Interpersonal attachment insecurity and emotional attachment to possessions partly mediate the relationship between childhood trauma and hoarding symptoms in a non-clinical sample

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ABSTRACT

Previous studies have indicated that childhood adversity and emotional attachment difficulties are common in hoarding disorder. The aim of this cross-sectional study was to explore whether current insecure attachment style, operationalized as insecure attachment to romantic partners, and emotional over-attachment to objects might be one mechanism linking the experience of early adversity to later hoarding tendencies. Data was gathered using an online survey from 463 adult participants; $n = 216$ scored in the clinical range for hoarding. The experience of two types of childhood trauma (emotional abuse and physical neglect) predicted higher levels of hoarding symptoms. Attachment anxiety and avoidance were positively correlated with hoarding symptoms and with emotional attachment to possessions. Current attachment insecurity and emotional attachment to objects partly mediated the relationship between childhood trauma and hoarding symptoms, after controlling for anxiety and depression. This study provides evidence for a novel way by which traumatic life events may influence hoarding symptomatology via attachment to significant others and object attachment. The findings are limited by the use of a cross-sectional design; however, they support the growing body of research which points to the importance of early adverse events and attachment difficulties in the aetiology of hoarding.

1. Introduction

Hoarding disorder (HD) is a characterised by the excessive acquisition of and failure to discard possessions, regardless of their actual worth (Frost & Hartl, 1996; Steketee & Frost, 2003). This is accompanied by extreme levels of clutter, resulting in significant levels of social and occupational impairment, including risk of fires, falls and unhealthy living conditions (Frost, Steketee, & Williams, 2000; Kim, Steketee, & Frost, 2001; Tolin, Frost, Steketee, Gray, & Fitch, 2008; Tolin, Frost, Steketee, & Fitch, 2008). Since the recognition of hoarding as a separate disorder to OCD (Mataix-Cols et al., 2010), there has been a considerable increase in research in this area. Studies have indicated that hoarding disorder may be more prevalent than OCD (Adam, Meinlschmidt, Gloster, & Lieb, 2012; Ruscio, Stein, Chiu, & Kessler, 2010), estimated to affect between 1.5% and 6% of the population (Iervolino et al., 2009; Nordsletten et al., 2013). Hoarding tends to take a more chronic course than OCD, with symptoms increasing rather than fluctuating over time (Ayers, Najmi, Mayes, & Dozier, 2015; Grisham & Barlow, 2005; Tolin, Meunier, Frost, & Steketee, 2010). A number of biopsychosocial risk factors for hoarding have been identified,

including genetic vulnerability (Iervolino et al., 2009; Lochner et al., 2005; Zilhão, Smit, Boomsma, & Cath, 2016), emotional coping style (de la Cruz et al., 2013; Timpano, Shaw, Cougle, & Fitch, 2014), sub-optimal attachment history (Chen et al., 2017; Frost, Kyrios, McCarthy, & Matthews, 2007; Kyrios et al., 2018; Neave, Tyson, McInnes, & Hamilton, 2016) and adverse life events, particularly in childhood (Cromer, Schmidt, & Murphy, 2007; Frost, Steketee, & Tolin, 2011; Landau et al., 2011; Samuels et al., 2008; Tolin et al., 2010).

Hoarding disorder is difficult to treat using psychological or pharmacological interventions (Timpano, Muroff, & Steketee, 2016). Current psychological therapies include hoarding-specific cognitive behavioural therapy (CBT), which targets thinking errors and behavioural aspects of clutter acquisition and discarding (Frost, Ruby, & Shuer, 2012), and other psychological factors such as indecisiveness and perfectionism (Frost, Steketee, & Greene, 2003). Although a number of studies have reported significant improvements following both individual (Ayers et al., 2014; Steketee, Frost, Tolin, Rasmussen, & Brown, 2010) and group-based CBT (Gilliam et al., 2011; Muroff et al., 2009), findings from a meta-analysis indicate that hoarding symptoms still tend to be in the clinical range following intervention (Tolin, Frost,

Steketee, & Muroff, 2015), suggesting that current approaches possibly fail to address some important contributing factors. In addition, hoarding is typified by low levels of apparent insight or distress at symptoms (Frost, Steketee, & Williams, 2000; Tolin et al., 2010), and high levels of resistance to change (Timpano et al., 2016; Wheaton, 2016). These aspects render hoarding less amenable to treatment success, particularly using CBT approaches that rely upon the conscious recognition and reframing of problematic thoughts and behaviours. Further research is therefore needed to better understand the psychological factors which contribute towards hoarding, and the types of psychological therapies that might prove most effective.

From a theoretical standpoint, the CBT model of hoarding is the most influential psychological model of hoarding to date (Frost & Hartl, 1996), and has guided the development of the evidence-based CBT programme (Frost et al., 2003; Tolin, Worden, Wootton, & Gilliam, 2017; Wheaton, 2016). The model describes hoarding as a multifaceted problem resulting from a combination of cognitive, emotional and behavioural difficulties, including information processing deficits, behavioural avoidance, faulty beliefs about possessions and emotional attachment difficulties (Frost & Hartl, 1996). Dysfunctional beliefs specific to hoarding include an exaggerated sense of responsibility for possessions, catastrophic thinking about the potential consequences of discarding, and a high need for control over possessions (Frost & Hartl, 1996; Steketee, Frost, & Kyrios, 2003). In addition, emotional over-attachment to objects appears to be one of the distinguishing features of hoarding disorder, with possessions often seen as extensions of the self (Dozier, Taylor, Castriotta, Mayes, & Ayers, 2017), and strongly associated with past memories (Frost & Steketee, 2010). Another attachment behaviour common in hoarding is the use of objects as "safety signals", providing comfort and security particularly at times of stress or uncertainty (Frost & Hartl, 1996; Frost, Hartl, Christian, & Williams, 1995).

