,90]] reported sleep problems to be the most reported bereavement-related symptom.

Objective sleep measures

The only article in which actigraphy was employed revealed no differences in actigraphically-recorded sleep between bereaved and good sleeping and insomniac controls, in sharp contrast to also demonstrated group differences on PSQI global score and sleep variables assessed by a sleep diary [70]. One well-controlled and longitudinal study employing PSG showed that both PSQI and standard electro-encephalographic (EEG) sleep variables of a relatively small sample of non-depressed bereaved were very similar to those of non-bereaved controls, except for consistent increases in rapid eye movement (REM)-density. According to the authors, this may represent an important psychophysiological correlate of adaptation to bereavement [81]. There are two well-controlled, cross-sectional PSG-studies. One investigation shows that particularly depressed bereaved persons, like depressed non-bereaved controls, have a lower subjective sleep quality, lower EEG slow wave activity in the first non-REM episode, a shorter REM-sleep latency and a higher percentage of REM-sleep [80]. The investigators further substantiated this observation by demonstrating that the decrease in subjective sleep quality and elevation

² Twelve of the studies in the 4th category are not discussed in further detail in the next section, since they do not directly address any of our specific research questions. They have been retained in Table S1, since they explicitly highlight sleep problems in bereavement (meeting the review’s inclusion criteria); these results (i.e., on dream recall [30,41], the relationships between sleep and chronic pain [14], depression [67,88]; PTSD [35]; quality of life [25]; immune system/physiological markers [44,83]; medication use for sleep problems [38], and sleep disruptions before/after/on anniversary of bereavement [54,94]) merit further investigation.

of the percentage of REM-sleep correlate with depression severity [21].

Taken together, bereavement is consistently associated with a transient phase of poor sleep, characterized by subjective sleep impairments such as experiencing problems initiating sleep, problems maintaining sleep and sleeping fewer hours than usual. In general, sleep among bereaved persons improves over time. In contrast, the few studies using objective sleep measures did not show marked differences between bereaved and non-bereaved.

Sleep disorders

Insomnia

All 3 well-controlled studies revealed that insomnia is more prevalent or insomnia scores are higher in bereaved than non-bereaved persons [45,53,55]. For instance, Hardison et al. [45] showed that 22% of a heterogeneous group of bereaved and 17% of non-bereaved had insomnia. Furthermore, the two studies with a longitudinal design demonstrated that insomnia scores decline over time among bereaved persons [79,87].

Nightmares

Studies investigating the occurrence of nightmares demonstrated that following a traumatic loss, 45–88% of children and adolescents experienced frequent/severe nightmares [13,28,37]. In traumatically-bereaved children, the incidence of frequent nightmares clearly exceeded that of non-bereaved children [28]; and the frequency of nightmares decreased across time [13].

Sleep disordered breathing

The one study investigating Apnea-Hypopnea Index (AHI) during PSG found no differences between conjugally bereaved and non-bereaved persons [49].

Taken together, the available information about the occurrence of sleep disorders in bereavement provides preliminary evidence for an elevated risk of insomnia and nightmares, but not for sleep-related breathing disorders. Notably, all insomnia questionnaires used in the studies discussed above assess current insomnia symptoms, yet do not fully assess the diagnostic criteria of the clinical disorder chronic insomnia. This probably explains the similarities in bereavement-related changes in sleep disturbances and insomnia. A further limitation is that the studies on nightmares were all on samples of children who had experienced traumatic loss; leaving the question unanswered to what extent nightmares are a result of trauma or bereavement.

2. Level of grief and sleep problems

Again excluding the studies on CG (all/nearly all) samples and intervention trials, we found fourteen studies (16%) which had investigated the relationship between the level of grief and sleep disturbances [11,23,45,59,60,62,63,66,69,71,80,81,86,89]. Apart from two studies [69,81], all found that higher grief intensity was associated with more frequent or severe sleep disturbances. Affected variables range from measures of subjective sleep difficulties and sleep quality [11,22,60,62,63,66,89], problems falling and/or staying asleep and shorter sleep duration [59,69,71] and insomnia [45,86] to objective sleep efficiency and early morning awakenings [80]. Two longitudinal studies examined whether grief intensity predicts prospective sleep disturbances. One study showed that grief severity at 3–6 months post-loss - but not depression or time since loss - was significantly associated with lower sleep quality 18 months after the loss [79]. Somewhat similarly, Boelen and Prigerson [18] found that grief symptomatology assessed at 6–12 months post-loss significantly predicted

sleep difficulties 6 and 15 months later. Another longitudinal study examined patterns of sleep difficulties in older widowed persons across the first 2 years of bereavement [82]. Persistent sleep difficulties were significantly associated with the most unfavorable grief outcomes throughout the entire follow-up period.

Taken together, results provide strong evidence for a positive association between grief intensity and disturbed sleep. However, this finding in itself does not indicate any direction in the association (we address the issue of causality in Section 5). There are indications that grief intensity predicts future sleep problems. Unfortunately, no study has yet examined whether sleep problems shortly after loss (or even, importantly, preexisting sleep problems) predict higher grief and/or changes in grief intensity over time.

3. Risk factors for sleep problems

Four risk factors - age, gender, cause of death and relationship to the deceased - have been investigated in several studies and are reviewed next.

