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Background. The emotions of people prone to hoarding are a component of the dominant cognitive- behavioural model of Hoarding Disorder. However, the emotional lives of people that hoard has been under researched compared to other aspects of the model. **Aims.** This study sought to use Q-methodology to explore the emotional experiences of people that hoard. **Method.** A forty-nine statement Q-set was generated following thematic analysis of initial interviews and a review of measures/literature. Forty-four participants with problematic hoarding (34 online, 10 offline) then completed a Q-sort of the statements, alongside a battery of psychometric measures. A by-person factor analysis was conducted and resulting clusters compared on the psychometric measures. **Results.** Four distinct participant clusters were found: "*emotionally overwhelmed*" (n = 11); "*social emotions*" (n = 13); "*object complexity*" (n = 6) and "*object-affect fusion*" (n = 4). The four clusters did not differ with regards to hoarding severity, anxiety, depression or impulsivity. **Conclusions.** Complex emotions appear to be a significant aspect of the lives of people that hoard and appear to play a role in maintaining problems with hoarding. Whilst the participant clusters reflect research evidence, they also demonstrate significant emotional heterogeneity and so prompt the need for further research and refining treatment models.

The 5th edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) identified Hoarding Disorder (HD) as a discrete diagnosis. The DSM-5 specifies that the essential features of HD are persistent difficulties discarding possessions (regardless of their actual value) and that these difficulties result in the build-up of clutter to the extent that impedes how living areas function. Living areas can over time become grossly cluttered and congested, causing clinically significant distress and impacting on individual wellbeing (Frost & Hartl, 1996). People that hoard experience impairments across multiple spheres of daily life (Nordsletten et al, 2013) and tend to be older, more frequently unemployed and are more often unmarried, separated or divorced (Mataix-Cols, Billotti, Fernandez de la Cruz & Nordsletten, 2013). The most recent iteration of the cognitive-behavioural model of HD (Steketee & Frost, 2003) includes information processing deficits (e.g., attention, organization, memory, decision-making), problematic beliefs about and emotional attachments to possessions and also cognitive and behavioural avoidance.

Research has provided evidence supporting the role of emotions in the cognitive behavioural HD model. For example, Pertusa et al. (2008) found that people with HD cited emotional attachment to objects (alongside their intrinsic value) as prime reasons for retaining them. Steketee, Frost, and Kyrios (2003) investigated cognitive and emotional aspects of hoarding and identified four factors including excessive emotional attachment to possessions (i.e. that possessions provided emotional comfort and fears regarding potential loss of identity associated with discard). Kellett and Knight (2003) proposed that object-affect fusion occurred in HD, whereby there is the merging of the emotions associated with an object and the object itself. Cherrier and Ponnor (2010) found that reluctance to discard possessions was due to a perceived threat to their personal sense of security and also memories of past experiences being attached. Emotional attachment to possessions has been linked to elevated levels of anxiety and

depression amongst people with HD (Coles, Frost, Heimberg, & Steketee, 2003; Frost, Steketee, & Tolin, 2011). There have been calls to increasing understanding of the features and characteristics of the phenomena of emotional attachment to objects in HD (Grisham & Norberg, 2010). This is in spite of treatment resistance and poor outcome in hoarding behaviour having often been linked to emotional attachment to possessions (Frost & Steketee, 1999).

A research method well suited to the investigation of the emotions in HD is that of Q-methodology (Stephenson, 1935). Q-methodology combines the strengths of both qualitative and quantitative methodologies and has been referred to as a "qualiquantological" method (Stenner & Stainton-Rogers, 2004). The methodology acquires the individual opinions of participants on a particular topic and uses a "by-person" factor analytic approach to identify clusters of individuals sharing common viewpoints on the topic (Watts & Stenner, 2005). The product of Q-method is therefore formation of theory developed through the experiences of individuals, rather than the results from the testing of pre-determined hypotheses (Simons, 2013). Q-methodology has a rich heritage and has been used in a multitude of areas (see Dean, Siddiqui, Beesley, Fox & Berry, 2018 for a recent example). The reliability of Q-methodology has been proven through test-retest studies and cross study replication (Valenta & Wigger, 1997). This study is the first attempt to apply a Q-methodology to people prone to hoarding in the attempt to better understand their emotional lives.

