CLINICAL RESEARCH ARTICLE

Traumatic and stressful life events in hoarding: the role of loss and deprivation

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ABSTRACT

Background: Although past research shows hoarding to be associated with stressful life events involving loss and/or deprivation, the temporal relationship between the onset of symptoms and these events is not completely clear.

Objectives: In a cross-sectional online study, we examined the relationship between the number of events involving loss or deprivation before/simultaneously vs. after the onset of hoarding and various hoarding-related beliefs, such as emotional attachment to possessions, and symptom severity. Further, we examined whether perceived social support moderated the influence of these events on emotional attachment to objects.

Methods: One hundred seventeen subjects with hoarding problems responded to a series of instruments to assess the history and timing of traumatic and stressful loss and/or deprivation in relation to the onset of hoarding, and self-report tools evaluating the severity of hoarding, beliefs/motivations, depression, anxiety, general distress, and perceived social support.

Results: The number of events involving loss or deprivation occurring before hoarding was related to increased emotional attachment to possessions, whereas events happening after the onset of hoarding were related to increased concerns about memory as drivers of hoarding symptoms. Events happening before hoarding did not interact with perceived social support to influence emotional attachment to objects.

Conclusions: The timing of traumatic and stressful life events related to loss and deprivation is associated with different hoarding phenotypes, including beliefs/motivations for hoarding. If confirmed by longitudinal studies, these findings may be relevant for therapeutic and preventive measures.

HIGHLIGHTS
- The number of events related to loss and deprivation before hoarding was related to increased emotional attachment.
- The number of events related to loss and deprivation after hoarding was related to increased concerns about memory.

Eventos vitales estresantes y traumáticos en la Acumulación: el rol de la pérdida y la deprivación

Antecedentes: Aunque investigaciones pasadas han mostrado que la acumulación se asocia con eventos vitales estresantes que incluyen pérdidas y/o deprivación, la relación temporal entre el inicio de los síntomas y estos eventos no están completamente claras.

Objetivo: En un estudio transversal realizado online, examinamos la relación entre el número de eventos que incluían perdida o deprivación en forma previa/simultánea versus posterior al inicio de la acumulación y variadas creencias relacionadas con la acumulación, tales como el apego emocional a las posesiones y la severidad sintomática. Además, examinamos si es que el apoyo social percibido moderaba la influencia de estos eventos en el apego emocional a los objetos.

Métodos: Ciento diecisiete sujetos con problemas de acumulación respondieron a una serie de instrumentos para evaluar la historia y temporalidad de eventos traumáticos y estresantes de pérdida y/o deprivación en relación al inicio de la acumulación, y herramientas de auto-reporte que evaluaban la severidad de la acumulación, motivaciones/creencias, depresión, ansiedad, malestar general, y apoyo social percibido.

Resultados: El número de eventos que incluían pérdida o deprivación que ocurrieron antes de la acumulación fueron relacionados con un aumento del apego emocional a las posesiones, mientras que los eventos que ocurrieron posteriores al inicio de la acumulación se relacionaron con una mayor preocupación sobre la memoria como potenciador de los síntomas de acumulación. Los eventos que ocurrieron antes de la acumulación no interactuaron con el apoyo social percibido para influir en el apego emocional a los objetos.

Conclusiones: La temporalidad de los eventos vitales traumáticos y estresantes relacionados con la pérdida y la deprivación está asociada con diferentes fenotipos de acumulación, incluyendo las motivaciones/creencias por las cuales se acumula. Si estos hallazgos son confirmados por estudios longitudinales, pueden ser relevantes para medidas terapéuticas y de prevención.