Age

Four studies reported a higher prevalence of sleep problems in older compared to younger bereaved people [11,43,82,87]. However, sleep disturbances generally increase with age [102]. In line with this, the only well-controlled study [82] showed that the higher level of sleep difficulties among older persons was independent of bereavement status. Three further studies found heightened risk of sleep disturbances within specific age cohorts: loss was associated with greater sleep disturbances in: younger compared to older widowers [42,47]; adolescents who lost a parent compared to adult bereaved [64]; and parentally bereaved older children compared to younger ones [93].

Gender

While two studies found no gender effects [11,87], four others reported a higher occurrence of sleep disturbances in bereaved females than in their male counterparts, both during childhood, adolescence, and adulthood [27,64,92,93]. This may at least partially reflect general gender differences in sleep problems [103]. Notably though, one study reported that unresolved grief following the loss of a child is associated with a higher risk for problems falling and staying asleep in fathers, but not in mothers [59]. In line with the fact that sleep apnea is more prevalent in males [104], one study found that males had a higher AHI than females, regardless of bereavement status [49].

Relation to the deceased

Hirooka et al. [48] found that losing a parent at a young age is associated with an elevated risk for problems falling asleep compared to losing a grandparent. In adults the loss of a spouse [85] or child [51,85] was particularly associated with sleep problems. The latter result is further illustrated by the finding that 51% of mothers 8 weeks after the death of their newborn baby suffered from severe disturbed sleep. Furthermore, in a study of Sudden Infant Death Syndrome bereavement, half of the parents still suffered from severe sleep disturbances after 2 years [33]. A study of the loss of schoolmates in children directly involved in a major traffic accident revealed an increase in incident-specific nightmares [13].

Type of death

Results of three studies on the influence of a natural versus unnatural death are inconsistent. One study showed that parents

who lost a child due to an accident or a chronic disease reported comparable sleep problems [65]; another found that a natural loss was related to higher risk for sleep disturbances than an unnatural loss [11]; and still another demonstrated that traumatically bereaved more frequently experienced insomnia than non-traumatically bereaved [45]. Relatedly, two studies demonstrated that people experiencing unexpected deaths compared to people experiencing expected deaths had higher rates of sleep problems [46,47]. However, four other studies did not demonstrate such differences [20,32,36,69]. In suicide-bereaved parents, viewing the child's dead body in an informal setting, but illogically not at the site of suicide [74], appeared to be a risk factor for the occurrence of nightmares [73]. One study [56] showed that anxiety and unrelieved pain of one's wife when dying is a risk factor for long-lasting problems falling and/or staying asleep among widowers.

Taken together, despite inconsistencies in results, our review identified several variables that potentially increase the incidence of sleep problems in bereaved persons (i.e., age, gender, relationship to the deceased, type of death). However, these variables are generally associated with increased risk of sleep problems (e.g., age), or demonstrate the existence of potentially vulnerable subgroups for sleep disturbances (e.g., parents bereaved of a child).

4. Complications in the grieving process and sleep problems

We found eight studies (9%) in which (nearly) all participants had CG [11,15,39–41,52,68,84], two of which were intervention studies [11,40]. The studies providing information on the prevalence of sleep disturbances/disorders consistently show that sleep disturbances are common in individuals with CG. Among participants with CG, years after the loss, around 50% experienced frequent grief-related trouble sleeping [15] and between 72% [40] and 89% [39] were poor sleepers. Eighteen months following the loss of a child in an accident, 68% of parents reported moderate insomnia, and 12% severe insomnia [52]. Studies directly comparing sleep disturbances in normal bereaved to those with CG show that sleep impairments are more prevalent in the latter group [62,63].

Taken together, results demonstrate that people with CG experience more severe and long-lasting sleep problems than people with normal grief patterns.

5. Causality

Four studies provided relevant information toward disentangling the direction of causality between CG and sleep problems [11,40,57,78]. However, since all of these were intervention trials (rather than laboratory studies manipulating sleep or CG) these results are discussed under section 7.

6. Relation of complicated grief and disturbed sleep with other mental disorders

Two of the studies on participants with CG examined the relation between CG, sleep problems and other mental health problems. Simon et al. [84] found that a large proportion (75%) of CG patients had a current comorbid mental disorder, particularly mood and anxiety disorders. Psychiatric comorbidity was associated with more intense grief and with poorer sleep (among other symptoms). Germain et al. [39] reported that both the level of CG and depressive symptoms, but not PTSD symptoms, predicted poor sleep in a cross-sectional analysis. We tentatively conclude that psychiatric comorbidity (i.e., depression) may exacerbate sleep problems in people experiencing CG.

7. Efficacy of therapeutic interventions on sleep problems for complicated grief, and vice versa.

Two studies examined the efficacy of CG treatments in reducing sleep disturbances. First, Germain et al. [40] experimentally investigated the effects of CG therapy and interpersonal psychotherapy on sleep disturbances. CG therapy compared to interpersonal psychotherapy caused reductions in sleep problems. Yet, clinically significant sleep disturbances persisted in all groups. Similarly, Boelen and Lancee [11] conducted an uncontrolled longitudinal analysis of people who had received cognitive behavioral treatment for CG, showing that this intervention reduced CG and sleep difficulties. However, independent of CG remission status, significant 'residual' sleep problems persisted in most participants. In another small quasi-experimental trial, conjugally bereaved seniors (47% with CG) received grief treatment, through either virtual reality or a grief website. Both treatments effectively decreased CG symptoms and improved subjective sleep quality, but no interactions between group and time emerged on either dependent variable [57].