It has been proposed that excessive emotional attachment to possessions may reflect a lack of emotional connectedness to other people (Grisham, Steketee, & Frost, 2008), and indeed there is consistent evidence for interpersonal attachment difficulties in hoarding from studies of both clinical (Chen et al., 2017; Grisham, Martyn, Kerin, Baldwin, & Norberg, 2018; Nedelisky & Steele, 2009) and non-clinical (Frost et al., 2007; Neave et al., 2016) cohorts. Higher hoarding symptoms have been associated with suboptimal early attachment patterns including lower maternal care (Chen et al., 2017), attachment uncertainty (Frost et al., 2007) and more anxious and avoidant maternal attachment (Neave et al., 2016); and with higher levels of attachment anxiety and avoidance in adult relationships (Frost et al., 2007; Grisham et al., 2018; Medard & Kellett, 2014). In addition, those who hoard are less likely to be in a long-term relationship (Neave et al., 2016; Nedelisky & Steele, 2009) and have difficulties forming and maintaining relationships with others (Tolin, Frost, & Steketee, 2012). It might very tentatively be suggested, that a history of insecure or suboptimal child-caregiver attachment may partly explain the development of emotional attachment to possessions as a way of deriving comfort, and that the hoarding of possessions may come to partly replace emotional relationships with others in adulthood. However, further research- preferably longitudinal- would be needed in order to substantiate this claim.

The experience of adverse life events both in childhood and adulthood appears to be another significant environmental risk factor for the development and maintenance of hoarding disorder (Cromer et al., 2007; Frost et al., 2011; Landau et al., 2011; Samuels et al., 2008; Tolin et al., 2010). Hoarding symptom onset or increase has been temporally linked to stressful and negative life events (Grisham, Frost, Steketee, Kim, & Hood, 2006), such as the loss of or change in close relationships, and the experience of interpersonal violence (Tolin et al., 2010). Childhood adversity that has been linked to the later development of hoarding includes excessive physical punishment before the age of 16 (Samuels et al., 2008), while a recent study found that hoarding

participants both with and without comorbid OCD reported significantly lower warmth in their family of origin (Kyrios et al., 2018). The authors suggest that these findings support an "augmented cognitive-behavioural model of hoarding", which recognises the impact of early developmental influences. It appears that there is a growing recognition within the hoarding research community that adverse events and early emotional experiences play an important role in the development of this difficulty.

The mechanisms by which adverse early life events contribute towards the development of hoarding are not well-understood, however. The association between the experience of multiple traumas and hoarding symptom severity supports the idea that cumulative rather than discrete negative events may be of particular significance (Cromer et al., 2007; Landau et al., 2011; Przeworski, Cain, & Dunbeck, 2014; Tolin et al., 2010). It has been suggested that hoarding may develop as a coping mechanism in response to a threatened sense of safety following traumatic or adverse events. In this sense having control over possessions may offer feelings of comfort and security (Frost et al., 2011), particularly in the absence of other types of emotional support. This proposal is supported by a consistent finding of similar or lower rates of PTSD in hoarding samples compared to other clinical groups, in spite of higher rates of stressful and traumatic life events (Ayers, Saxena, Golshan, & Wetherell, 2010; Frost et al., 2011; Landau et al., 2011; Pertusa et al., 2008).

Attachment difficulties may be another mechanism by which early trauma impacts the later development of hoarding tendencies. Previous studies with non-hoarding populations have found that adult attachment insecurity partly mediates the relationship between past trauma and current psychopathology, including symptoms of anxiety and depression (Bifulco et al., 2006; Fowler, Allen, Oldham, & Frueh, 2013). This possibility has not been explored to date in hoarding, however, as previously discussed, hoarding is associated with a higher rate of past and current attachment insecurity and relationship difficulties (Frost et al., 2007; Grisham et al., 2018; Medard & Kellett, 2014), as well as a high rate of traumatic life events (Landau et al., 2011; Tolin et al., 2010). In the context of hoarding, it might be suggested that a history of childhood trauma could contribute to the development of an insecure interpersonal attachment style, and that emotional attachment to physical possessions may then be more likely in the absence of adaptive relationships with significant others. A greater emotional attachment to possessions might then perpetuate a higher level of hoarding behaviours.

It should be acknowledged, however, that the experience of trauma in childhood is a well-established risk factor for a range of psychological disorders, including anxiety and depression (Hovens et al., 2010), psychosis (Freeman & Fowler, 2009), personality disorders (Battle et al., 2004; Johnson, Cohen, Brown, Smailes, & Bernstein, 1999) and OCD (Mathews, Kaur, & Stein, 2008), and is not specific to hoarding disorder. Previous studies have also linked childhood adversity to current psychological symptoms via the mediating influence of insecure adult attachment style (Bifulco et al., 2006; Fowler et al., 2013). In this sense, trauma and attachment may represent trans-diagnostic risk factors for psychopathology in the context of other neurobiological and environmental risk factors. In the case of hoarding there may be other important factors which contribute, and which are beyond the scope of this study, such as genetic and familial risk factors for hoarding and other compulsive disorders (Iervolino et al., 2009).

The current study sought to explore the putative mechanisms by which childhood trauma may influence the expression of hoarding tendencies in adulthood, via the mediating influence of emotional attachment difficulties in terms of both interpersonal attachment insecurity, and emotional attachment to possessions. A large, non-selected community sample of adults was recruited to take part in an online survey which included a number of standardised measures of hoarding symptoms and cognitions, childhood trauma, attachment and mood. Hoarding was captured on a dimensional scale, with symptoms

ranging from non-clinical, sub-clinical to clinical levels. This allowed for the inclusion of a greater range of hoarding behaviours, which may have more relevance to hoarding tendencies within the general population. In addition, given that the on-line nature of the study did not allow for a clinical diagnosis of hoarding disorder, exploring hoarding from a dimensional perspective avoided a reliance upon poorly-characterised clinical and non-clinical groups.

