Sensory experiences of one's deceased spouse in older adults: An analysis of predisposing factors

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Author's Note

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Declaration of Interest Statement

The authors report no conflict of interest

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Abstract

Objectives: This study focuses on pre-disposing factors associated with sensory experiences of the deceased (SED), also called bereavement hallucinations. Even though SED are common among older widowed adults, our knowledge of these experiences is still limited. **Method:** Survey responses were obtained from 310 older widowed participants (M=70.05±8.39), complemented with data from Danish national registers. **Results:** Hierarchical logistic regression analysis revealed four significant pre-disposing factors: prior experiences of SED in the context of previous significant bereavements (OR = 4.72), a history of interpersonal trauma (OR = 5.8), high pre-death relationship closeness (OR = 2.76) and stronger religious/spiritual worldview (OR = 1.12). No association to registered mental health diagnosis was identified. **Conclusion**: SED may be considered an interpersonal experience, which may be more likely to occur if the pre-death relationship is described as very close and if the bereaved has previously experienced interpersonal trauma. We argue that SED should not necessarily be considered an indication of neurodegenerative or psychiatric diseases.

Keywords words: Auditory-verbal hallucinations; Bereavement; Hallucinations; Non-clinical; Non-responder analysis

Introduction

Spousal bereavement in later life is very common and is associated with negative health impacts and decreased well-being (Naef et al., 2013; Richardson et al., 2015; Utz et al., 2014). However, a majority of people successfully adjust after a period of acute grief (Bonanno & Malgaroli, 2019; Maccallum et al., 2015). One of the numerous reactions to bereavement is spontaneously having a sensory experience of the deceased in any of the five sensory modalities, such as hearing their voice or feeling their touch, as well as sensing the presence of the deceased (Hayes & Leudar, 2016; Rees, 1971). While these experiences have received limited research attention, a number of studies have found these experiences to be common among older adults (Byrne & Raphael, 1994; Grimby, 1993; Kamp et al., 2019; Olson et al., 1985); however, many of these studies are several decades old and/or used small convenience samples (<100).

Several terms have been used to denote these phenomena (Kamp et al., in press), including hallucinations (e.g. Kamp et al., 2019; Rees, 1971) and variations of 'sense of presence' experiences (e.g. Keen et al., 2013b; Steffen & Coyle, 2011), reflecting various ontological and theoretical perspectives. However, at present no theoretical framework has succeeded in fully and coherently accounting for the etiology of the experiences, as well as for variations in phenomenology and consequences as reported by experiencers (Kamp et al., in press). The term 'sensory or quasi-sensory experiences of the deceased' (SED), originating from an interdisciplinary working group on SED is preferred here (Kamp et al., in press), as it is a relatively neutral term, not closely associated with a particular theoretical or ontological stance.

Many perspectives or conceptualizations of SED consider them as common and broadly normal bereavement experiences. Indeed, most people who experience SED find them to be benign, and at times helpful or comforting (Castelnovo et al., 2015; Kamp et al., in press). A central conceptualization of SED is as a relationally meaningful phenomenon (e.g. Hayes & Leudar, 2016; Ratcliffe, 2020). For example, SED are defined as a part of a continuing bond (CB) with the deceased within CB theory (Klass et al., 1996; Klass & Steffen, 2018). CBs may change over time, and may influence the process of grief in both positive and negative ways (Klass & Steffen, 2018; Root & Exline, 2014). From an attachment theory perspective, SED have been seen as a type of searching

behavior (for the lost attachment figure) predominant in the first few months of bereavement (Bowlby, 1998; Parkes, 1972). A relational perspective on SED is supported by associations between reporting SED and longer marriages (Kamp et al., 2019; Rees, 1971) and indicators of the quality of the pre-death relationship, such as higher marital satisfaction and harmony (Grimby, 1993; Rees, 1971).

However, little is known about why some bereaved persons experience SED and others do not. Research on socio-demographic characteristics is limited and has generally yielded inconclusive results (Castelnovo et al., 2015; Kamp et al., in press; Keen et al., 2013a), although there is some indication that SED may be more prevalent among women (Asai et al., 2012; Grimby, 1993; Klugman, 2006), and associated with higher age (Olson et al., 1985; Rees, 1971). Another factor, which has been associated with SED after late life spousal bereavement, is SED in response to earlier bereavements (Olson et al., 1985). Lastly, SED have been conceptualized as a spiritual experience (Steffen & Coyle, 2010) and linked with belief in life after death (Nowatzki & Kalischuk, 2009; Steffen & Coyle, 2011). Even so, SED have been reported by people both with and without a religious affiliation (Ata, 2012; Datson & Marwit, 1997; Sabucedo et al., In press).