We did not find a study focusing specifically on the causal effects of sleep interventions on CG symptoms. However, one randomized trial of widowed persons (no % CG given) found that, compared to a control intervention, a therapy program including daily lifestyle regulation and sleep management increased diary-assessed sleep duration and sleep efficiency and decreased depressive symptomatology [78]. However, grief severity and subjective sleep quality did not improve. One RCT of recently bereaved spouses investigated the effects of taking diazepam [95]. There was no evidence of any effect on sleep quality nor on grief symptoms. The small sample size, the low doses and/or the very low intake of benzodiazepine may have contributed to the negative results. Taken together, findings indicate that psychological CG treatment, not specifically targeting sleep, has modest sleep-improving effects. There is as yet no evidence of a reverse effect, but this could be due to the lack of well-designed, adequately-powered sleep intervention trials among people with CG. Moreover, the finding that most participants still exhibited clinically significant sleep problems after (efficacious) CG treatment suggests that the insomnia problems are/have become (at least partially) independent of CG.

Discussion

This is the first comprehensive systematic review examining the role of sleep disturbances and disorders in bereavement. The available literature provides answers to some of the questions posed for our review, while indicating the need for further investigation of sleep difficulties among bereaved persons where information is still lacking. In this section, we summarize and contextualize the main findings, highlight limitations of the evidence base and our review, and consider future research directions.

Bereavement, grief and sleep problems

Bereaved persons are at elevated risk of experiencing sleep problems, with the majority of studies demonstrating increased sleep impairments in bereaved compared to non-bereaved controls. These sleep disturbances are diverse, including lower sleep quality, problems falling asleep, staying asleep shorter sleep duration, and anxious nighttime awakenings. Sleep difficulties are more frequent during the first few months of bereavement, declining gradually thereafter. Looking at severe sleep disorders, bereavement has been associated with insomnia. It is important to note that in the latter studies, insomnia was not assessed with diagnostic instruments/techniques and procedural requirements for

establishing the clinical condition (e.g., duration of complaints; daytime dysfunction).

Information on *prevalence* for specific of sleep problems is limited, but in general, quite sizeable minorities of bereaved persons (sometimes 20–30% more than non-bereaved) suffer from sleep disturbances. There is little doubt about a close association between grief *intensity* and sleep problems: higher grief intensity is associated with more frequent and/or more severe sleep difficulties. There is evidence of an even closer association between sleep problems and CG (we noted that around 80% of persons with CG experienced longer-term poor sleep). We have to be tentative about drawing conclusions based on mainly correlational information, but evidence so far suggests that the severe, distressing impact of bereavement may be exacerbated by the simple fact that one has trouble sleeping.

In contrast to the results emerging from subjective sleep measures, the few available objective sleep measures did not show bereavement-related sleep changes. The reason for this could be that actigraphy and PSG are not sensitive enough to reflect self-reported sleep problems [105,106]. Recent research shows that insomnia is associated with restless REM-sleep, which may interfere with the overnight resolution of emotional distress [107]. Possibly, a finer-grained PSG analysis, assessing REM-sleep awakenings/arousals, would show a similar relationship between restless REM-sleep and emotional distress in acute and/or CG. This is a promising line for future research.

Risk factors

We do not yet know precisely which subgroups of the bereaved - in terms of their personal, loss-related or deceased-related characteristics - are most vulnerable to sleep problems. In our view, this should be a topic for concerted research effort. Directions for future examination of risk factors include: 1) Systematic and simultaneous investigation of the broad range of potential variables implicated in post-loss sleep patterns [cf. [108]]. 2) Establishing whether (for each risk factor) there is a *relative* excess of sleep problems among the bereaved compared to non-bereaved controls. 3) Inclusion of pre-bereavement assessments, not only of risk factors (e.g., mental disorders) but also of sleep problems (e.g., pre-existing insomnia).

Causality, comorbidity and intervention efficacy

A fundamental, initial interest in conducting this review was to establish the direction of causality in relationships between sleep problems and (complicated) grief: does poor sleep exacerbate grief, and/or is it that grief prevents one from sleeping properly? To date, only two intervention studies demonstrated causal effects of grief treatment on sleep, but experiments demonstrating the reverse effect (i.e., sleep on grief) have not been conducted. We found two studies demonstrating a unique effect both of CG, and comorbid depression on sleep problems. It was also found that CG predicts sleep disturbances over time. Looking beyond bereavement, we noted the centrality of sleep disturbances in the development, maintenance, and even exacerbation of various mental disorders [1]. We cited evidence to illustrate that sleep problems are not just secondary symptoms of these disorders, but rather, a risk factor for complications (e.g., in depression and PTSD). There are good reasons, then, to assume that further studies will confirm bi-directional causal relationships between sleep and CG. Establishing these more firmly is critical: Our continuing concern is that poor sleep is a core symptom of CG, one that *causes and intensifies* other complications in grief, leading to a negative downward-spiraling effect. It is possible that treating sleep problems early in

bereavement may (at least to some extent) prevent the development of CG. We also need to establish the precise role of other (comorbid) disorders in the relationship of sleep problems with CG. Following these lines of argument: In our view, it is important to conduct not only high quality RCTs (targeting sleep or CG and including both as dependent variables), but also large-scale, intensive longitudinal studies including cross-lagged analyses, and laboratory studies (e.g., finer-grained polysomnographic investigations) monitoring sleep in the bereaved to establish effects on CG levels, could disentangle causal effects.