Based on previous research suggesting that childhood adversity is a risk factor for hoarding, it was first hypothesised that higher levels of childhood trauma would predict higher current levels of hoarding symptoms. Secondly, given that hoarding has been associated with high rates of interpersonal attachment difficulties, it was predicted that adult attachment insecurity would be associated with higher levels of hoarding tendencies. Finally, it was hypothesised that the impact of childhood trauma on hoarding symptoms would be mediated by a higher level of insecure interpersonal attachment, operationalized as insecure attachment to romantic partners, and a greater emotional attachment to possessions. An integrative model of hoarding is discussed, which incorporates early adverse experiences and attachment theory with the current CBT model.

2. Methods

2.1. Study design and procedure

The study received full ethical approval from the University Research Ethics Committee. A cross-sectional design was employed, and the data were collected using an online survey consisting of self-report measures hosted by the Survey Monkey portal (https://www.surveymonkey.com). The results reported in this study form part of a larger project which included additional questionnaires, however only those measures relevant to the current study are detailed here. Once participants had read the information leaflet and provided informed consent they continued onto the main part of the study, which took approximately 30–40 min to complete. Contact details of the researchers and for a number of free supportive organisations and counselling services were provided. The survey was accessible online for 12 weeks, and following deactivation of the survey the data were exported for onward statistical analyses.

2.2. Participants

A large, non-selected community sample of adult participants with a range of hoarding symptoms were recruited via press release, radio interviews by the principal investigators, and social media. The press release and interviews explained that the study aimed to explore psychological and emotional risk factors which might contribute to the development of hoarding tendencies across the population, with a particular emphasis on negative life events. A wide range of participants were sought for the study, reflective of the dimensional spectrum along which hoarding was captured. This included those who felt they may have a serious difficulty with hoarding, those who may have more minor difficulties with clutter or difficulty throwing things away, as well as people with no hoarding difficulties at all. The participants were not financially or otherwise compensated for taking part. In total, 877 people logged on to the study; 837 proceeded to the informed consent page and 463 (55.3%) completed the study. Only participants who completed all questionnaires were included in the final analysis.

2.3. Assessment measures

2.3.1. Saving Inventory-Revised (SI-R)

Hoarding symptoms were assessed using the SI-R (Frost, Steketee, & Grisham, 2004). This is a well-validated, 23-item self-report measure assessing hoarding symptoms across three factor-analytically derived subscales which reflect the key clinical features of hoarding: clutter,

difficulty discarding and excessive acquisition. Each item is rated using a five-point Likert scale ranging from (0) *None/Never* to (4) *Almost all/Very Often*, with higher total scores indicating more severe hoarding symptoms. A total score of ≥ 41 has been suggested as a cut-off score for clinically significant levels of hoarding (Muroff, Underwood, & Steketee, 2014). The SI-R has previously demonstrated high internal consistency for all subscales and good reliability (Frost et al., 2004). Cronbach's alpha for the total scale in the current study was 0.96.

2.3.2. Saving Cognitions Inventory (SCI)

Thoughts and beliefs related to hoarding were assessed using the SCI (Steketee et al., 2003). This questionnaire consists of 24 items loading onto four subscales: emotional attachment to possessions, memory for possessions, control over possessions and responsibility for possessions. Each item is rated on a Likert scale from (1) *Not at all* to (7) *Very much*. The SCI demonstrates good internal consistency (Steketee et al., 2003). In the current study Cronbach's alpha for the SCI total score (sum of all items) was 0.96; for the emotional attachment subscale (SCI-EA) it was 0.94.

2.3.3. Childhood Trauma Questionnaire (CTQ)

Retrospective reports of childhood abuse were measured using the CTQ (Bernstein & Fink, 1998). This measure consists of 28 items pertaining to physical abuse, sexual abuse, emotional abuse, emotional neglect and physical neglect. Participants rate the frequency with which they experienced these events in their childhood on a five-point Likert scale, ranging from (1) *Never true* to (5) *Often true*. Higher scores on each subscale reflect greater exposure to childhood trauma. The subscales of the CTQ have been shown to have high internal consistency and good test-retest reliability (Bernstein & Fink, 1998). Cronbach's alpha values for the five subscales in the current study were: emotional abuse $\alpha = 0.89$, physical abuse $\alpha = 0.86$, sexual abuse $\alpha = 0.93$, emotional neglect $\alpha = 0.90$, physical neglect $\alpha = 0.72$.

2.3.4. Adult Attachment Questionnaire (AAQ)

Adult attachment style was assessed using the AAQ (Simpson, Rholes, & Nelligan, 1992), a 17-item measure that asks individuals to indicate how they generally relate to romantic partners. Each item is rated on a seven-point Likert scale ranging from (1) *I strongly agree* to (7) *I strongly disagree*. Two orthogonal dimensions/scales underlie the AAQ: avoidance, which is the tendency to withdraw from intimacy and closeness in relationships; and ambivalence/anxiety, which is the tendency to have conflicting thoughts and feelings about whether a partner can be depended upon. Secure attachment is reflected in low scores on both dimensions (Simpson, Rholes, & Phillips, 1996). The two scales have been found to have high internal consistency and good reliability (Simpson et al., 1992). In the current study Cronbach's alpha for the avoidance scale was 0.86, for the anxiety scale was 0.83, and for the total scale was 0.87.

2.3.5. Hospital Anxiety and Depression Scale (HADS)

Symptoms of anxiety and depression were assessed using the HADS (Zigmond & Snaith, 1983), a widely-used 14-item measure. Each item is rated on a four-point Likert scale ranging from 0 to 3. Scores for the anxiety and depression subscales are derived by summing the 7 items for each scale. Higher scores suggest higher levels of anxiety or depression, and higher total scores are thought to reflect greater overall psychological distress (Zigmond & Snaith, 1983). Cronbach's alpha for the anxiety and depression subscales were 0.87 and 0.84 respectively, and 0.90 for the total scale.