Historically, SED have been conceptualized as a sign of non-adaptive grieving within grief theories grounded in early psychoanalytic ideas about the bereaved person needing to 'break bonds' with the deceased to allow for new relationships (Freud, 1917; Parkes, 1972). More recently, some incidences of SED have been conceptualized as hallucinations, suggesting a lack of integration of the death (Field & Filanosky, 2010). Research points to a history of trauma as a strong predictor of hallucinations in several contexts, such as post-traumatic stress disorder (PTSD) and psychosis, as well as in non-clinical populations (Armour et al., 2019; Medjkane et al., 2020; Morrison & Petersen, 2003), but, to our knowledge, such a possible link has not been explored in relation to SED. In addition, hallucinations may also be associated with a number of neurodegenerative diseases, such as Parkinson's and Alzheimer's disease, among older adults (Badcock et al., 2017; Waters & Fernyhough, 2017), but research exploring whether SED are associated with diagnosed mental health issues is lacking (Castelnovo et al., 2015). Lastly, auditory hallucinations have been associated with

hearing impairment (Badcock et al., 2017; Linszen et al., 2016), but it is unclear if such sensory deprivations are similarly associated with auditory SED. Exploring potential connections to mental and physical health is important, particularly because SED are associated with stigma in many cultures (Grimby, 1998; Rees, 1971; Sabucedo et al., 2020). As a consequence, these experiences may often be perceived as positive in themselves, but worry about others people's reactions may cause distress and be detrimental to the individual (Kamp et al., in press).

In addition, there is currently no validated measure of SED nor consensus regarding the phrasing of items (see Kamp et al., in press for an overview of different approached to assessing SED). Studies have used such diverse measures as semi-structured interviews (e.g. Grimby, 1998), single items (e.g. Lee, 2015) within a survey (e.g. Jahn & Spencer-Thomas, 2014) or a full scale (e.g. Field & Filanosky, 2010). Despite these efforts, our current knowledge about the general phenomenology and characteristics of SED, which should form the basis for developing a valid measure of SED, remains limited.

In this context, research on pre-disposing factors for SED is warranted; therefore, the present study focusses on exploring three categories of pre-disposing factors identified as relevant in the literature: 1) socio-demographic characteristics; 2) mental health diagnoses (e.g. dementia, depression); and 3) personal and interpersonal characteristics (e.g. pre-death closeness to the deceased, history of interpersonal trauma). In addition, the potential association between hearing impairment and auditory SED is explored.

Materials and Methods

Design and Procedure

The present study is a sub-study of a larger two-point longitudinal survey collecting data at 6-10 months (T1) and 18-20 months (T2) post loss.

Recruitment: A study population of 1200 older (M=72.37 years old, ±8.31) widowed people was identified and randomly selected from the general Danish population through the Danish Central

Person Register (CPR; a national register containing information on all people residing in Denmark) based on these criteria: Registered residents of Denmark aged 50-85 years and conjugally bereaved between 1st of March and 15th of April 2016.

Letters inviting the study population to participate were sent out on October 1st, 2016, on average 6.28 (±0.44) months post loss. The letter contained a cover letter, a FAQ-folder on the study, a consent form, and a pre-paid envelope. Furthermore, participants (or family members, professional carers, etc.) were encouraged to provide reasons for non-participation by completing an included questionnaire or by contacting the first author directly. A study-reminder[1] was sent out at the beginning of November 2016.

Ethics: The present study was exempt from ethical approval by the regional research ethics committee, based on the rules of the Committee Act which except register-based and survey studies (guidelines from The Danish National Commitee on Health Research Ethics; 2019). To minimize any potential distress associated with participating the initial assessment was set after the acute phase of grief. Participants had the opportunity to contact the first author directly if needed both during and after having responded to the questionnaire, and all T1 responses were reviewed by the first author to check for any indication of concerning distress among participants.

Data collection: The first questionnaire packages were sent out on October 15, 2016, and consecutively distributed as written consent was obtained. To ensure participation regardless of disabilities or despite age-related difficulties, the manner of distribution (i.e. by post, email or telephone interview) was selected by the participant. In addition, participants were encouraged to contact the first author, or, if preferred, a trusted person from their supportive network, if any help was needed. Data collection ended on December 31, 2016. The second questionnaire package, which also included a gift certificate of 50 Dkk (c.6.7 EURO; not depending on participation, as this has been suggested to enhance follow-up participation; O'Connor, 2011), was distributed a year later on

[1] The letter included a typing-error correction in the stated timeframe of the participant's bereavement from 15.02.2016-30.03.2016 to 01.03.2016-15.04.2016.

October 15, 2017. Data collection ended on December 1, 2017. The survey data was supplemented by data from the Danish national registers.

Sample Description and Comparison with Non-participants

The 310[2] participants were on average 70.05 (±8.39) years of age and had been married on average 40.31 (±14.09) years. Most of the participants were retired (75.5%, N=234), with an average disposable income of 272.448 Dkk (±138.336; c.30.009 EURO±18.579), and about a third of the participants were men (34.8%, N=108). The most common cause of death of the deceased was illness (69.0%, N=214; see Table 1 for detailed sample characteristics).