Two features regarding the presented evidence base deserve mention. First, the studies were of varying design quality. While some evidence has come from well-controlled studies, others were much weaker (e.g., cross-sectional surveys among small samples, without adequate control groups). Second, measures of both grief and sleep ranged from reliable, valid instruments to single-item indices, or measures of doubtful relevance. Future studies need to use valid, standardized measures covering all key symptoms of insomnia and CG. For instance, PCBD can be assessed with the Traumatic Grief Inventory [109]. This would enable comparison of the relative importance of particular sleep problems and ultimately provide an overview on patterns of sleep difficulties in bereavement. Relatedly, the range of sleep dimensions has so far been limited to sleep “problems”, rather than focusing on clinical sleep disorders, some of which would likely affect grief (e.g., chronic insomnia, sleep apnea syndrome; restless legs syndrome).

Limitations of our review must also be taken into account. We may have missed relevant information by restricting inclusion to peer-reviewed English-language literature. Furthermore, we may have missed clinically relevant issues that warrant investigation because we focused on pre-defined research questions. For example, grief [16,18,20] and sleep disturbances [110] both increase the risk for suicidal behavior. Similar to other psychiatric disorders [111], comorbid sleep problems may further exacerbate suicidal behaviors in people with CG. No meta-analysis was conducted, given the heterogeneity of study designs, characteristics, independent variables, and outcomes. For similar reasons, our quality evaluation was limited to classification by study design.

Conclusion

Despite these limitations, our systematic review provides a broad overview of the current state of knowledge about the role of sleep problems in bereavement. Evidence so far has clearly demonstrated links between bereavement, grief severity, and sleep problems. The close association between sleep disturbance and CG suggests strong clinical relevance, not least given preliminary evidence that sleep difficulties reduce but persist following effective treatment of CG. Could addressing sleep difficulties in CG substitute or enhance the efficacy of existing CG interventions? To answer this critical question, the suggested directions for future research seem of paramount importance in the field of bereavement.

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Practice points

Current knowledge in the bereavement-sleep field demonstrates:

- 1) Need for awareness: High prevalence of sleep disturbances/disorders in bereavement; close associations with (complicated) grief
- 2) Grief intervention efficacy: Treating complicated grief reduces sleep problems, albeit not completely
- 3) Sleep intervention efficacy needs further examination: Interventions targeting sleep may aid post-loss psychological adaptation
- 4) In general: There is value to “screening” for sleep problems among bereaved persons

Research agenda

Future research on sleep difficulties in bereavement needs to:

- 1) Systematically investigate the range of sleep problems (incl. diagnostically-established disorders), using validated sleep measures, in pre-, post-bereavement and follow-up designs, including non-bereaved control participants
- 2) Establish the extent to which sleep disturbances precede or cause complications in grieving and/or vice versa, using longitudinal cross-lagged studies, laboratory research, and RCTs
- 3) Examine the relative efficacy of psychotherapeutic sleep interventions (on complicated grief; sleep problems) compared to waitlist, to established (or add-on) treatment
- 4) Further explore how psychiatric comorbidity (e.g., depression) may exacerbate sleep problems in people experiencing complicated grief

Declaration of Competing Interest

The authors do not have any conflicts of interest to disclose. Options for future research.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.smr.2020.101331>.

References

- *[1] Hertenstein E, Feige B, Gmeiner T, Kienzler C, Spiegelhalter K, Johann A, et al. Insomnia as a predictor of mental disorders: a systematic review and meta-analysis. *Sleep Med Rev* 2019;43:96–105.
- [2] Carney CE, Segal ZV, Edinger JD, Krystal AD. A comparison of rates of residual insomnia symptoms following pharmacotherapy or cognitive-behavioral therapy for major depressive disorder. *J Clin Psychiatr* 2007;68:254–60.