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囤积中的创伤性和压力性生活事件: 损失和剥夺的作用

背景: 虽然以往研究表明囤积与包括损失和/或剥夺的压力性生活事件有关, 症状开始与这些事件之间的时间关系尚不完全清楚。

目的: 在一项横断面在线研究中, 我们考查了囤积开始之前/之时与之后涉及损失或剥夺的事件数量与各种囤积相关信念 (例如对物品情感依恋和症状严重程度) 之间的关系。此外, 我们考查了领悟社会支持是否会调节这些事件对物品情感依恋的影响。

方法: 117 名有囤积问题的被试回答一系列评估与囤积开始相关的创伤性和压力性损失和/或剥夺的历史和时间的工具, 以及评估囤积严重程度, 信念/动机, 抑郁, 焦虑, 一般精神痛苦和领悟社会支持的自我报告工具。

结果: 在囤积之前发生的涉及损失或剥夺的事件数量与对物品情感依恋增加相关, 而在囤积开始后发生的事件与作为囤积症状驱动因素的对记忆的担忧增加有关。在囤积之前发生的事件不会与领悟社会支持交互影响对物品情感依恋。

结论: 与损失和剥夺相关的创伤性和压力性生活事件发生的时间与不同的囤积表型有关, 包括囤积的信念/动机。如果经纵向研究证实, 这些发现可能与治疗和预防措施有关。

1. Introduction

Hoarding Disorder is a complex and yet common psychiatric disorder, affecting up to 2.5% of the general population (Postlethwaite, Kellett, & Mataix-Cols, 2019). It is characterized by (1) difficult discarding possessions, regardless of their real or perceived value, (2) clutter that interferes with one's ability to use one's home and, in the majority of cases, (3) excessive acquisition behaviour including buying, stealing, or obtaining things for free (APA, 2013). Once thought to be simply a symptom of obsessive-compulsive personality disorder (OCPD) or obsessive-compulsive disorder (OCD) (APA, 2000), hoarding gained the status of a standalone psychiatric disorder in DSM-5 (APA, 2013). A similar approach was adopted in ICD-11 (Stein et al., 2016). While twin studies have demonstrated a strong genetic component associated with hoarding disorder, they have also highlighted the potential importance of non-shared environmental factors (Iervolino et al., 2009), including, among others, traumatic and other stressful life events (SLEs).

In fact, an increased prevalence of traumatic and SLEs has also been reported in clinical samples of people with hoarding. For instance, Landau et al. (2011) found that 52% of hoarding individuals linked the onset of hoarding difficulties to stressful life circumstances. Nevertheless, these studies did not assess the frequency of SLEs after the onset of hoarding (Grisham, Frost, Steketee, Kim, & Hood, 2006; Landau et al., 2011), simply focused on their lifetime rates (Cromer, Schmidt, & Murphy, 2007; Hartl et al., 2004) or collapsed precipitating and maintaining factors into one single variable (Tolin, Meunier, Frost, & Steketee, 2010). Thus, most studies do not allow one to establish whether stressful life circumstances have a greater role precipitating or simply maintaining hoarding. In one of the few studies that attempted to control for onset in relation to hoarding, Przeworski, Cain, and Dunbeck (2014) found severity of hoarding to be positively associated with the number of SLEs prior to (but not after) symptom onset, thus supporting the aetiological role of 'cumulative trauma' in hoarding.

Another debate in the literature of trauma and stressful life circumstances in hoarding is the detrimental role of particular types of events as compared to others. A few studies have supported an over representation of 'interpersonal' traumatic or SLEs, such as sexual and physical violence, among individuals with hoarding (e.g. Tolin et al., 2010). However, differences between interpersonal and non-interpersonal (i.e. accidents, illness, natural disasters) traumatic or SLEs are not always obvious, i.e. what is considered to be non-interpersonal for some individuals (e.g. accidents or illnesses) may be considered as interpersonal for others depending on the individual's perception of the role played by third parties (Ojserkis, McKay, & Kim, 2020). Perhaps an idiographic approach, where the relationship between SLEs and hoarding is more obvious/understandable, may provide further clues into the problem of trauma and SLEs in hoarding. Given the similarities between themes of loss and deprivation and the fears of individuals with hoarding disorder (APA, 2013), the role of material/emotional loss or deprivation (known for their detrimental effect on people mental health and association with a number of mental disorders, e.g. McKay et al. (2021)) appears particularly relevant. Yet, this relationship is relatively unexplored (Destrée et al., 2020; Landau et al., 2011). Thus, for the reasons exposed above, this study will focus specifically on events involving loss or deprivation.