****Insert Table 1****

As illustrated in the Flowchart, 325 people participated at T1 (following 2.7% dropout) and 304 people participated at T2 (following 0.3% dropout). Of the 335 participants 87.5% (N=293) responded at both time-points. At least one reason for not participating was supplied by about a third (N=243) of the non-participants (see Flowchart). The most common reasons were that the bereaved felt they did not have sufficient mental resources and that the loss was too recent (39.1% and 29.6%, respectively). However, 17.7% declined to participate because they reported feeling fine, having continued life and having a supportive network.

****Insert Flowchart****

Analysis revealed participants to be slightly younger, with a shorter average length of marriage and a higher income compared to non-participants. Furthermore, there was a higher percentage of men in the present sample compared with non-participants. Finally, those who participated were less likely to have received a mental health diagnosis (e.g. depression, Parkinson's disease, epilepsy, dementia). However, all differences were of a small effect size (see Table 2).

****Insert Table 2****

[2] 25 participants reporting to be unsure of having had SED were excluded.

Materials

Sensory and Quasi-sensory Experiences of the Deceased

To identify all experiencers of SED, we assessed the presence of SED at T1 and T2 with a detailed survey developed by the first author. The survey draws on a broad range of research on SED (e.g. Austad, 2015; Datson & Marwit, 1997; Grimby, 1998) as well as research on hallucinations (e.g. Chadwick et al., 2000; Papapetropoulos et al., 2008). All remaining data were register-based or collected as self-report along with SED-data at T1. However, only the questions assessing the presence of SED within 18-20 months post loss were used in the present study. The general survey results, as well as details on the development, content validation among researchers and clinical experts of SED and piloting of the survey among experiencers, is available elsewhere (Kamp et al., Submitted) and Open Science Framework (OSF; DOI Blinded for Review).

The survey was initiated with a statement normalizing the experience, and defining it as occurring spontaneously (i.e. not induced) and while the bereaved person was awake. At T1 the survey was initiated with a single filter-question addressing all of the possible SED, prompting the full survey, including eight separate questions addressing the different types of SED (i.e. visual, auditory, tactile, olfactory, gustatory and sense of presence) with a categorical response-format (i.e. yes, unsure, no). At T2 all participant were asked the eight questions on the different types of SED (e.g. 'Have you seen your deceased spouse while awake?'), which prompted the rest of the survey.

To ensure the quality of the responses, the first author systematically reviewed all returned questionnaires, and contacted participants with missing or inconsistent responses on the SED survey, inviting them to fill in or/and clarify their response. The amendment to the SED survey from T1 to T2 was based on feedback from the 27 (96.4% of 28 contacted) participants reached at T1. At T2, 19 participants were contacted, and 13 (68.4%) were reached and responded.

Self-report Background Information

At T1 the following information were collected using self-report single items: Employment status, educational level, cause of death, closeness of the pre-death relationship (i.e. 'How emotionally close

would you say that you were with your spouse on a scale from 0 (not at all close) to 4 (extremely close)? Emotionally close means to share emotions, concerns and ideas'), lifetime trauma history, prior experiences of SED, strength of religious/spiritual worldview (Item three from The Royal Free Interview for Spiritual and Religious Beliefs; King et al., 2001), hearing impairment ('Do you use a hearing aid?' with yes-no response-option and 'Do you have impaired hearing?' on 5-point severity scale [0-4]).

Data from the Danish National Registers

Participants' information on gender, age, income (includes available personal income in DKK after tax in 2016), and length of marriage was obtained through the Danish National registers.

Diagnoses were derived from the Psychiatric Central Register (i.e. psychiatric admissions from 1969-2017, psychiatric outpatient contacts from 1995-2017) and the National Patient Register (somatic admissions from 1977-2017, somatic outpatient contacts from 1995-2017). Psychiatric diagnoses as presented in chapter 5 (i.e. Mental and behavioural disorders) of ICD-10 (World Health Organization (WHO), 2016) were used and categorized into overall groups such as 'Dementia', 'Depression' and 'Anxiety'. A selected number of neurological diagnoses from ICD-10 chapter 6 (i.e. Diseases of the nervous system), associated with hallucinatory experiences were used (i.e. Alzheimer (included as part of 'Dementia), Parkinson's disease, epilepsy), and diagnosis of hearing impairment were derived from chapter 7 (Diseases of the ear and mastoid process). In addition, previous incidences of diagnosed hallucinations were checked using the ICD-10 code R40 (0-4). Some participants had received the same diagnosis several times, but each diagnosis were only used once in this study. Validation of the information in the registers is done continually, and research validating a selected diagnosis has generally provided positive results, pointing to the registers as a valuable resource in research (Mors et al., 2011; Schmidt et al., 2015).