- [3] Germain A. Sleep disturbances as the hallmark of PTSD: where are we now? *Am J Psychiatr* 2013;170:371–82.
- [4] Cheng P, Kalmbach DA, Tallent G, Joseph CL, Espie CA, Drake CL. Depression prevention via digital cognitive behavioral therapy for insomnia: a randomized controlled trial. *Sleep* 2019;42:1–9.
- [5] Gee B, Orchard F, Clarke E, Joy A, Clarke T, Reynolds S. The effect of non-pharmacological sleep interventions on depression symptoms: a meta-analysis of randomized controlled trials. *Sleep Med Rev* 2019;43:118–28.
- [6] WuJQ, Appelman ER, Salazar RD, Ong JC. Cognitive behavioral therapy for insomnia comorbid with psychiatric and medical conditions. A meta-analysis. *JAMA Intern Med* 2015;175:1461–77.
- *[7] Stroebe M, Schut H, Stroebe W. Health consequences of bereavement: a review. *Lancet* 2007;370:1960–73.
- *[8] Zisook S, Iglewicz A, Avanzino J, Maglione J, Glorioso D, Zetumer S, et al. Bereavement: course, consequences, and care. *Curr Psychiatr Rep* 2014;16:482.
- [9] World Health Organization. International classification of diseases of mortality and morbidity statistics (11th Revision). 2018.
- [10] Monk TH, Germain A, Reynolds CF. Sleep disturbance in bereavement. *Psychiatr Ann* 2008;38:671–5.
- *[11] Boelen PA, Lancee J. Sleep difficulties are correlated with emotional problems following loss and residual symptoms of effective prolonged grief disorder treatment. *Depression Research and Treatment* 2013:739804.
- [12] Cohen J. In: *Statistical power analysis for the behavioral sciences*. 2nd ed. Hillsdale NJ: Erlbaum; 1988.
- [13] Arnberg FK, Rydelius PA, Lundin T. A longitudinal follow-up of post-traumatic stress: from 9 months to 20 years after a major road traffic accident. *Child Adol Psych Men* 2011;5:8.
- [14] Ásgeirsdóttir HG, Valdimarsdóttir U, Fürst CJ, Steineck G, Hauksdóttir A. Low preparedness before the loss of a wife to cancer and the widower's chronic pain 4–5 years later—a population-based study. *Psycho Oncol* 2013;22:2763–70.
- [15] Baker AW, Keshaviah A, Horenstein A, Goetter EM, Mauro C, Reynolds III CF, et al. The role of avoidance in complicated grief: a detailed examination of the grief-related avoidance questionnaire (GRAQ) in a large sample of individuals with complicated grief. *J Loss Trauma* 2016;21:533–47.
- [16] Balk D. Effects of sibling death on teenagers. *J Sch Health* 1983;53:14–8.
- [17] Beem EE, Schut HA, Maes S, Cleiren M, Garssen B. Psychological functioning of recently bereaved, middle-aged women: the first 13 months. *Psychol Rep* 2000;87:243–54.
- [18] Boelen PA, Prigerson HG. The influence of symptoms of prolonged grief disorder, depression, and anxiety on quality of life among bereaved adults. *Eur Arch Psychiatr Clin Neurosci* 2007;257:444–52.
- [19] Brazil K, Bedard M, Willison K. Bereavement adjustment and support among caregivers. *J Ment Health Aging* 2003;9:193–204.
- [20] Breckenridge JN, Gallagher D, Thompson LW, Peterson J. Characteristic depressive symptoms of bereaved elders. *J Gerontol* 1986;41:163–8.
- [21] Brown LF, Reynolds III CF, Monk TH, Prigerson HG, Dew MA, Houck PR, et al. Social rhythm stability following late-life spousal bereavement: associations with depression and sleep impairment. *Psychiatr Res* 1996;62:161–9.
- [22] Buckley T, Bartrop R, McKinley S, Ward C, Bramwell M, Roche D, et al. Prospective study of early bereavement on psychological and behavioural cardiac risk factors. *Intern Med J* 2009;39:370–8.
- [23] Byrne GJ, Raphael B. The psychological symptoms of conjugal bereavement in elderly men over the first 13 months. *Int J Geriatr Psychiatr* 1997;12:241–51.
- [24] Carlsson ME, Nilsson IM. Bereaved spouses' adjustment after the patients' death in palliative care. *Palliat Support Care* 2007;5:397–404.
- [25] Chen JH, Gill TM, Prigerson HG. Health behaviors associated with better quality of life for older bereaved persons. *J Palliat Med* 2005;8:96–106.
- [26] Chirinos DA, Ong JC, Garcini LM, Alvarado D, Fagundes C. Bereavement, self-reported sleep disturbances, and inflammation: results from project HEART. *Psychosom Med* 2019;81:67–73.
- [27] Chiu YW, Yin SM, Hsieh HY, Wu WC, Chuang HY, Huang CT. Bereaved females are more likely to suffer from mood problems even if they do not meet the criteria for prolonged grief. *Psycho Oncol* 2011;20:1061–8.
- [28] Cluver L, Gardner F. The psychological well-being of children orphaned by AIDS in Cape Town, South Africa. *Ann Gen Psychiatr* 2006;5:8.
- [29] Cohen M, Granger S, Fuller-Thomson E. The association between bereavement and biomarkers of inflammation. *Behav Med* 2015;41:49–59.
- [30] Cooper CA. Children's dreams during the grief process. *Prof Sch Counsel* 1999;3:137.
- [31] Cuthbertson SJ, Margetts MA, Streat SJ. Bereavement follow-up after critical illness. *Crit Care Med* 2000;28:1196–201.
- [32] Demi AS, Miles MS. Suicide bereaved parents: emotional distress and physical health problems. *Death Stud* 1988;12:297–307.
- [33] Dyregrov A, Mattheisen SB. Stillbirth, neonatal death and sudden infant death (SIDS): parental reactions. *Scand J Psychol* 1987;28:104–14.