A number of studies have tested different constructs that seem to moderate the relationship between stress and hoarding symptoms, such as emotional intolerance (Timpano, Keough, Traeger, & Schmidt, 2011), aggression (Mathes et al., 2018), different saving cognitions (Chou et al., 2018), attachment insecurity (Kehoe & Egan, 2019) and emotional attachment (Kehoe & Egan, 2019). In general, these studies suggest that certain circumstances (particularly 'interpersonal' (Mathes et al., 2018) or childhood trauma) (Kehoe & Egan, 2019) can result in a range of situations known to decrease relatedness to other people (such as aggressive impulses (Mathes et al., 2018) and attachment insecurity (Kehoe & Egan, 2019)) and in a compensatory emotional

attachment to possessions and hoarding (Yap & Grisham, 2020). Nevertheless, it is unclear whether the decreased perceived social support that is associated with loss and deprivation may actually be responsible for decrease interpersonal relatedness and, as a consequence, increase emotional attachment to and hoarding of possessions. Yet, previous studies suggested that increased social support promote positive behavioural outcomes through its promotion of socio-cognitive competencies, which in turn underlie attachment behaviours (De Guzman, Jung, & Do, 2012).

Thus, based on the association between early traumatic and SLEs, greater emotional attachment to possessions (Yap & Grisham, 2020), and more severe post-traumatic psychopathology (Dunn, Nishimi, Powers, & Bradley, 2017; Hayashi et al., 2015), and on the role that decreased interpersonal relationships seems to have on greater object attachment (Yap & Grisham, 2020), a number of predictions were made. Firstly, we hypothesized that pre-hoarding traumatic and stressful events involving loss or deprivation would predict greater severity of hoarding. Secondly, we postulated that loss or deprivation before the onset of hoarding would be predicted by greater emotional attachment to possessions, increased severity of hoarding, greater severity of comorbid psychiatric symptoms, and lower perceived social support. Thirdly, we hypothesized that loss or deprivation occurring before the onset of hoarding would interact with lower perceived social support to predict greater emotional attachment to possessions.

2. Methods

2.1. Subjects

For this study, individuals with hoarding problems were recruited through advertisements in social media (i.e. Facebook, Instagram and Reddit), internet forums and support groups for hoarding. A snowball sampling method (a chain-referral technique that gathers data through existing social networks) was adopted. Inclusion criteria comprised 1) Problematic hoarding behaviours according to the participant or to his or her significant others, as confirmed by Saving Inventory-Revised (SI-R) total score > or = 39 (Kellman-McFarlane et al., 2019), 2) age above 18 years old and 3) being able to read and fill out forms. Out of 223 research subjects that started the research protocol, 117 were eventually included, as the remaining subjects did not complete the assessment.

2.2. Ethics statement

The Monash University Human Research Ethics Committee (MUHREC) approved the research protocol. Each volunteer agreed with his or her own participation after reading the explanatory statement and signing eletronically.

2.3. Assessment

Data were collected using Qualtrics. This survey took approximately 45 minutes to be completed; however, participants were allowed to save and return to their unfinished survey if required. The assessment battery comprised a sociodemographic questionnaire, instruments to assess for the history and timing of trauma and SLEs in relation to the onset of hoarding, and self-report tools to evaluate the severity of hoarding, hoarding beliefs/motivations, depression, anxiety, general distress and perceived social support.

2.3.1. Obsessive-compulsive and related disorders traumatic and stressful life events scale, hoarding version (OTRAS-HV)

The OTRAS-SV was specifically developed for this study. The OTRAS-SV is a self-report inventory that investigates whether the respondent has been exposed to ten traumatic or SLEs related to loss and/or deprivation before/simultaneously (Cronbach's alpha = .754) or after (Croanbach's alpha = .746) the onset of his or her hoarding symptoms; The inclusion of specific traumatic or stressful circumstances was based on a literature review and situations thought to be particularly stressful for individuals with hoarding problems. The items were grouped into five clusters with 2 items each, namely (1) termination of personal relationships/death of loved ones (Destrée et al., 2020; Tolin et al., 2010), (2) forced subtraction of possessions (Hartl et al., 2004; Landau et al., 2011; Samuels et al., 2008), (3) material deprivation (Frost & Gross, 1993; Landau et al., 2011), (4) failure to meet standards (Hartl et al., 2004; Samuels et al., 2008) and (5) loss of personal items (Timpano et al., 2011). Only items described as significantly traumatic or stressful were rated as present.