Statistics

Recoding: A measure of SED within 18-20 months of bereavement was coded by categorizing participants reporting at least one SED at either time-point as having had SED. Participants were

considered not to have had SED if they replied 'no' to all questions of SED at both time-points. Participants reporting being unsure of having had any form of SED (i.e. did not clearly confirm any of the 8 SED types) were excluded from the present study (N=25). This conservative approach was taken to ensure the validity of the present results. Experiencing prior SED and a history of interpersonal trauma (i.e. violent or sexual assault, physical or sexual abuse, threats with weapon, neglect as a child) was recoded into report/no report. Educational level was recoded into ordinal categories of length of education (i.e. ≤ 2 years of higher education; 3-4 years of higher education; ≥5 years of further education). Employment status was recoded into 'Retired', 'Sick-leave/unemployed' and 'Employed'.

Descriptive statistics were used for sample description, and t-tests and χ^2- tests were used to examine any differences between participants and non-participants. Effect sizes were estimated using Cohen's *d* interpreted as 0.20=small, 0.50=medium, 0.80=large, and Cramer's V interpreted as 0.10=small, 0.30=medium, 0.50=large (Cohen, 1988). Tests of heterogeneity were conducted for t-test and corrected results reported if the assumption was violated.

Hierarchical logistic regression analysis was conducted to explore associations between register-based data and self-report data from T1 with reporting SED at T1 and/or T2. The first model contained register-based socio-demographic information (e.g. age), and in the second model register-based mental health diagnoses (e.g. dementia, depression) was added. Self-report data from T1 were added in the third model (i.e. education level, strength of religious/spiritual worldview, interpersonal trauma, closeness of pre-death relationship, and prior experiences of SED), resulting in a reduced sample due to missing data (N=223). Register-based socio-demographic variables were included as controls throughout the model, but the rest of the variables were only retained if they reached marginal significance (<.1).

Logistic regression was used to test if hearing impairment was associated with auditory SED (i.e. voice hearing, familiar sounds and other sounds associated with the deceased). The model contained three variables indicating hearing impairments: having a hearing aid, self-reported hearing, and register-based diagnoses of hearing loss.

All logistic regression models were tested for the assumptions of linearity of continuous variables with the logit on all continuous variables and recoded as ordinal data if the assumption was violated (i.e. age, length of marriage, income, closeness of pre-death relationship; see Table 3). We ran multi-collinearity diagnostics checking VIF (<10) and tolerance (>.1). The overall fit of the models was assessed with Hosmer and Lemeshow's goodness-of-fit test.

Analyses were conducted with STATA 15 (StataCorp, 2017).

Results

Hierarchical logistic regression analysis explored pre-disposing factors associated with having SED within 18-20 months of bereavement (see Table 3). The final model (N=223) revealed that having had SED previously (e.g. of parents, siblings) was a strong predictor of SED, increasing the odds of experiencing SED 4.72 times. In addition, participants were 2.76 times more likely to have SED if they reported the highest levels of pre-death relationship closeness, compared to participants reporting medium closeness, and participants with a history of interpersonal trauma had 5.8 the odds of experiencing SED, compared to those reporting no such experiences. However, considering the large confidence interval for the association of trauma in comparison to the confidence interval of the other significant variables, the strength of the effect of trauma should be interpreted with caution. SED were also associated with slightly higher levels of religious/spiritual worldview (OR = 1.12). Registered mental health diagnoses (i.e. stress, anxiety, and depression) did not predict SED in Model 2. Several diagnoses were omitted from the analysis because they were too infrequent in the present sample (e.g. dementia, see Table 3). Lastly, the significant associations between SED and socio-demographic characteristics found in Model 1 became non-significant in Model 3, except for income. This may to some extent be caused by the reduced sample size.

****Insert Table 3 ****

The analysis exploring the impact of hearing impairment showed no significantly increased odds of having auditory SED (i.e. hearing the deceased's voice, familiar sounds and other sounds associated with the deceased).

Discussion

The present study explored SED among older widowed people of whom 51.3% (N=159) reported SED. The hierarchical logistic regression revealed that a history of interpersonal trauma, previous experiences of SED and pre-death relationship closeness were the strongest predictors of SED.

SED is an Interpersonally Meaningful Experience

In line with the increasingly accepted perspective of SED as an interpersonally meaningful experience (Hayes & Leudar, 2016; Ratcliffe, 2020; Root & Exline, 2014; Steffen & Coyle, 2011), an association with higher levels of pre-death emotional closeness was found. This concurs with previous research suggesting an impact of self-reported pre-death relationship satisfaction on the prevalence of SED among older widowed adults (Grimby, 1993; Rees, 1971). From an attachment perspective, this could be seen as evidence that SED are more likely to occur in close relationships. In short, the attachment system is activated in times of distress which may cause the bereaved person to seek proximity with an attachment figure, (Simpson & Steven Rholes, 2017), such as the deceased partner. However, as the assessments are retrospective, the causal direction of the association is unclear. Alternatively, SED may help maintain, or even lead to an improvement of, the relationship with the deceased, for instance by enabling the bereaved person to resolve 'unfinished business' with the deceased and/or by providing access to the deceased as a source of guidance and support (Hayes & Steffen, 2018).