- [34] Eilegård A, Steineck G, Nyberg T, Kreicbergs U. Psychological health in siblings who lost a brother or sister to cancer 2 to 9 years earlier. *Psycho Oncol* 2013;22:683–91.
- [35] Elkliit A, Hyland P, Shevlin M. Evidence of symptom profiles consistent with posttraumatic stress disorder and complex posttraumatic stress disorder in different trauma samples. *Eur J Psychotraumatol* 2014;5.
- [36] Erlangsen A, Runeson B, Bolton JM, Wilcox HC, Forman JL, Krogh J, et al. Association between spousal suicide and mental, physical, and social health outcomes: a longitudinal and nationwide register-based study. *JAMA Psychiat* 2017;74:456–64.
- [37] Fanos JH, Nickerson BG. Long-term effects of sibling death during adolescence. *J Adolesc Res* 1991;60:70–82.
- [38] Feldman S, Byles J, Mishra G, Powers J. The health and social needs of recently widowed older women in Australia. *Australas J Ageing* 2002;21:135–40.
- [39] Germain A, Caroff K, Buysse DJ, Shear MK. Sleep quality in complicated grief. *J Trauma Stress* 2005;18:343–6.
- *[40] Germain A, Shear K, Monk TH, Houck PR, Reynolds III CF, Frank E, et al. Treating complicated grief: effects on sleep quality. *Behav Sleep Med* 2006;4:152–63.
- [41] Germain A, Shear KM, Walsh C, Buysse DJ, Monk TH, Reynolds III CF, et al. Dream content in complicated grief: a window into loss-related cognitive schemas. *Death Stud* 2013;37:269–84.
- [42] Grimby A, Johansson AK. Factors related to alcohol and drug consumption in Swedish widows. *Am J Hospice Palliat Med* 2009;26:8–12.
- [43] Hall M, Buysse DJ, Dew MA, Prigerson HG, Kupfer DJ, Reynolds III CF. Intrusive thoughts and avoidance behaviors are associated with sleep disturbances in bereavement-related depression. *Depress Anxiety* 1997;6:106–12.
- [44] Hall M, Baum A, Buysse DJ, Prigerson HG, Kupfer DJ, Reynolds CF. Sleep as a mediator of the stress-immune relationship. *Psychosom Med* 1998;60:48–51.
- [45] Hardison HG, Neimeyer RA, Lichstein KL. Insomnia and complicated grief symptoms in bereaved college students. *Behav Sleep Med* 2005;3:99–111.
- [46] Hatano Y, Aoyama M, Morita T, Yamaguchi T, Maeda I, Kizawa Y, et al. The relationship between cancer patients' place of death and bereaved caregivers' mental health status. *Psycho Oncol* 2017;26:1959–64.
- [47] Hauksdóttir A, Steineck G, Fürst CJ, Valdimarsdóttir U. Long-term harm of low preparedness for a wife's death from cancer—a population-based study of widowers 4–5 years after the loss. *Am J Epidemiol* 2010;172:389–96.
- [48] Hirooka K, Fukahori H, Ozawa M, Akita Y. Differences in posttraumatic growth and grief reactions among adolescents by relationship with the deceased. *J Adv Nurs* 2017;73:955–65.
- [49] Hoch CC, Reynolds CF, Buysse DJ, Machen M, Schlernitzauer M, Hall F, et al. Sleep-disordered breathing in healthy and spousally bereaved elderly: a one-year follow-up study. *Neurobiol Aging* 1992;13:741–6.
- [50] Horowitz MJ, Siegel B, Holen A, Bonanno GA, Milbrath C, Stinson CH. Diagnostic criteria for complicated grief disorder. *Focus* 2003;1:290–8.
- [51] Huberty J, Green J, Cacciatore J, Buman MP, Leiferman J. Relationship between mindfulness and posttraumatic stress in women who experienced stillbirth. *J Obstet Gynecol Neonatal Nurs* 2018;47:760–70.
- [52] Huh HJ, Huh S, Lee SH, Chae JH. Unresolved bereavement and other mental health problems in parents of the Sewol ferry accident after 18 months. *Psychiat Invest* 2017;14:231–9.
- [53] Iwasa H, Takebayashi Y, Suzuki Y, Yagi A, Zhang W, Harigane M, Mental Health Group of the Fukushima Health Management Survey. Psychometric evaluation of the simplified Japanese version of the Athens insomnia scale: the Fukushima health management survey. *J Sleep Res* 2018;28:e12771.
- [54] Jacobs SC, Schaefer CA, Ostfeld AM, Kasl SV, Berkman L. The first anniversary of bereavement. *Isr J Psychiatry Relat Sci* 1987;24:77–85.
- [55] Jang KI, Shim M, Lee SM, Huh HJ, Huh S, Joo JY, et al. Increased beta power in the bereaved families of the Sewol ferry disaster, a paradoxical compensatory phenomenon?: a two-channel electroencephalography study. *Psychiatr Clin Neurosci* 2017;71:759–86.
- [56] Jonasson JM, Hauksdóttir A, Valdimarsdóttir U, Fürst CJ, Onelöv E, Steineck G. Unrelieved symptoms of female cancer patients during their last months of life and long-term psychological morbidity in their widowers: a nationwide population-based study. *Eur J Canc* 2009;45:1839–45.
- [57] Knowles LM, Stelzer EM, Jovel KS, O'Connor MF. A pilot study of virtual support for grief: feasibility, acceptability, and preliminary outcomes. *Comput Hum Behav* 2017;73:650–8.
- [58] Kowalski SD, Bondmass MD. Physiological and psychological symptoms of grief in widows. *Res Nurs Health* 2008;31:23–30.
- *[59] Lannen PK, Wolfe J, Prigerson HG, Onelöv E, Kreicbergs UC. Unresolved grief in a national sample of bereaved parents: impaired mental and physical health 4 to 9 years later. *J Clin Oncol* 2008;26:5870.
- [60] Lee SA. Persistent complex bereavement symptoms explain impairments above depression, posttraumatic stress, and separation anxiety: an incremental validity study. *Death Stud* 2019;43:634–8.