2.4. Data screening and analysis

The data were first screened and cleaned to identify potential outliers and assess assumptions for the planned statistical analyses. As expected with a large dataset ($n > 200$), many of the variables violated

assumptions of normality based on the Kolmogorov-Smirnov statistic. However, the SI-R, SCI, HADS and AAQ had approximately symmetric distributions based on skewness and kurtosis values (less than ± 0.8; George & Mallery, 2016). The CTQ subscales were positively skewed, containing more low values. This can be expected in clinical research, given the underlying psychological constructs being measured (Pallant, 2013); for example, only approximately 20% of the population would be expected to have experienced childhood sexual or physical abuse (Briere & Elliott, 2003). Given that statistical inferences from large sample sizes tend to be robust to the effects of non-normally distributed variables (Hayes, 2017), and that issues can arise with the clinical interpretation of transformed variables (Feng et al., 2014), no transformations were made to the CTQ. Statistical analyses were conducted using IBM SPSS version 24, including descriptive statistics, Pearson's correlation and linear regression.

The main hypothesis was addressed using mediation analysis conducted with the PROCESS macro v3.0 for SPSS (Hayes, 2017). The model tested the indirect effect of childhood trauma (X) on hoarding symptoms (Y) via two serial mediators, assumed by the model to be causally linked: interpersonal attachment insecurity (M_1) and beliefs about emotional attachment to possessions (M_2). The total indirect effect of X on Y ($c - c'$) was divided into three indirect effects tested by the model: $X \rightarrow M_1 \rightarrow Y$, $X \rightarrow M_2 \rightarrow Y$ and $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$. A simplified schematic representation of the mediation model is provided in Fig. 1. Total HADS scores were included as a covariate of no interest to control for anxiety and depression levels. Direct and indirect effects were evaluated for statistical significance at $p < 0.05$, using 95% confidence intervals (CIs) established via bootstrapping techniques, with 5000 bootstrapped samples (Hayes, 2017). For the purposes of interpretation, bootstrapped CIs were considered statistically significant if they did *not* cross 0.

3. Results

3.1. Demographic and clinical characteristics

Of the 463 participants included in the final sample, the majority (84.2%) were female. Participants ranged in age from 18 to 75 years or older, with over two-thirds (69.1%) aged between 34 and 64 years. 87.3% of the sample were resident in Ireland; a minority lived in

Table 1
Demographic characteristics of the sample.

Variable	n	%
Gender (Female)	390	84.2
Age breakdown		
18–24	10	2.2
25–34	74	15.9
35–44	92	19.8
45–54	126	27.1
55–64	102	22.0
65–74	53	11.4
75 or older	6	1.3
Relationship status		
In a relationship	272	58.7%
Single	191	41.3%
Highest education level		
Secondary school or less	52	11.2%
College or university	244	52.7%
Postgraduate degree	157	33.9%
Trade/technical training	10	2.2%
Employment status		
Full time employment	216	46.7%
Part-time employment	75	16.2%
Caring for family	36	7.7%
Unemployed	34	7.3%
Full-time student	27	5.8%
Retired	75	16.2%
Alcohol per week		
None	161	34.6%
14 units or less	267	57.7%
More than 14 units	36	7.8%
Prior illicit drug use (Yes)	42	9.0%
Mental health diagnosis ever		
Yes	181	39.1%
No	270	58.3%
Prefer not to say	12	2.6%
Current mental health problem		
Yes	109	23.5%
No	342	73.9%
Prefer not to say	12	2.6%

countries such as the UK, USA, Canada and Australia. Most participants were in full-time (46.7%) or part-time employment (16.2%), 5.8% were full-time students, 7.8% were caring for family, 7.3% were unemployed and 16.2% were retired. Over half the participants had completed a
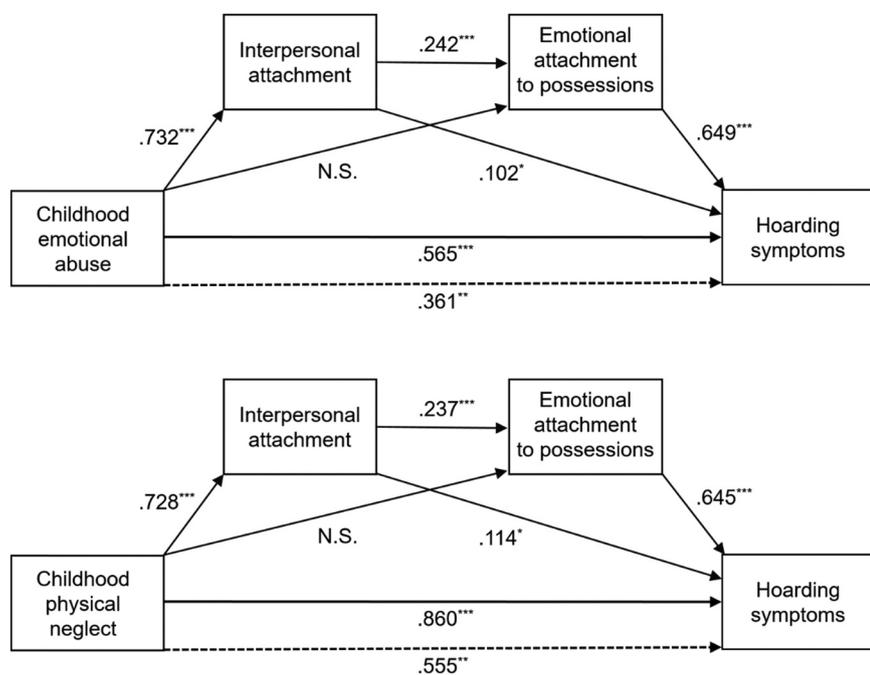

Fig. 1. Statistical diagrams of the mediation models testing the direct and indirect effects of childhood trauma on hoarding symptoms via insecure attachment and emotional attachment to objects. Models adapted from Hayes (2017). *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$, N.S., = not significant. Solid black line = path c (total effect of X on Y); dashed line = path c' (direct effect of X on Y); total indirect effect of X on Y = $c - c'$.