SED is about Bereavement, not Mental Health Problems

The present study found no association between SED and neurodegenerative or psychiatric diagnosis, indicating that SED may primarily be bereavement-related rather than related to any pre-existing mental health issues. Nevertheless, 'hallucinations of a deceased relative' have been reported in relation to specific neurological diseases, such as Parkinson's disease (Fénelon et al., 2000; Papapetropoulos et al., 2008), and some auditory-verbal hallucinations have been reported to be personifications of deceased relatives or friends (Waters & Fernyhough, 2017). Nonetheless, one should be cautious about equating SED with symptoms of a neurodegenerative disease or psychiatric

disorder, as there is opposing research, which points to its normality. One should be particularly cautious since such a perspective maintains stigma associated with SED, such as concern for one's mental health and negative reactions from others (Grimby, 1993; Rees, 1971). Of note, as these findings are based on register data, there may have been an under-registration of some diagnoses, such as Alzheimer's disease (Phung et al., 2007), or some participants may have been in an early, and undiagnosed, stage of a neurodegenerative disease.

A History of Trauma is one Pathway to SED

A considerable connection between previous interpersonal trauma and SED was identified, which points to trauma as one potential pathway to SED, similar to research on hallucinations (Luhrmann et al., 2019), where trauma (and related dissociation) is a strong predictor of hallucinations in both clinical and non-clinical populations (Longden et al., 2019; Morrison & Petersen, 2003; Read et al., 2005). This is particularly relevant from a clinical perspective, as psychological suffering from previous trauma may be carried over into experiences of SED among a minority of the small group of people with distressing SED according to the clinical experience of psychotherapists (Sabucedo et al., 2020). However, the individual experience of SED must be viewed in light of their personal and cultural context (Hayes & Leudar, 2016).

Strength of Belief as a Pathway to SED

Reporting SED was associated with a stronger religious/spiritual worldview, which is interesting, as it may suggest that a stronger religious/spiritual worldview - regardless of the relevant category of belief (e.g. Christian Protestant, spiritual, belief in life after death) – may increase the likelihood of experiencing SED. A potential explanation may be found in the relationship between religiousness, including spirituality, and the personality trait of Openness to Experience (Saroglou, 2002), as this trait has been associated with experiencing SED (Kamp et al., 2019), and proneness to hallucinations in older adults (Larøi et al., 2005).

Having SED once makes it more likely to re-occur

Participants reporting SED in relation to previous loss, such as parents or child, were almost 5 times more likely to report SED after losing their spouse, which concurs with previous research findings that a history of SED in relation to other bereavements was associated with the occurrence of SED among older widowed persons (Olson et al., 1985). This may be caused by expectations, for example from a facilitative worldview or meaning-making framework allowing for the possibility of SED to occur, such as belief in life after death and the continued attachment with deceased loved ones (Bennett & Bennett, 2000; Benore & Park, 2004; Parker, 2005; Steffen & Coyle, 2011). This concurs with the association to strength of worldview (including belief in afterlife) and the suggestion that having SED is in accordance with the overall worldview of a majority of the experiencers in the present study (Kamp et al., Submitted). However, the association between reporting having had SED previously, and experiencing them in relation to the current loss may potentially in part be caused by a recollection bias (Coughlin, 1990). That is, the current experiencers of SED may be more likely to recall previous SED in relation to another loss compared to current non-experiencers (who may actually have had a SED before), resulted in an overestimated association.

Socio-demographic characteristics and SED

Although our analyses pointed to a tentative impact of some socio-demographic factors on reporting SED, e.g. being female in accordance with previous research (Asai et al., 2012; Grimby, 1993; Kalish & Reynolds, 1973), our analysis also indicates that other variables, such as a history of trauma, have considerable explanatory value. More research is needed to further increase our understanding of the associations between socio-demographics and SED reported here.