Method

Phase 1: Q-set generation

Ethical approval for this research study was granted (ref: 012409). The research instrument in Q-methodology is the set of opinion statements, called a *Q-set.* The Q-set is the formation of emblematic, distinct and representative statements of the area under

investigation and so the Q-set for this study consisted of a set of statements representing HD specific emotions. Q-sets can be generated using many different sources, such as academic literature, initial interviews and pilot studies (Watts & Stenner, 2005); a typical Q-set consists of between 40-80 statements (Stainton-Rogers, 1995). For the current study the Q-set was generated from interviews and from review of relevant research and HD assessment measures. There is no current guidance as to the number of interviews necessary to be conducted in order to produce the Q-set items, but producing a Q-set without interviewing is inadvisable (Valenta & Wigger, 1999). Statements are generated from the concourse, and this means that they will be primarily grounded in the interviews with those with lived experience of the issue being explored (Coogan & Herrington, 2011). Therefore, in the current study two participants (one clinical psychologist with a special interest in HD, and one individual with a HD diagnosis) were interviewed, in order to cover both patient and clinician perspectives. The participant with problematic hoarding was recruited from a Specialist Psychotherapy Service and had a DSM-5 diagnosis of HD, as assessed by the Structured Interview for Hoarding Disorder (Nordsletten et al., 2013).

A panel of $N = 3$ trainee clinical psychologists then coded the interview transcripts and reviewed any relevant HD assessment measures (Coogan & Herrington, 2011). A panel meeting was convened to agree statements on which there was complete consensus. A total of 166 statements were prospected (156 from interviews and 10 from HD measures); these were then reduced to the 49 most directly relevant HD emotional statements (46 interview statements and 3 items taken from published HD measures). The decision to reduce the statements to 49, was driven by the choice of prearranged frequency distribution for the subsequent Q-sort phase (Watts & Stenner, 2012). The 49 items were also reviewed by expert panel of N=2 accredited members of the British Association for Behavioural and Cognitive Psychotherapies with detailed

clinical and research HD expertise (i.e. domain experts; Valenta & Wigger, 1997). They rated each of the N=49 potential Q-set items in terms of relevance (i.e. 1 = not relevant, 2 = somewhat relevant, 3 = quite relevant, 4 = highly relevant). Scores were then reduced to a dichotomy (i.e. "relevant" (a score of 3 or 4) or "not-relevant" (a score of 1 or 2; Davis, 1992). Acceptable levels of inter-rater agreement can range from 0.70-0.80 (Selby-Harrington, Mehta, Jutsum, Riportella-Muller, & Quade, 1994). The level of inter-rater agreement concerning the relevancy of the Q-set was found to be 0.76. The content validity index (CVI) was then also used to calculate the proportion of statements rated as either "quite relevant" or "highly relevant" (Polit & Beck, 2006). The CVI for the current study was 0.71 and a level of 0.80 has been proposed as being desirable when developing new scales (Polit & Beck, 2006). The relevance and content validity scores combined indicated that the Q-set was appropriate for administration during the Q-sort in the next stage.

Phase 2: Q-sorting

The Q-sort task was completed by a participant sample (either online or offline) and involved sorting the 49 item Q-set. Offline study participants received the pack of randomly numbered Q-statements (each printed on a separate card), a sheet with sorting instructions called a *condition of instruction* and an answer sheet to record the chosen order of statements. The answer sheet used in Q-methodology forces the Q-sort into the shape of a quasi-normal distribution (Watts & Stenner, 2012). Participants in the current study sorted the randomly shuffled statements along a seven-point scale. Each point could only house a specific number of statements: strongly disagree (3 statements); disagree (5); slightly disagree (9); neither agree nor disagree (15); slightly agree (9); agree (5); and strongly agree (3). The online Q-sort was presented to participants via the internet via Qualtrics software (Qualtrics, 2015). This mirrored the offline process and so each participant were presented which randomly shuffled

individual statements. Online participation also enabled the collection of data about the time taken for each participant to complete the Q-sort.