2.3.2. Saving inventory-revised (SI-R)

The SI-R is a 23-item self-report scale used to measure the severity of hoarding symptoms (Frost, Steketee, & Grisham, 2004). It provides scores on three different dimensions, namely difficult discarding, clutter and excessive acquisition. The original SI-R scale has shown acceptable psychometric properties (including good internal consistency, test-retest reliabilities, convergent and divergent validities) (Frost et al., 2004; Tolin, Frost, & Steketee, 2010) and has been translated and validated in multiple cultures (e.g. Fontenelle et al. (2010)). Total scores vary from 0 to 92. Recently, a score of 39 was proposed as the optimal cut-off to differentiate people with problematic from non-problematic hoarding symptoms (Kellman-McFarlane et al., 2019).

2.3.3. Saving cognition inventory (SCI)

The SCI is a 24-item self-report scale used to assess the beliefs/motivations underlying hoarding symptoms

(Steketee, Frost, & Kyrios, 2003). It provides scores on four different dimensions, namely, emotional attachment (e.g. 'This possession provides me with emotional comfort''), concerns about memory (e.g. 'Saving this means I don't have to rely on my memory'), control over possessions (e.g. 'I like to maintain sole control over my things'), and responsibility towards possessions (e.g. 'I am responsible for finding a use for this possession'). The SCI has demonstrated adequate psychometric properties, including internal consistency, and convergent and discriminant validities (Steketee et al., 2003). Total scores range from 24 to 168.

2.3.4. Multidimensional scale of perceived social support (MSPSS)

The MSPSS is a 12-item self-report scale that measures the amount of social support an individual perceives to receive from three different sources i.e. friends ('I can count on my friends when things go wrong'), family ('My family really tries to help me') and significant other/special person ('There is a special person who is around when I am in need'). Each source is associated with a specific sub-score (Zimet, Powell, Farley, Werkman, & Berkoff, 1990). The original version of the MSPSS yielded a three-factor structure, high internal consistency, stability and divergent validity (Zimet et al., 1990). The MSPSS has been translated and validated in multiple cultures (Dambi et al., 2018). Its total scores range from 12 to 84 – the higher the score, the greater the amount of available perceived social support.

2.3.5. Depression anxiety stress 21 (DASS 21)

The DASS 21 is a 21-item self-report instrument based on the tripartite model proposed by Clark and Watson and on the 42-item original scale (DASS-42) (Henry & Crawford, 2005). The DASS 21 allows one to assess three different dimensions, namely (1) depression (e.g. sadness, anhedonia, lack of initiative, low self-esteem, among others); (2) anxiety (e.g. worrying, panic, fear, and somatic symptoms); and (3) stress (e.g. irritability, impatience, tension, and other symptoms consistent with persistent arousal) (Henry & Crawford, 2005). The DASS 21 has shown good psychometric features across different settings, has been translated to different languages and was validated in different cultures (Bibi, Lin, Zhang, & Margraf, 2020). Its scores range from 0 to 63 (0 to 21 for each subscale).

2.4. Data analysis plan

Our first hypothesis was tested with a linear regression, as the dependent variable (SI-R scores) followed a normal distribution as attested by inspection of the histogram and appropriate tests. Age, age at onset, and number of events before and after hoarding were the independent variables. The statistical level of significance was .05. Analyses were performed with SPSS 21.

To test our second hypothesis, a Poisson regression was planned, as the dependent variable (the number of traumatic and SLEs before hoarding) was a count variable and therefore expected to follow a Poisson distribution. Based on the existing literature (see above), age, age at onset, SI-R subscores, SCI subscores, total DASS 21, and MSPSS and were entered as independent variables in this Poisson regression.