Limitations

The present survey offers new insights into associations between SED and potential pre-disposing factors, including a number of new variables, such as mental health history and trauma, and as such, it contributes to the efforts of improving our understanding of SED. However, the results should be considered with a number of limitations in mind: first, non-responder analysis indicates that responders were younger (potentially explaining the, on average, shorter length of marriage) and had

a higher income than non-responders. The prevalence of mental health diagnoses was also significantly higher among non-participants, which means that we cannot rule out the possibility that SED to some extent could be associated with mental health issues. However, the strength of all the associations was low (Cohen's d<0.40; Cramer's V<0.15). In addition, the reasons for non-participation point towards fewer resources and that (at least some of) the non-participants were more affected by age-related difficulties and by the recent loss of their spouse (30-40% with loss-related reasons). In contrast, a minority reported that they did not participate because they felt fine and had a strong network (18.5%). Taken together, the present sample might primarily consist of bereaved people with more emotional, physical and financial resources, as may be expected in bereavement research (Stroebe et al., 2003), but there is also a possibility that some of the highest-functioning bereaved individuals did not participate. Second, the study is situated in Denmark, and results may not be generalizable beyond Scandinavia. However, the results align with previous research, and as SED seem to be a cross-cultural phenomenon (Kamp et al., in press; Sabucedo et al., In press), the present results may represent a significant contribution to the field of SED in general, not only to older adults with SED. Thirdly, the data were collected using three manners of distribution to ensure participation regardless of any disabilities (e.g. blindness), but mixed distribution may increase the risk of bias (Hoy et al., 2012), but post-hoc χ^2-test revealed no impact on the main outcome (i.e. SED or not; p=.631). Fourth, the initial invitation letter to participate in the present study contained an error in the date of bereavement, which may have caused some confusion about the perceived eligibility of the participants, in turn affecting the participation rate. The mistake was corrected in the follow-up invitation letter, and post-hoc t-test revealed no significant difference in time since loss at study start (i.e. October 15, 2016) between participants and non-participants (p=.79). Fifth, the lack of a validated measure of SED is a limitation to this study shared with other quantitative research of SED. However, the present measure was content validated by experts and piloted among bereaved with follow-up interviews, to ensure the validity of the survey (Kamp et al., Submitted). In addition, the first author reviewed all responses and contacted participants in case of discrepancies or incomplete responses of the SED survey adding to the validity of the present SED survey.

Conclusions and Future Directions

The present study is to our knowledge the largest study conducted with the explicit purpose of exploring associations between pre-disposing factors and SED, shedding light on several new associations not studied before in relation to SED. A little more than half of the sample reported at least one SED of their deceased spouse, and a strong pre-disposing factor was a history of SED related to other bereavements (e.g. child, parent). Furthermore, SED were significantly more likely to occur to people reporting a history of interpersonal trauma, a high level of pre-death emotional closeness with the bereaved and a stronger religious/spiritual worldview (regardless of the content). How these results should be interpreted in relation to theoretical conceptualizations of SED is still up for debate. Although the present study may be interpreted as indicating that SED are interpersonally meaningful experiences, for example within an attachment or CB perspective, the present study also points to the relevance of looking beyond theories of SED, such as theories on trauma and dissociation. Future research should consider including additional pre-disposing factors, such as attachment style, history of other anomalous or hallucinatory experiences (e.g. hearing voices as a child), dissociation and personality traits. In addition, it would be relevant to replicate the study using a more nuanced assessment of the pre-death relationship closeness and different meaning-making frameworks, ideally using a prospective design.

Notably, as we found no association with registered neurodegenerative or psychiatric diseases, our results support the literature cautioning against assuming SED to be a sign of mental health issues (Hayes & Leudar, 2016; Kamp et al., in press; Keen et al., 2013a; Sabucedo et al., 2020). It is important to normalize SED to avoid unnecessary distress due to concerns about one's mental health, which becomes even more apparent in the wake of the worldwide COVID-19 pandemic, which have left many to grieve under unfamiliar and restricted circumstances (Carr et al., 2020; Wallace et al., 2020)

Future research may explore associations to neurological, sensory and mental functioning assessed with more finely-grained measures than used in this study, as well as comparing the

experience of SED directly with hallucinatory experiences outside of bereavement, such as in people diagnosed with Parkinson's Disease or PTSD.

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Declaration of Interest Statement