Phase 3: by-person factor analysis

PQMethod was used for the analysis (Watts & Stenner, 2005) and consisted of an initial pairwise intercorrelation of individual Q-sorts to generate a by-person correlation matrix. A factor analysis was then undertaken to identify an optimal model of factors (Preacher, Zhang, Kim, & Mels, 2013). The objective of this analysis was to identify the model with the highest relative verisimilitude (i.e. closest appearance to having truthful meaning and interpretability). Factors were only chosen that had eigenvalues of > 1.00 and that each of factor had to have at least two Q-statements that loaded significantly on them alone. These are known as "factor exemplars" (Brown, 1996; Watts & Stenner, 2005).

Participants

As Q-methodology is not designed for hypothesis testing, it is therefore not subject to sample size estimation. Breadth and diversity of viewpoints is believed to be best achieved however when samples contain between 30-60 participants (McKeown & Thomas, 2013; Stainton Rogers, 1995). Q-method samples rarely exceed N=50 (Brown, 1993). The number of participants is usually (but unnecessarily) smaller than the Q-set *(*Brouwer, 1999) and the sample size for the current study was N=44. Offline participants were recruited via hoarding support groups (n = 10). An access link to the online version of the study was distributed via national charities, on social media websites, and through hoarding support forums, with the expressed approval of the relevant gatekeepers and administrators. A total of n = 79 participants consented to begin the online version of the study, with n = 34 (43%) reaching completion.

Measures

Clutter Image Rating (CIR): This pictorial measure indexes the extent of clutter within the participant's home. It includes nine photographs for each of three rooms (kitchen, living room, and bedroom) varying in the amount of clutter from a rating of 1 (no clutter) to 9 (severe clutter). A mean score for the individual is calculated across the three rooms, with a mean score of 3 or more being indicative of caseness (Muroff, Underwood, & Steketee, 2014). The CIR has been shown to demonstrate good psychometric properties (Frost, Steketee, Tolin, & Renaud, 2008). *Saving Inventory – Revised (SI-R)*: This is a 23-item self-report measure of three primary components of hoarding: difficulty discarding (7 items), compulsive acquisition (7 items), and clutter (9 items). A total score of 41 or more is indicative of caseness (Muroff, et al., 2014) and the SI-R has been validated (Frost, Steketee, & Grisham, 2004). *Hospital Anxiety and Depression Scale (HADS):* This is a 14-item self-report questionnaire detects anxiety and depression in clinical and non-clinical populations. It consists of two subscales: anxiety (7 items) and depression (7 items) and total scores range from 0 to 21. Scores are normal (0-7), mild (8-10), moderate (11-14), and severe (15-21). Caseness is defined by a score of 8 or above for each of the anxiety and depression subscales (Bjelland, Dahl, Haug, & Neckelmann, 2002). The HADS has been shown to possess good psychometric properties (Mykletun, Stordal, & Dahl, 2001).

Results

Sample characteristics

A total of 89 participants consented to take part in the Q-sort phase of the study; 79 online and 10 offline. Forty-four participants completed the study with attrition of 45 online and 0 offline participants (see Figure 1). The majority of participants were female (86%; $N = 43$). Duration of hoarding ranged from 4-50 years (M=23 years) with N=38 having received a psychological intervention for their HD. Duration of hoarding for

completers (mean = 209.21 months, median = 180) did not differ from non-completers (mean = 276.46 months, median = 240), $U = 460.5$, $z = 1.894$, $p = 0.058$. Similarly, completers and non-completers did not differ in terms of gender; χ^2 (1) = 3.084, p = 0.079, HADS total score ($U = 361.0$, $z = -0.209$, $p = 0.834$), SI-R total score ($U = 478.0$, $z = 0.899$, $p = 0.368$) and CIR mean score ($U = 473.0$, $z = 1.200$, $p = 0.230$).