- [61] Martin JL. Psychological consequences of AIDS-related bereavement among gay men. *J Consult Clin Psychol* 1988;56:856.
- [62] Maytal G, Zalta AK, Thompson E, Chow CW, Perlman C, Ostacher MJ, et al. Complicated grief and impaired sleep in patients with bipolar disorder. *Bipolar Disord* 2007;9:913–7.
- [63] McDermott OD, Prigerson HG, Reynolds CF, Houck PR, Dew MA, Hall M, et al. Sleep in the wake of complicated grief symptoms: an exploratory study. *Biol Psychiatr* 1997;41:710–6.
- [64] Meshot CM, Leitner LM. Adolescent mourning and parental death. *Omega J Death Dying* 1993;26:287–99.
- [65] Miles MS. Emotional symptoms and physical health in bereaved parents. *Nurs Res* 1985;34:76–81.
- *[66] Milic J, Saavedra Perez H, Zuurbier LA, Boelen PA, Rietjens JA, Hofman A, et al. The longitudinal and cross-sectional associations of grief and complicated grief with sleep quality in older adults. *Behav Sleep Med* 2019;17:31–40.
- [67] Mojtabei R. Bereavement-related depressive episodes: characteristics, 3-year course, and implications for the DSM-5. *Arch Gen Psychiatr* 2011;68:920–8.
- [68] Monk TH, Houck PR, Shear M. The daily life of complicated grief patients—what gets missed, what gets added? *Death Stud* 2006;30:77–85.
- [69] Monk TH, Begley AE, Billy BD, Fletcher ME, Germain A, Mazumdar S, et al. Sleep and circadian rhythms in spousally bereaved seniors. *Chronobiol Int* 2008;25:83–98.
- [70] Monk TH, Germain A, Buysse DJ. The sleep of the bereaved. *Sleep Hypn: an international journal of sleep, dream, and hypnosis* 2009;11:1–10.
- [71] Monk TH, Pfoff MK, Zarotney JR. Depression in the spousally bereaved elderly: correlations with subjective sleep measures. *Depress Res treatment* 2013;409538.
- [72] Okun ML, Reynolds III CF, Buysse DJ, Monk TH, Mazumdar S, Begley A, et al. Sleep variability, health-related practices and inflammatory markers in a community dwelling sample of older adults. *Psychosom Med* 2011;73:142.
- [73] Omerov P, Steineck G, Nyberg T, Runeson B, Nyberg U. Viewing the body after bereavement due to suicide: a population-based survey in Sweden. *PLoS One* 2014;9:e101799.
- [74] Omerov P, Pettersen R, Titelman D, Nyberg T, Steineck G, Dyregrov A, et al. Encountering the body at the site of the suicide: a population-based survey in Sweden. *Suicide Life-Threat* 2017;47:38–47.
- [75] Parkes CM, Brown RJ. Health after bereavement: a controlled study of young Boston widows and widowers. *Psychosom Med* 1972;34:449–61.
- [76] Pasternak RE, Reynolds CF, Miller M, Frank E, Fasiczka A, Prigerson HG, et al. The symptom profile and two-year course of subsyndromal depression in spousally bereaved elders. *Am J Geriatr Psychiatr* 1994;2:210–9.
- [77] Persson C, Östlund U, Wennman-Larsen A, Wengström Y, Gustavsson P. Health-related quality of life in significant others of patients dying from lung cancer. *Palliat Med* 2008;22:239–47.
- [78] Pfoff MK, Zarotney JR, Monk TH. Can a function-based therapy for spousally bereaved seniors accrue benefits in both functional and emotional domains? *Death Stud* 2014;38:381–6.
- [79] Prigerson HG, Frank E, Kasl SV, Reynolds III CF. Complicated grief and bereavement-related depression as distinct disorders: preliminary empirical validation in elderly bereaved spouses. *Am J Psychiatr* 1995;152:22.
- [80] Reynolds CF, Hoch CC, Buysse DJ, Houck PR, Schlernitzauer M, Frank E, et al. Electroencephalographic sleep in spousal bereavement and bereavement-related depression of late life. *Biol Psychiatr* 1992;31:69–82.
- [81] Reynolds CF, Hoch CC, Buysse DJ, Houck PR, Schlernitzauer M, Pasternak RE, et al. Sleep after spousal bereavement: a study of recovery from stress. *Biol Psychiatr* 1993;34:791–7.
- [82] Richardson SJ, Lund DA, Caserta MS, Dudley WN, Obay SJ. Sleep patterns in older bereaved spouses. *Omega J Death Dying* 2003;47:361–83.
- [83] Seiler A, Murdock KW, Fagundes CP. Impaired mental health and low-grade inflammation among fatigued bereaved individuals. *J Psychosom Res* 2018;112:40–6.
- *[84] Simon NM, Shear KM, Thompson EH, Zalta AK, Perlman C, Reynolds CF, et al. The prevalence and correlates of psychiatric comorbidity in individuals with complicated grief. *Compr Psychiatr* 2007;48:395–9.
- [85] Simpson C, Allegra JC, Ezeamama AE, Elkins J, Miles T. The impact of mid- and late-life loss on insomnia: findings from the Health and retirement study, 2010 cohort. *Fam Community Health* 2014;37:317–26.
- [86] Svein J, Pohlkamp L, Kreicbergs U, Eisma MC. Rumination in bereaved parents: psychometric evaluation of the Swedish version of the Utrecht grief Rumination scale (UGRS). *PLoS One* 2019;14:e0213152.
- [87] Tanimukai H, Adachi H, Hirai K, Matsui T, Shimizu M, Miyashita M, et al. Association between depressive symptoms and changes in sleep condition in the grieving process. *Support Care Canc* 2015;23:1925–31.
- [88] Taylor MP, Reynolds CF, Frank E, Dew MA, Mazumdar S, Houck PR, et al. EEG sleep measures in later-life bereavement depression: a randomized, double-blind, placebo-controlled evaluation of nortriptyline. *Am J Geriatr Psychiatr* 1999;7:41–7.
- [89] Toblin RL, Riviere LA, Thomas JL, Adler AB, Kok BC, Hoge CW. Grief and physical health outcomes in US soldiers returning from combat. *J Affect Disord* 2012;136:469–75.