The authors report no conflict of interest

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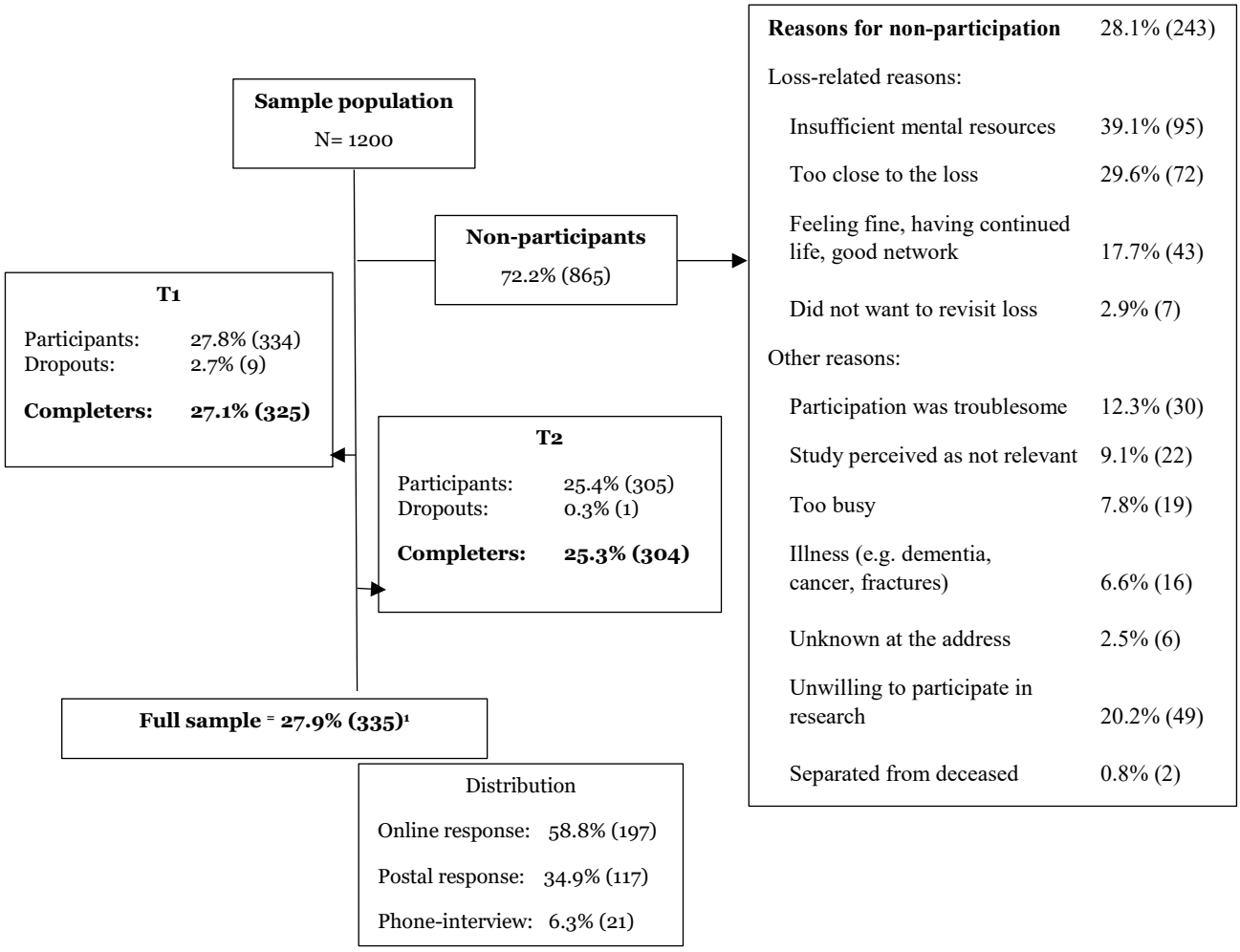
Flowchart of participation



Note: Data presented as %(N); T1=6-10 months post loss; T2=18-20 months post loss. [1]Participants responding to at least one questionnaire; 32 participants responded only at T1; 10 participants responded only at T2; 293 participants responded at both T1 & T2.

Table 1

Study Sample characteristics

Variable		**N=310**
Age		70.05 (8.39)
Income (in thousands; DKK)		272.45 (138.3)
Length of marriage		40.31 (14.90)
Gender	Men	34.8% (108)
Mental health diagnosis[3]		6.5% (20)
Education	≤2 years	60.0% (186)
	3-4 years	26.8% (85)
	≥5 years	11.3% (35)
Employment	Retired	75.5% (234)
	Working	23.5% (73)
	Sick-leave/unemployed	0.6% (2)
Cause of death	Long-term illness (i.e. months/years)	69.0% (214)
	Short-term illness (i.e. weeks)	11.9% (36)
	Sudden illness (e.g. heart attack)	13.2% (41)
	Accident	1.0% (3)
	Suicide	1.3% (4)
	Other (e.g. substance misuse)	1.6% (5)

Note: Results are reported as % (N). Numbers may not add up to 100% due to missing data

Table 2. *Study population characteristics and comparison between participants and non-participants*

Variable	Study population N=1200	Participants N=335	Non-participants N=865	p	Effect size[1]
Age	72.37 (8.31)	70.15 (8.35)	73.22 (8.14)	**<.001**	0.37
Income (in thousands; DKK)	233.56 (146.4)	272.89 (141.07)	218.32 (145.70)	**<.001**	0.38
Length of marriage	43.05 (15.27)	40.62 (14.79)	44.00 (15.36)	**<.001**	0.22
Gender Men	30.42% (365)	34.9% (117)	28.7% (248)	**.035**	0.06
Mental health diagnosis	13.9% (167)	7.2% (24)	16.5% (143)	**<.001**	0.12
Neurological diagnosis[3]	5% (60)	1.5% (5)	6.4% (55)	**<.001**	0.10
Psychiatric diagnosis[4]	7.5% (90)	3.9% (13)	8.9% (77)	**.003**	0.09
Other Diagnosis[5]	3.6% (43)	2.1% (7)	4.2% (36)	.083	0.05