For the 44 participants who fully completed the study, HADS scores for the anxiety subscale ranged from 3-19 (M = 11.62, SD = 4.14) with 36 participants (81.8%) meeting caseness for anxiety. Depression subscale scores ranged from 1-19 (M = 10.78, SD = 4.23) with 35 participants (79.5%) meeting caseness for depression. Mean scores for the CIR ranged from 1.67 to 7.00 (M = 3.97, SD = 1.49) with 32 participants (72.7%) meeting clutter caseness. Total SI-R scores ranged from 32-76 (M = 57.52, SD = 12.28), with 40 participants (90.9%) meeting hoarding caseness. Three online participants did not meet caseness for hoarding on either of the hoarding measures and so were removed from the dataset for the subsequent Q-sort analysis.

Analysis of Q-sort data

Analysis of the unrotated factors indicated twelve factors with eigenvalues of greater than 1, which explained 79% of the variance. Exploration of the first eight factors revealed that only two factors had two or more factor exemplars. A varimax rotation was conducted and a four-factor model was chosen as having the highest verisimilitude. The four factors explained 49% of the variance and Q-sort loadings for each of the factors are presented in Table 1. Correlations between factors were low, ranging between r = 0.0093 and r = 0.3665. Thirty-four of the 41 Q-sorts (82.93%) were found to load significantly onto one factor alone and were therefore classified as factor exemplars. The remaining seven cases were excluded from subsequent analyses. Analysis indicated that 46 of the 49 (93.88%) statements in the Q-sort significantly

discriminated between clusters. Statements 24 ("*objects are predictable and are not able to let you down like people might*"), 28 ("*other people get frustrated by my hoarding*"), and 44 ("*I am often torn between needing to discard items and thinking they are still useful*") were found to not significantly distinguish between clusters. Factor arrays (i.e. Q-sort arrangements configured to represent the viewpoints of each cluster are presented in Table 2). The Z-scores and Q-sort values demonstrate agreement between individuals within each factor.

Two statements were found to statistically distinguish each factor from all other factors ($p < .01$). Statement 21, "*letting go of an item feels like letting a part of me go*" was rated differently by each cluster of participants. Factor 2 participants strongly disagreed with this statement whereas Factor 4 participants strongly agreed with the statement. Factor 1 participants slightly agreed whereas Factor 3 participants slightly disagreed. Statement 33, "*my anxiety causes me to postpone addressing my hoarding*" was also rated consistently differently by each of the participant clusters. Factor 4 participants strongly disagreed with this statement whereas Factor 3 participants only slightly disagreed, Factor 2 participants slightly agreed, and Factor 1 participants agreed.

Factor 1: the emotionally overwhelmed cluster (n = 11)

This cluster of participants was represented by 11 factor exemplars that explained 15% of the variance. The majority of the 11 participants (63.6%) completed the study online. All 11 participants met caseness for anxiety and 7 (63.6 %) met caseness for depression. All met hoarding caseness on the SI-R, with 8 (72.7%) also meeting clutter caseness on the CIR. In summary, this cluster of participants was characterised by high emotional distress associated with their hoarding and associated difficulties with discard owing to stress and anxiety. They do not appear to place special value on objects, or experience

positive affect upon acquiring items, but felt overwhelmed by the extent of their hoarding and due to this feeling feel unable to subsequently initiate discard.

Emotionally over-whelmed participants strongly agreed (Q-sort value scores of +3) that thinking about discarding their possessions caused them to feel distressed (statement 11 [S11]), as they also did discarding their possessions (S12), and that they felt embarrassed about the state of their home (S41). There was also agreement (+2) that rediscovering items refreshed positive memories attached to them (S4), that their anxiety caused them to postpone addressing their hoarding (S33) and that they avoided discarding possessions due to finding this process stressful (S49). This group of participants strongly disagreed (-3) that they got a sense of companionship from their possessions (S31).