- [90] Tudehope DI, Iredell J, Rodgers D, Gunn A. Neonatal death: grieving families. *Med J Aust* 1986;144:290–2.
- [91] Valdimarsdóttir U, Helgason ÁR, Fürst CJ, Adolffson J, Steineck G. Long-term effects of widowhood after terminal cancer: a Swedish nationwide follow-up. *Scand J Publ Health* 2003;31:31–6.
- [92] Van der Klink MA, Heijboer L, Hofhuis JG, Hovingh A, Rommes JH, Westerman MJ, et al. Survey into bereavement of family members of patients who died in the intensive care unit. *Intensive Crit Care Nurs* 2010;26:215–25.
- [93] Van Eerdewegh MM, Clayton PJ, Van Eerdewegh P. The bereaved child: variables influencing early psychopathology. *Brit J Psychiat* 1985;147:188–94.
- [94] Waldrop DP. Caregiver grief in terminal illness and bereavement: a mixed-methods study. *Health Soc Work* 2007;32:197–206.
- [95] Warner J, Metcalfe C, King M. Evaluating the use of benzodiazepines following recent bereavement. *Brit J Psychiat* 2001;178:36–41.
- [96] Yoo S, Sim M, Choi J, Jeon K, Shin J, Chung S, et al. Psychological responses among humidifier disinfectant disaster victims and their families. *J Korean Med Sci* 2019;34:e29.
- [97] Prigerson HG, Maciejewski PK, Reynolds CF, Bierhals AJ, Newsom JT, Fasiczka A, et al. Inventory of complicated grief: a scale to measure maladaptive symptoms of loss. *Psychiatr Res* 1995;59:65–79.
- [98] Faschingbauer TR, De Vaul RA, Zisook S. Development of the Texas inventory of grief. *Am J Psychiatr* 1977;118:621–6.
- [99] Buysse DJ, Reynolds CF, Monk TH, Berman SR, Kupfer DJ. The Pittsburgh Sleep Quality Index: a new instrument for psychiatric practice and research. *Psychiatr Res* 1989;28:193–213.
- [100] Bastien CH, Vallières A, Morin CM. Validation of the Insomnia Severity Index as an outcome measure for insomnia research. *Sleep Med* 2001;2:297–307.
- [101] Okajima I, Nakajima S, Kobayashi M, Inoue Y. Development and validation of the Japanese version of the Athens insomnia scale. *Psychiatr Clin Neurosci* 2013;67:420–5.
- [102] Zhong HH, Yu B, Yang LY, Zhang J, Jiang SS, Hu SJ, et al. Roles of aging in sleep. *Neurosci Biobehav Rev* 2019;98:177–84.
- [103] Suh S, Cho N, Zhang J. Sex differences in insomnia: from epidemiology and etiology to intervention. *Curr Psychiatr Rep* 2018;20:69.
- [104] Young T, Skatrud J, Peppard PE. Risk factors for obstructive sleep apnea in adults. *J Am Med Assoc* 2004;291:2013–6.
- [105] Biagioni C, Regen W, Teghen A, Spiegelhalter K, Feige B, Nissen C, et al. Sleep changes in the disorder of insomnia: a meta-analysis of polysomnographic studies. *Sleep Med Rev* 2013;18:195–213.
- *[106] Riemann R, Spiegelhalter K, Nissen C, Baglioni C, Feige B. REM sleep instability – a new pathway for insomnia? *Pharmacopsychiatry* 2012;45:167–76.
- *[107] Wassing R, Benjamins JS, Talamini LM, Schlakwijk F, Van Someren EJW. Overnight worsening of emotional distress indicates maladaptive sleep in insomnia. *Sleep* 2019;42:zsy268.
- [108] Stroebe M, Folkman S, Hansson RO, Schut H. The prediction of bereavement outcome: development of an integrative risk factor framework. *Soc Sci Med* 2006;63:2446–51.
- [109] Boelen P, Smid G. The traumatic grief inventory self-report version (TGI-SR): introduction and preliminary psychometric evaluation. *J Loss Trauma* 2017;22(3):196–212.
- [110] Pigeon WR, Pinquart M, Conner K. Meta-analysis of sleep disturbance and suicidal thoughts and behaviors. *J Clin Psychiatr* 2012;73:e1160–7.
- [111] Malik S, Kanwar A, Sim LA, Prokop LJ, Wang Z, Benkhadra K, et al. The association between sleep disturbances and suicidal behaviors in patients with psychiatric diagnoses: a systematic review and meta-analysis. *Syst Rev* 2014;3:18.