The second hypothesis was further tested using a second Poisson regression, but this time with the number of traumatic and stressful life circumstances after hoarding as a dependent variable. This time, the Poisson was planned using the same set of independent variables but also with traumatic and SLEs before hoarding to check if some of these variables were associated with the number of traumatic and SLEs after hoarding.

Finally, to answer the third hypothesis, a linear regression was planned, as the new dependent variable (in the case, SCI scores on emotional attachment) was normally distributed according to inspection of histogram and appropriate tests. This latter model tested the main effects of the number of traumatic and SLEs occurring before the onset of hoarding, the main effects of the MSPSS, and their statistical interaction.

3. Results

3.1. Description of the sample

A total of 117 individuals have completed data collection. Most individuals were originally from the US (n = 60; 53.1%), Australia (n = 25; 22.3%) or the UK (n = 17; 16.2%). Subjects' mean age was 48.38 (12.74) years. In terms of gender, 105 individuals (90.5%) were female, seven (6.0%) were males, two (1.7%) were non-binary, one (.9%) stated a gender identity that wasn't listed, and one (.9%) preferred not to say. The majority of subjects (n = 48; 41.4%) were married or de facto, 45 (38.8%) were single, 21 (18.1%) were divorced or separated, and two (1.7%) were widowed. In terms of education, 33 (28.7%) had bachelor's degree, 28 (24.3%) had secondary/high school degree, 24 (20.5%) had master's degree, four (3.4%) had PhD degrees, and 26 (22.6%) some other educational level.

The subjects' mean age at the onset of hoarding symptoms and their associated interference/distress were 20.25 (14.16) and 30.19 (15.72) years, respectively. In the majority of cases, subjects lived with their partners (n = 52; 44.8%), alone (n = 39; 33.3%) and, in the minority of cases, in some other arrangement (n = 25; 21.6%). Forty-seven subjects (41.0%) reported having sought treatment for their hoarding behaviours in the past (the mean age at which treatment was sought was 41.76 [SD = 15.74] years). Their mean severity of hoarding according to the SI-R was 76.54 (SD = 14.17). At least 50% of the sample hoarded old clothes (76.9%), books (n = 82; 70%), old notes (n = 72; 61.5%), letters (n = 70;

59.8%), pens (*n* = 68; 58.1%) and video tapes, cassettes or CDs (*n* = 60; 51.3%). A series of Spearman's correlations between the variables of interest were performed and can be visualized in the Table A1 in the appendix.

3.2. Traumatic and stressful life events

According to the OTRAS-HV, the median number of events involving loss or deprivation occurring before or concomitantly to the onset of hoarding was 3.0 [minimum of 0 and maximum of 16 different events], whereas the median number of events involving loss or deprivation taking place after the onset of hoarding was 1.0 [minimum of 0 and maximum of 10 different events]. Further, in 79 cases (67.5%), subjects reported at least one traumatic or SLEs happening before or concomitantly with the onset of hoarding symptoms, whereas in 63 cases (53.8%), at least one traumatic or SLEs happened after the onset of hoarding symptoms.

A linear regression was performed to test whether pre-hoarding traumatic and stressful life circumstances predicted increased severity of hoarding symptoms independently from age, age at onset, and post-hoarding trauma/stress. Age at the onset of hoarding and current age were added to the model to parse out the effects of the developmental period over the timing of traumatic and stressful events as they may impact (theoretically) the number of pre- and post-hoarding traumatic and stressful events. As can be seen in Table 1, only age (but not the number of traumatic and stressful life circumstances before the onset of hoarding) predicted the severity of hoarding.

As portrayed in Table 2, a Poisson regression was performed and demonstrated a number of predictors of the number of stressful events happening before or concomitantly to hoarding symptoms, namely (1) greater number of traumatic and stressful events occurring after hoarding, (2) increased emotional attachment to possessions, (3) decreased scores on concerns about memory and (4) lower perceived social support. The model also showed that the effect of increased age of onset on the number of stressful events happening before or concomitantly to hoarding symptoms approached significance.