Table 2
Clinical scale scores.

Scale and subscale	Mean (SD)
SI-R Total	38.34 (19.56)
SI-R Clutter	14.37 (9.14)
SI-R Difficulty Discarding	12.12 (6.71)
SI-R Excessive Acquisition	9.83 (5.93)
SCI Total	79.21 (34.68)
SCI Emotional Attachment	32.01 (16.33)
SCI Control	13.95 (5.18)
SCI Responsibility	18.67 (8.87)
SCI Memory	14.59 (7.94)
CTQ Emotional Abuse	10.78 (5.60)
CTQ Physical Abuse	7.46 (3.94)
CTQ Sexual Abuse	6.91 (4.27)
CTQ Emotional Neglect	11.80 (5.14)
CTQ Physical Neglect	8.06 (3.55)
AAQ Total	66.54 (17.46)
AAQ Avoidance	33.62 (10.02)
AAQ Anxiety	32.92 (10.89)
HADS Total	16.11 (8.03)
HADS Anxiety	9.56 (4.65)
HADS Depression	6.55 (4.23)

Key: SI-R = Saving Inventory Revised; SCI = Saving Cognitions Inventory, CTQ = Childhood Trauma Questionnaire, subscales: EA = Emotional abuse, PA = Physical abuse, SA = Sexual abuse, EN = Emotional neglect, PN = Physical neglect; AAQ = Adult Attachment Questionnaire; HADS = Hospital Anxiety and Depression Scale.

third-level qualification (52.7%), while a third (33.9%) indicated they held a postgraduate degree. More participants were in a relationship (58.7%) than single, divorced or widowed (41.3%). 39.1% reported a previous mental health diagnosis; 23.5% reported a current mental health diagnosis. The majority of participants indicated that they either did not drink alcohol (34.6%) or consumed 14 units or less of alcohol per week (57.7%). Just 9.1% reported ever using illicit drugs (marijuana, ecstasy, cocaine, heroin, or medications not prescribed for them such as sleeping pills or benzodiazepines) (Table 1).

The mean and standard deviations of the clinical scales are summarised in Table 2. The mean SI-R score for the sample was 38.34 (*SD* = 19.56); the mean SCI score was 79.21 (*SD* = 34.68). Applying a suggested clinical cut-off of ≥ 41 on the SI-R (Muroff et al., 2014), approximately half of the sample (46.4%, *n* = 216) scored in the clinical range for hoarding symptoms. However, given that the focus of this study was to explore hoarding tendencies as a dimensional phenomenon in a non-clinical sample, the whole dataset was included in the subsequent analyses. This approach is also consistent with a number of recent studies on hoarding symptoms in non-clinical samples (Neave et al., 2016; Taylor, Moulding, & Nedeljkovic, 2018; Wheaton, Abramowitz, Franklin, Berman, & Fabricant, 2011). Male and female participants did not differ significantly in terms of hoarding symptom level (independent *t*-test, *p* > 0.05 for SI-R); similarly there was no effect of age group on hoarding scores (Pearson chi-squared tests, *p* > 0.05 for SI-R).

Applying the clinical ranges of the CTQ to each subscale (Bernstein & Fink, 1998) the rates of each type of childhood abuse reported by participants were estimated. Approximately one-third (33.2%) of participants reported moderate or severe levels of childhood emotional abuse; 30.5% reported moderate or severe levels of physical abuse; 29.4% reported experiencing some level of sexual abuse; 32.2% reported moderate or severe levels of emotional neglect, and 25.3% reported moderate or severe levels of physical neglect.

3.2. Correlation and regression analyses

Pearson's correlation values between the key clinical variables are shown in Table 3. The SI-R was significantly correlated with all other clinical variables at *p* < 0.01 level, 2-tailed significance. There were moderate effect sizes for anxiety/depression (HADS, *r* = 0.43), insecure adult attachment style (AAQ total, *r* = 0.419; anxiety subscale, *r* = 0.379; avoidance subscale, *r* = 0.319), and the emotional abuse subscale of the Childhood Trauma Questionnaire (CTQ EA, *r* = 0.313). Small effect sizes were found for the four remaining CTQ subscales (Physical abuse, CTQ PA, *r* = 0.184; Sexual abuse, CTQ SA, *r* = 0.173; Emotional neglect, CTQ EN, *r* = 0.188; Physical neglect, CTQ PN, *r* = 0.267). The two hoarding measures were highly correlated (SI-R and SCI, *r* = 0.711). Insecure current attachment style (indicated by higher scores on the AAQ) was correlated with emotional attachment to objects (SCI-EA), with a moderate effect size (*r* = 0.376).

In order to further explore the relationship between insecure attachment style and hoarding symptoms (SI-R total score), a linear regression model was run which included the anxiety and avoidance subscales of the AAQ as predictor variables. Total HADS scores were included as a covariate to control for the possible confounding effects of anxiety and depression, which are common comorbid difficulties in hoarding (Frost et al., 2011; Frost, Steketee, Williams, & Warren, 2000). The overall regression model was significant, $F_{(3, 459)} = 46.58$, $p < 0.001$, $R^2 = 0.233$. Both attachment anxiety (*b* = 0.359, SE = 0.086, $t_{(459)} = 4.30$, $p < 0.001$), and attachment avoidance (*b* = 0.219, SE = 0.092, $t_{(459)} = 2.38$, $p = 0.018$), were significant predictors of SI-R scores. For the mediation analysis attachment insecurity was included as the AAQ total score, which is the sum of the anxious and avoidant sub-scales and provides a general measure of attachment insecurity. There were no specific hypotheses about whether attachment anxiety or avoidance would be more significantly related to hoarding behaviours, and the preliminary analyses confirmed that both subscales were significant predictors of SI-R scores.