Note: Results are reported as % (N). Significant differences are in bold. [1]Cohen's *d*: 0.20=small, 0.50=medium, 0.80=large; Cramer's V (df=1): 0.10=small, 0.30=medium, 0.50=large (Cohen, 1988). [3] Parkinson's disease, epilepsy, dementia [4] Current or previous diagnosis of depression, anxiety, stress, post-traumatic stress disorder, bipolar disorder, schizophrenia, psychosis [5]Head Injury, Intellectual disability.

Table 3. *Hierarchical logistic regression analysis of pre-disposing factors associated with sensory and quasi-sensory experiences of the deceased (SED)*

		Model 1[1]				Model 2[2]				Model 3[3]			
Variables (reference category)		OR	SE	95% CI	p	OR	SE	95% CI	P	OR	SE	95% CI	P
Gender	Women	1.70	0.43	1.03-2.80	**.037**	1.71	0.44	1.04-2.83	**.036**	1.42	0.5	0.71-2.82	.317
Age	65-<75	0.94	0.35	0.45-1.93	.856	0.93	0.34	0.45-1.92	.838	1.04	0.55	0.37-2.91	940
(50-<65)	75-85	0.97	0.39	0.43-2.13	.937	0.96	0.39	0.43-2.12	.921	1.63	0.93	0.53-4-98	.393
Income[4]	Lowest	1.25	0.83	0.34-4.62	.737	1.24	0.83	0.34-4.61	.740	1.7	1.67	0.25-11.62	.589
(High)	Low	2.17	0.69	1.16-4.06	**.015**	2.19	0.70	1.17-4.10	**.014**	2.74	1.28	1.1-6.85	**.031**
	Medium	1.81	0.62	0.94-3.53	.077	1.83	0.62	0.94-3.56	.077	4.57	2.26	1.74-12.04	**.002**
	Highest	0.77	0.92	0.07-8.08	.827	0.77	0.93	0.07-8.12	.831	4.74	6.56	0.32-71.33	.261
Length of marriage	0-11	4.04	2.78	1.05-15.56	**.042**	4.15	2.91	1.05-16.39	**.042**	3.92	3.77	0.59-25.83	.156
(>11-25)	>25-42	1.65	0.66	0.75-3.63	.217	1.64	0.67	0.74-3.65	.221	1.84	1.03	0.61-5.49	.276
	>42-60	1.39	0.59	0.60-3.22	.441	1.396	0.60	0.60-3.25	.438	1.59	0.95	0.49-5.15	443
	>60-70	0.92	0.71	0.21-4.13	.917	0.92	0.71	0.20-4.14	.914	1.44	1.83	0.12-17.31	.772
Stress	+ diagnose[5]					0.82	0.61	0.19-3.52	.789				
Anxiety	+ diagnose[5]					0.87	1.3	0.05-15.99	.927				
Depression	+ diagnose[5]					1.10	1.66	0.06-21.16	.949				
Education[6]	3-4 years									1.19	0.46	0.55-2.55	.655
≤2 years	≥5 years									0.70	0.4	0.23-2.14	.532
Strength of religious/spiritual worldview										1.12	0.06	1.01-1.25	**.040**
+ Interpersonal trauma										5.8	3.88	1.56-21.52	**.009**
Pre-death closeness (Medium)[7]	High									2.76	1.04	1.32-5.79	**.007**
+ Previous SED										4.72	1.7	2.34-9.56	**<.001**
Constant		.39	.23	.13-1.21	.103	.23	.35	0.01-4.58	.334	0.03	0.03	0.01-0.16	<.001

Note: Significant values are in bold. [1]Hosmer and Lemeshow's ((HL's) goodness-of-fit: χ^3 (9)=3.88, p=.919, groups=11, N=310. [2]HL's goodness-of-fit: $\chi^3(11)$=4.31, p=.960, groups=14, N=310. Variables omitted because of too few observations = bipolar disorder, post-traumatic stress disorder, schizophrenia,

psychosis, dementia, Parkinson's disease, epilepsy, head injury, diagnosed hallucinations. [3]HL's goodness-of-fit: χ^3 (8)=5.25, p=.731, groups=10, N=223. [4] Lowest=-200.000-130,000 DKK; Low=>130,000-230,000 DKK; medium= >230,000-330,000 DKK; High =>330,000-730,000 DKK; highest = >730,000-3,700,000 DKK. [5] Current and/or previous diagnosis [6]Years of further education; [7]Recoded from five-point scale to 'No closeness'=0 (omitted from analysis because of too few observations), 'Medium closeness'=1-3; 'High closeness'=4.