As seen in Table 3, the second Poisson regression showed the following predictors of the number of traumatic and SLEs after the onset of hoarding: (1) lower age at onset, (2) number of traumatic and SLEs happening before the onset of hoarding, (3) decreased concerns about control and (4) increased concerns about memory. The effects of greater

age and responsibility over possessions on the number of traumatic and SLEs after the onset of hoarding approached significance. Finally, as seen in Table 4, a model was unable to confirm any interaction between the number of traumatic and SLEs and perceived social support (adjusted R2 = .05; F (3,99) = 2.80; *p* = .04).

4. Discussion

In this online cross-sectional study of self-identified hoarding problems, we could confirm part of our hypothesis regarding trauma or SLEs related to loss and/or deprivation. Although pre-hoarding traumatic and SLEs did not predict increased severity of hoarding symptoms, we demonstrated that the number of events happening *before* hoarding were predicted by increased emotional attachment to possessions, but also by decreased scores on concerns about memory, greater number of later traumatic and SLEs, and lower perceived social support. In addition, loss and/or deprivation occurring *after* hoarding were predicted by increased concerns about memory, decreased concerns about control, and traumatic and SLEs *before* hoarding. As expected, lower age at onset predicted more events after the onset of hoarding.

The fact that the number of proximal vs. distal traumatic and SLEs were predicted by different hoarding-related beliefs/motivations can be interpreted in different ways. For instance, whereas early trauma and SLEs may preferentially affect attachment (as compared to memory) brain mechanisms, more recent trauma and SLEs may determine greater memory than attachment problems. Despite the fact that loss and deprivation occurring before the onset of hoarding are not necessarily indicative of 'early' SLEs, previous studies suggest that stressful events occurring earlier in life (e.g. in child and adolescent years) can have singular repercussions on neurobiological systems that may be implicated in attachment regulation, e.g. the HPA axis (Gerritsen et al., 2010; Kidd, Hamer, & Steptoe, 2013) There is also epidemiological evidence suggesting that middle-aged women with a greater number of recent SLEs demonstrate memory decline over a decade later (Munro et al., 2019).

We found that trauma and SLEs before and after the onset of hoarding were predicted by one another. This finding dovetails with a number of studies on traumatic and SLEs of different types, such as sexual abuse (Walker, Freud, Ellis, Fraine, & Wilson, 2019), and cross-national data from the *World Mental Health Survey Consortium* showing that exposure to interpersonal violence had the

Table 1. Results of the Linear Regression with total Saving Inventory Revised as the as the dependent variable.

	Unst.		Std.			Collinearity Statistics	
	B	Std Error	B	t	Sig.	Tolerance	VIF
(Constant)	58.562	5.466		10.714	.000	58.562	5.466
Age (yrs)	**.389**	**.133**	**.347**	**2.919**	**.004**	**.389**	**.133**
Age at onset (yrs)	−.150	.109	−.168	−1.376	.172	−.150	.109
N stressful events (before)	.685	.456	.164	1.504	.136	.685	.456
N stressful events (after)	.770	.755	.115	1.021	.310	.770	.755

Table 2. Results of the Poisson Regression with number of trauma and stressful life events before hoarding as the dependent variable.

	Unst. B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	1.525	.6364	.277	2.772	5.740	1	.017
Age (yrs)	−.010	.0073	−.024	.005	1.761	1	.184
Age at onset (yrs)	.009	.0054	−.001	.020	2.965	1	.085
N stressful events (after)	**.173**	**.0296**	**.115**	**.231**	**34.107**	**1**	**<.001**
SI-R Clutter	.017	.0130	−.009	.042	1.652	1	.199
SI-R Dif_Discarding	−.024	.0209	−.064	.017	1.276	1	.259
SI-R Excessive Acquisition	−.009	.0192	−.047	.029	.221	1	.638
SCI Emotional Attachment	**.011**	**.0055**	**.000**	**.022**	**4.193**	**1**	**.041**
SCI Control	.004	.0139	−.023	.031	.083	1	.773
SCI Responsibility	−.001	.0122	−.025	.022	.014	1	.905
SCI Memory	**−.030**	**.0110**	**−.051**	**−.008**	**7.382**	**1**	**.007**
DASS 21 total	.006	.0079	−.010	.021	.514	1	.473
MSPSS total	**−.009**	**.0047**	**−.018**	**<.001**	**3.895**	**1**	**.048**
(Scale)	1a						

SI-R = Saving Inventory-Revised; SCI = Saving Cognitions Inventory; DASS −21 = Depression Anxiety Stress Scale-21; Multidimensional Scale of Perceived Social Support (MSPSS).