Before running the planned mediation analysis, linear regression was used to explore whether the planned independent variables (IVs) predicted hoarding symptoms (SI-R). The five subscales of the CTQ were included as predictor variables; HADS scores were included as a covariate as before. The overall model was significant, $F_{(6, 456)} = 21.37$, $p < 0.001$, $R^2 = 0.219$. Two subscales of the CTQ, emotional abuse (*b* = 0.555, SE = 0.236, $t_{(456)} = 2.35$, $p = 0.019$) and physical neglect (*b* = 0.782, SE = 0.328, $t_{(456)} = 2.39$, $p = 0.017$), were significant predictors of SI-R scores. These variables (CTQ-EA and CTQ-PN) were therefore used as independent variables in the subsequent mediation analyses.

3.3. Mediation analysis: Direct and indirect effects of childhood trauma on hoarding symptoms

The first mediation model tested whether the relationship between childhood emotional abuse (CTQ-EA) and current hoarding symptoms (SI-R) was mediated by interpersonal attachment insecurity (AAQ) and emotional attachment to possessions (SCI-EA). The total indirect effect was (*c* - *c'*) was statistically significant (*B* = 0.203, SE = 0.104, 95% CI [0.004, ULCI = 0.415]). Dividing the indirect effect into its three constituent components, two indirect effects were significant. The indirect effect from $X \rightarrow M_1 \rightarrow Y$ was significant (*b* = 0.075, SE = 0.037, LLCI = 0.008, ULCI = 0.151), indicating that childhood emotional abuse partially predicted hoarding symptoms via its effect on attachment insecurity. The other significant indirect effect was from $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$, with childhood emotional abuse significantly predicting hoarding symptoms via its effect on attachment insecurity, which in turn impacted emotional attachment to possessions (*b* = 0.115, SE = 0.033, LLCI = 0.059, ULCI = 0.186). Emotional attachment to possessions (SCI-EA) on its own did not mediate the relationship between childhood emotional abuse and hoarding symptoms. As the direct effect of childhood emotional abuse on hoarding symptoms (path *c'*) remained significant (*B* = 0.361, SE = 0.138, $t_{(460)} = 2.61$, $p = 0.007$), this suggests partial mediation.

The second model tested whether interpersonal attachment

Table 3
Pearson's correlations between the key clinical variables.

Scales	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. SI-R	1	0.711**	0.647**	0.313**	0.184**	0.173**	0.188**	0.267**	0.430**	0.419**
2. SCI	0.711**	1	0.954**	0.237**	0.187**	0.147**	0.126**	0.196**	0.395**	0.418**
3. SCI-EA	0.647**	0.954**	1	0.202**	0.155**	0.120**	0.101*	0.169**	0.351**	0.376**
4. CTQ EA	0.313**	0.237**	0.202**	1	0.612**	0.429**	0.658**	0.627**	0.417**	0.423**
5. CTQ PA	0.184**	0.187**	0.155**	0.612**	1	0.455**	0.426**	0.524**	0.322**	0.309**
6. CTQ SA	0.173**	0.147**	0.120**	0.429**	0.455**	1	0.273**	0.365**	0.204**	0.177**
7. CTQ EN	0.188**	0.126**	0.101*	0.658**	0.426**	0.273**	1	0.636**	0.255**	0.337**
8. CTQ PN	0.267**	0.196**	0.169**	0.627**	0.524**	0.365**	0.636**	1	0.286**	0.292**
9. HADS	0.430**	0.395**	0.351**	0.417**	0.322**	0.204**	0.255**	0.286**	1	0.552**
10. AAQ	0.419**	0.418**	0.376**	0.423**	0.309**	0.177**	0.337**	0.292**	0.552**	1

Key: SI-R = Saving Inventory Revised; SCI = Saving Cognitions Inventory, SCI-EA = Emotional attachment subscale; CTQ = Childhood Trauma Questionnaire, subscales: EA = Emotional abuse, PA = Physical abuse, SA = Sexual abuse, EN = Emotional neglect, PN = Physical neglect; HADS = Hospital Anxiety and Depression Scale total score; AAQ = Adult Attachment Questionnaire total score. ** Correlation significant at the $p < 0.01$ level (2-tailed).

insecurity (AAQ) and emotional attachment to possessions (SCI-EA) mediated the relationship between childhood physical neglect (CTQ-PN) and current hoarding symptoms (SI-R). The findings mirrored those of the first mediation model, with a significant total indirect effect ($B = 0.306$, SE = 0.154, 95% CI [0.014, ULCI = 0.624]). As before, two indirect pathways were significant, with attachment insecurity and attachment insecurity's influence on emotional attachment to possessions partially mediating the influence of childhood physical neglect on current hoarding symptoms. The direct effect of childhood physical neglect on hoarding symptoms (path *c'*) remained significant ($B = 0.555$, SE = 0.196, *t* (460) = 2.82, $p = 0.005$), indicating partial mediation. The results of these mediation models are summarised graphically in Fig. 1.

4. Discussion

4.1. Main findings

The main aim of this study was to explore whether attachment disturbances might be one mechanism by which childhood trauma contributes to hoarding symptoms in adulthood. A large community-based sample of adults with a range of hoarding symptoms was recruited, and the main hypothesis was tested using mediation analysis. By exploring the psychological origins and maintenance of hoarding symptoms from an attachment approach, it was hoped that the findings could be integrating with the existing cognitive behavioural model of hoarding with a view better understanding the aetiology of hoarding and guiding future research into more effective therapeutic approaches.