Table 3. Results of the Poisson Regression with number of trauma and stressful life events after hoarding as the dependent variable.

	Unst.B	Std. Error	95% Wald Confidence Interval		Hypothesis Test		
			Lower	Upper	Wald Chi-Square	df	Sig.
(Intercept)	−1.53	.9389	−3.369	.312	2.650	1	.104
Age (yrs)	.020	.0104	.000	.041	3.728	1	.053
Age at onset (yrs)	**−.017**	**.0073**	**−.031**	**−.002**	**5.195**	**1**	**.023**
N stressful events (before)	**.131**	**.0261**	**.080**	**.182**	**25.096**	**1**	**<.001**
SI-R Clutter	−.010	.0178	−.044	.025	.285	1	.593
SI-R Difficult Discarding	−.046	.0282	−.102	.009	2.705	1	.100
SI-R Excessive Acquisition	.041	.0282	−.015	.096	2.088	1	.148
SCI Emotional Attachment	−.004	.0086	−.021	.012	.267	1	.605
SCI Control	**−.058**	**.0222**	**−.101**	**−.014**	**6.816**	**1**	**.009**
SCI Responsibility	.030	.0178	−.005	.065	2.742	1	.098
SCI Memory	**.048**	**.0162**	**.016**	**.080**	**8.729**	**1**	**.003**
DASS 21 total	.013	.0116	−.010	.036	1.295	1	.255
MSPSS total	.008	.0067	−.005	.021	1.433	1	.231
(Scale)	1a						

SI-R = Saving Inventory-Revised; SCI = Saving Cognitions Inventory; DASS −21 = Depression Anxiety Stress Scale-21; Multidimensional Scale of Perceived Social Support (MSPSS).

Table 4. Results of the linear regression with emotional attachment scores of the Saving Inventory Cognition.

	Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
SCI Emotional attachment	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
(Constant)	−1.162	1.629		−.714	.477		
MSPSS total	−.198	.105	−.206	−1.87	.064	.770	1.299
N trauma before	.665	.494	.144	1.346	.181	.816	1.226
MSPSS total x N trauma before	−.001	.031	−.004	−.030	.976	.665	1.503

MSPSS = Multidimensional Scale of Perceived Social Support.

strong associations with subsequent traumatic events (Benjet et al., 2016). However, in addition to being consistent with a lifetime (environmental) predisposition towards exhibiting trauma and SLEs, we believe that an alternative explanation should be entertained: whereas some trauma and SLEs *before* hoarding may be likely to have aetiological significance (e.g. death of loved ones), they may also increase the odds for further SLEs that may emerge as a consequence of hoarding (for instance, loss of personal items) (Timpano et al., 2011).

While lower perceived social support may be an obvious outcome of earlier loss and deprivation, we demonstrate that the opposite phenomenon may also hold true, i.e. lower perceived social support may also render individuals with problematic hoarding more vulnerable to experience a variety of stressful events related to loss and deprivation. Further, although the relationship between lower perceived social support and increased emotional attachment approached significance (thus suggesting that a clearer relationship between the two could be unveiled by an increased sample size), no interaction between the number of traumatic and SLEs before hoarding and perceived social support to predict emotional attachment was found. Therefore, it seems that a deleterious effect of SLEs on emotional attachment does not appear to be dependent on the levels of perceived social support.

Our study had a couple of limitations, including the predominance of middle-aged woman (which can affect generalizability), high attrition levels (which can affect representativeness), the use of self-report instruments (which are subject to memory bias) and a cross-sectional design. In relation to the later limitation, despite attempting to establish whether events happened before/simultaneously, or after hoarding symptoms, it did not allow one to establish direction of causality with certainty, e.g. rather than maintaining symptoms, events occurring after the onset of illness may actually maintain or result from symptoms (Timpano et al., 2011). Also, by embedding violent events on themes related to loss or deprivation, our study might have downplayed the role played by traumatic and SLEs unrelated to hoarding. Finally, most coefficients were quite small.

Despite its limitations, our study was able to demonstrate that the timing of events related to hoarding is associated with different hoarding features (particularly beliefs/motivations for hoarding behaviours). These results, which need to be confirmed by longitudinal assessments, may help establishing specific therapeutic and preventive measures for people with (or 'at risk for') hoarding. As the progression of clutter can lead to further losses, injuries, eviction (Rodriguez et al., 2012), or even fire (Iyer & Ball, 2010), it would be interesting to test if early intervention could avoid exposure to additional stressful events. Also, poorly informed family members or untrained practitioners may force decluttering measures, which can also be traumatic on its own. Providing treatment in an empathetic, sensible and well-paced way may prevent these traumatic situations from occurring. It would also be interesting to monitor populations at risk for hoarding (e.g. children of affected parents) who experience significant losses or deprivation, as they can experience further traumatic and stressful events in the long run.

Authorship contribution statement

All authors were responsible for the study conception/ design and the interpretation of findings; JM and JE were directly responsible for data acquisition; LF and LA performed analysis; LF drafted the first version of the paper, which was revised for intellectual content by JM, LA and JE; All authors approved the final version of the manuscript and agree to be accountable for all aspects of the work.

Data availability statement

Data from the present study is not freely available *as per* lack of ethical authorization from the relevant research committee.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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Appendix A1

Table A1. Matrix of Spearman's correlations between different variables investigated in the present study.

		N trauma after	Age	Age at onset	SI-R Clutter	SI-R Difficulty discarding	SI-R Excessive acquisition	SCI Emotional attachment	SCI Control	SCI Responsibility	SCI Memory	MSPSS	DASS
N trauma before	rho	.413**	.007	−.030	.206*	−.012	.118	.198*	.065	.120	.063	−.218*	.183
	p	<.001	.939	.747	.026	.899	.207	.036	.495	.207	.511	.027	.067
N trauma after	rho		−.129	−.241**	.056	.046	.183*	.263**	.053	.243**	.266**	−.033	.289**
	p		.174	.009	.546	.623	.048	.005	.580	.010	.005	.741	.003
Age	rho			.643**	.302**	.153	.180	.087	.263**	.068	.102	−.272**	−.110
	p			<.001	.001	.106	.056	.371	.006	.482	.292	.007	.285
Age at onset	rho				.075	.055	−.076	−.012	.061	−.018	−.068	−.133	−.167
	p				.427	.559	.417	.902	.528	.849	.481	.186	.099
SI-R C	rho					.482**	.522**	.202	.187*	.255**	.249**	−.398**	.370**
	p					<.001	<.001	.033	.050	.007	.008	<.001	<.001
SI-R DD	rho						.655**	.460	.279**	.512**	.407**	−.226*	.432**
	p						<.001	<.001	.003	<.001	<.001	.022	<.001
SI-R-EAq	rho							.301	.213*	.389**	.217*	−.143	.430**
	p							.001	.025	<.001	.022	.149	<.001
SCI-EAt	rho								.401**	.721**	.611**	−.243*	.369**
	p								<.001	<.001	<.001	.014	<.001
SCI-C	rho									.406**	.294**	−.192	.300**
	p									<.001	.002	.054	.003
SCI-R	rho										.611**	−.260**	.417**
	p										<.001	.008	<.001
SCI-M	rho											−.316**	.362**
	p											.001	<.001
MSPSS	rho												−.360**
	p												<.001

SI-R = Saving Inventory-Revised, Clutter; SCI = Saving Cognitions Inventory, Multidimensional Scale of Perceived Social Support (MSPSS); DASS −21 = Depression Anxiety Stress Scale-21.