Based on previous research suggesting that childhood adversity is a risk factor for hoarding (Lochner et al., 2005; Samuels et al., 2008), it was first hypothesised that higher levels of childhood trauma would predict current levels of hoarding symptoms. The results supported this hypothesis, and after controlling for levels of depression and anxiety, two subscales of the CTQ- emotional neglect and physical abuse, were significant predictors of SI-R scores. Previous studies have found that the lifetime experience of traumatic events (Cromer et al., 2007; Landau et al., 2011), and childhood trauma such as physical punishment (Samuels et al., 2008) and sexual abuse (Hartl, Duffany, Allen, Steketee, & Frost, 2005) are more common in hoarding populations compared to both clinical and non-clinical control groups. The current findings expand upon this research, and offer support for a link between the experience of childhood trauma and greater hoarding symptom severity in a non-clinical sample.

The second hypothesis focused on the association between interpersonal attachment insecurity and hoarding tendencies. There was a moderate positive correlation between attachment insecurity and hoarding symptoms, and after controlling for anxiety and depression levels, both attachment anxiety and avoidance were significant predictors of hoarding levels. This association between adult attachment

insecurity and hoarding tendencies bolsters the findings from several previous studies exploring hoarding and attachment in large non-clinical samples (Medard & Kellett, 2014; Neave et al., 2016), and hoarding disorder (Grisham et al., 2018). In addition, attachment insecurity was positively correlated with emotional attachment to possessions, with a medium effect size. Few studies have explored the direct relationship between these two phenomena, and these results accord with findings from a previous paper which found that both insecure adult attachment style and a history of a more insecure maternal attachment relationship were significantly correlated with greater attachment to possessions, as well as with higher anthropomorphic tendencies (Neave et al., 2016).

Finally, results from two serial mediation models supported the hypothesis that the relationship between childhood trauma and hoarding symptoms would be explained in part by attachment difficulties, namely higher interpersonal attachment insecurity and a greater emotional attachment to possessions. Of note, only the indirect pathways that involved interpersonal attachment were significant, which suggest that this may be a key factor linking early adversity and later risk for hoarding, via both a direct influence on hoarding symptoms and an indirect influence through increased emotional attachment to objects. Although previous studies have linked childhood adversity to current psychological symptoms via the mediating influence of insecure adult attachment style (Bifulco et al., 2006; Fowler et al., 2013), this is the first time, to our knowledge, that a putative mechanism for the influence of childhood trauma on hoarding symptoms via attachment difficulties has been supported by empirical findings.

Attachment theory is one of the most influential of all psychological theories (Ainsworth, 1978; Bowlby, 1988). Relationships with early caregivers have a profound impact upon later development (DeKlyen & Greenberg, 2008), and suboptimal attachment experiences, where the core emotional needs of a child have not been sufficiently met, play a role in the development of a range of psychological difficulties (Mikulincer & Shaver, 2012), through putative mechanisms such as stress responses and emotional regulation, neurobiological development, care-seeking strategies and personality development (Kobak, Cassidy, Lyons-Ruth, & Ziv, 2006). In addition, childhood trauma is a well-established risk factor many psychological disorders (Battle et al., 2004; Hovens et al., 2010; Mathews et al., 2008). In this sense, both trauma and attachment may represent transdiagnostic risk factors, which in the case of hoarding potentially interact with other specific factors to confer risk for this difficulty. Putatively, a history of childhood trauma that contributes towards the development of an insecure attachment to early caregivers may predispose those who hoard towards poorer emotional attachment to significant others throughout life, as the earliest developmental experiences lay the foundation for later relationships (Bowlby, 1988). If an insecure attachment pattern with significant others emerges in the context of developmental trauma, possessions may take on an increasingly central role, as people are perhaps viewed as less reliable than objects as a source of emotional

comfort (Grisham et al., 2008; Medard & Kellett, 2014). This phenomenon may be central to hoarding, perpetuating a reliance on possessions in the context of attachment anxiety and ambivalence towards significant others. Considerable further research will be needed, however, to further explore this hypothesis.

4.2. Potential clinical implications

One potential clinical implication of the current study is that a stronger focus on role of traumatic experiences and attachment in hoarding may offer a fresh approach to understanding and treating this difficulty. Although cognitive behavioural models have long acknowledged that attachment to objects and others is dysfunctional in hoarding (Frost & Hartl, 1996; Kyrios et al., 2018), hoarding-specific CBT does not address this core relational difficulty (Tolin et al., 2017). Example of some evidence-based therapeutic approaches which might be applied to hoarding include Transference-Focused Psychotherapy (Yeomans, Levy, & Caligor, 2013), Schema Therapy (Young, Klosko, & Weishaar, 2003), and Mentalization-based Psychotherapy (Allen & Fonagy, 2006). These types of relational therapies place a significant emphasis on the transformative effect of the therapeutic alliance in helping clients to develop a more adaptive view of themselves and their relationships with others, and focus on changing maladaptive ways of coping which have emerged in response to adverse or suboptimal developmental events. In addition, they have shown efficacy in treating long term psychological difficulties such as personality disorders (Bateman & Fonagy, 2004; Jacob & Arntz, 2013; Levy et al., 2006), which is an important consideration given that hoarding tends to be a chronic condition with high resistance to change (Frost, Tolin, & Maltby, 2010; Timpano et al., 2016). These types of approaches could potentially be used in conjunction with hoarding-specific CBT, which contains many useful elements focusing on the conscious thoughts, beliefs and emotions driving hoarding behaviours, as well as practical elements to help clients break the behavioural patterns of hoarding (Frost, Trumbo, & Goar, 2017). Future research into this possibility will be necessary in order to explore whether this might prove a useful psychotherapeutic approach.

4.3. Strengths and limitations of the study and future research

One of the main strengths of this study is that the results support numerous previous studies emphasising the importance of early adverse events and interpersonal attachment insecurity in hoarding. In addition, evidence of one putative mechanism (attachment to others and possessions) by which early trauma may impact later hoarding tendencies is presented. The study includes well-validated measures of hoarding disorder and other psychological symptoms, however it is limited by the absence of a clinical interview and assessment of hoarding disorder. Although there was a relatively high rate of individuals in the study with hoarding symptoms within the clinical range, the use of self-report measures may have biased the sample towards those with relatively good insight into their difficulties. In addition, the findings may not be generalizable to clinical samples with hoarding disorder.

In terms of exploring the role of attachment in this study, the decision was made to focus on current attachment to romantic partners as this relationship is thought to relate most closely to the internalized experiences of early parent-child relationships (Roisman, Madsen, Hennighausen, Sroufe, & Collins, 2001). This focus is a limitation of the design, as childhood abuse may contribute to broader attachment difficulties which were not assessed and which might be relevant in hoarding, such as attachment relationships with close friends, children, etc. In addition, the focus on attachment to romantic partners may have been problematic for those who had not experienced a recent romantic relationship, which may be more likely in individuals with hoarding difficulties. Approximately 60% of the sample indicated that they were

currently in a relationship; of the others who were single it is not known if they were ever previously in a relationship and whether the questions on the AAQ were therefore more difficult to answer. In order to address this limitation in future studies, a broader measure of attachment could be considered, which might allow for participants to respond based on their experiences within a significant relationship (e.g., close friendship) rather than specifically a romantic relationship.

The emphasis on early trauma within this study fits with substantive research showing that this has the most profound impact developmentally (Lanius, Vermetten, & Pain, 2010), and is also likely to have occurred before the onset of hoarding symptoms. However, retrospective reports of childhood trauma have been found to include a high rate of false negatives and measurement error (Hardt & Rutter, 2004). Reports of retrospective abuse may also be inconsistent; for example, in one large study which asked respondents about the experience of extra-familial child sexual abuse, 35.5% of participants denied this in the second phase of the study several weeks later (Langeland et al., 2015). In another study which compared prospective informant-reports and retrospective self-reports in young adults (18 years), inter-rater reliability was found to quite low (kappa values ≤ 0.31). Of particular interest, those who recalled being maltreated had a greater risk of psychopathology (Newbury et al., 2018), which raises interesting questions about the nature of memory, memory bias, vulnerability, as well as actual adverse childhood events in the later development of psychological distress. Thus, although a very large number of studies, including the current one, include retrospective reports of childhood abuse, it is important to acknowledge that these measurements are fraught with methodological challenges, and that a certain level of under or over-reporting is possible.

Another potential limitation of the current study is the relatively high attrition rate, with 44.7% of participants not completing the study. A high dropout can be problematic if it leads to a selection bias in the sample. A preliminary analysis of the dropout pattern indicated that the highest attrition rate was at the start of survey. It is possible that people without hoarding difficulties may have stopped responding if they found the SI-R and SCI less relevant to them; equally it is possible that people with hoarding difficulties found these questionnaires hard to complete if the items were particularly resonant. Earlier reviews have suggested that about one-third of participants do not complete internet-based studies (Reips, 2002), however the dropout rate can vary considerably and may depend on many different factors. The current study took approximately 30–40 min to complete and participants were not compensated for taking part; these factors may have contributed to the relatively high dropout rate.

Ultimately the findings are limited by the cross-sectional design of the study, which necessarily implies that causation cannot be inferred. Mediation models are popular in psychological research as they offer a statistical method of exploring how an antecedent variable transmits its effect on a consequent variable (Hayes & Rockwood, 2017). However, it has been suggested that the use of mediation models with cross-sectional datasets is problematic because mediation is a process that unfolds over time (O'Laughlin, Martin, & Ferrer, 2018). Previous studies have found that cross-sectional approaches to mediation can generate biased estimates of longitudinal parameters, potentially over- or underestimating the effect of the predictor variables on the outcome variable (Maxwell, Cole, & Mitchell, 2011; O'Laughlin et al., 2018). Thus it could be argued that the most significant limitation of the current study is the use of a cross-sectional dataset to model what is essentially a longitudinal phenomenon.

Ideally, a longitudinal study would be required to test the main hypothesis, which might be capable of tracking the emergence of an insecure attachment style in relationships with significant others and an over-dependence on inanimate objects for emotional comfort across time, following the experience of childhood trauma. Longitudinal mediation models could then be employed, such as autoregressive (Cole & Maxwell, 2003) or latent growth models (McArdle, 2009), which

offer methods of examining changes in variables across time. However, longitudinal data can also have methodological difficulties, including impractical measurement times and potentially omitted variables (MacKinnon, Fairchild, & Fritz, 2007). There may also be ethical concerns if studying the impact of childhood trauma on later psychological outcomes. Furthermore, other authors have argued that covariation over time does not imply causation any more than covariance at a single time point (Hayes, 2017). Ultimately, no statistical methods are without inherent bias and should not be relied upon to make causal inferences. It is important therefore that the findings are interpreted in light of the limitations of the dataset and the statistical methods employed.

5. Conclusion

The aim of this study was to explore a putative mechanism by which childhood trauma may influence the expression of hoarding symptoms in adulthood. The findings lend support to the hypothesis that early adversity in childhood predicts hoarding tendencies in adulthood, and suggest that this effect can be explained in part by greater interpersonal attachment insecurity and stronger emotional attachment to possessions. The results support the augmented CBT model of hoarding (Kyrios et al., 2018), which acknowledges that early childhood events and attachment patterns play important roles in the aetiology of hoarding. Future research is needed to further clarify the psychological origins of hoarding, and may be guided by the findings that childhood trauma and attachment style play important roles. Longitudinal research will be important in tracking the impact of developmental and life events on the emergence and maintenance of hoarding, in order to see whether across time, the impact of early trauma influences hoarding tendencies via the attachment mechanisms proposed by this study. Current psychological treatments for hoarding may arguably be limited by their focus on symptoms, including thoughts and beliefs about possessions. A psychotherapeutic approach which includes an exploration of the developmental impact of traumatic events and the resulting impact on self-other and self-possession relationships, might tentatively be suggested as a way to break the therapeutic impasse, by focusing on the emotional origins and function of hoarding, and the internal as well as external world of the hoarder.

Conflict of interest

All authors declare that they have no conflicts of interest.

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