Of the statements mentioned, statements 11 *"thinking about discarding my possessions causes me to feel distressed"*, 33 *"my anxiety causes me to postpone addressing my hoarding"*, and 49 *"I avoid discarding possessions because it is too stressful"* were found to statistically distinguish the emotionally overwhelmed cluster from the other three clusters ($p < .01$). Participants in other clusters tended to neither agree nor disagree with statement 11, and whereas participants in this cluster agreed with statement 49, participants in the other three clusters slightly disagreed. Further distinguishing statements included a slight disagreement with statement 17 "*I am able to see unique features in items*", whereas participants in other clusters tended towards agreement with this statement. Participants in other clusters held shared opinions on several statements which "emotionally overwhelmed" participants did not. Participants in the emotionally over whelmed cluster neither agreed nor disagreed with S10 "*my hoarding is destructive to my relationships*" whereas those in other clusters expressed stronger opinions. Emotionally overwhelmed participants also neither agreed nor

disagreed with S6 "*I think about how I could use an object in the future*" and S2 "*it's exciting when I find bargains*" suggesting that these items were not significant in their hoarding, whereas the other clusters all showed agreement across these items.

Factor 2: the social emotions cluster (n = 13)

This cluster of participants was best represented by 13 factor exemplars that explained of 16% of the variance. The majority (76.9%) completed the study online. Eleven participants (84.6%) met caseness for anxiety and all met caseness for depression. All met SI-R caseness for hoarding and 12 (92.3%) met clutter caseness on the CIR. In summary, "social emotion" cluster participants were characterised by a strong concern about the impact of hoarding on their social relationships. They worry that others view them negatively, fear others visiting their home and strongly believe that hoarding was destructive to their relationships. Participants in this cluster experience positive affect when acquiring new items, do not find it difficult to discard when others direct them to and do not appear to find discard particularly challenging. They denied feeling that they were strongly connected to their possessions, but sometimes question why they have so many belongings.

"Social emotions" cluster participants strongly agreed (+3) fearing what would happen if someone came to their home (S18), that hoarding was destructive to their relationships (S10), and that they questioned why they have so many belongings (S9). They also agreed (+2) that they worried that others thought them to be disgusting (S16), that finding bargains was exciting (S2) and that they get a buzz from acquiring items (S3). Social emotion participants strongly disagreed (-3) with statement 21 "*letting go of an item feels like letting a part of me go*". Of the statements mentioned, statements 3, 9, 10, 16, 18, and 21 were found to statistically distinguish social emotion cluster participants from the other clusters ($p < .01$). This cluster contained the only participants

to agree with statements 10 "*my hoarding is destructive to my relationships*" and 16 "*I worry that others think I am disgusting*". Factor 2 participants also rated stronger disagreement with statement 21 "*letting go of an item feels like letting a part of me go*" than did participants of the other three clusters.

Factor 3: the object complexity cluster (n = 6)

This cluster of participants was best represented by 6 exemplars that explained 10% of the variance. The majority (83.3%) completed the study online. Four (66.7%) met caseness for anxiety, and four (66.7%) met caseness for depression. Five (83.3%) met SI-R caseness for hoarding and four (66.7%) met CIR clutter caseness. In summary, "object complexity" participants shared agreement that they think about the potential that objects have and how they could be used in future, and as such feel responsible to use them. This cluster often feel that they are rescuing objects and feel guilty for discarding objects. They do not feel that they gain a sense of safety or companionship from their possessions.

"Object complexity" cluster participants strongly agreed (+3) about feeling guilty about throwing items away (S20). They also strongly agreed that they think about the potential that objects have (S7) and about how they could use them in the future (S6). This cluster agreed (+2) that they sometimes feel they are rescuing objects (S35) but not because they felt the object looked sad (S36). They strongly disagreed (-3) with statement 39 "*I feel safe when I am with my possessions*", and disagreed with statement 31 "*I get a sense of companionship from my possessions*". They slightly agreed (+1) that they felt responsibility towards objects and that if they can be used then they should (S37) and that they sometimes feel they are being made to discard things (S14). They were the only cluster that expressed any degree of agreement towards these two

statements. Of the statements mentioned, statements 7, 14, 35, 36, and 37 significantly distinguished "object complexity" participants from the other clusters ($p < .01$).

Factor 4: the object-affect fusion cluster (n = 4)

This cluster of participants was best represented by 4 factor exemplars that explained 8% of the variance. The majority (75%) completed the study online. Three (75%) met caseness for anxiety, and three (75%) met caseness for depression. All four met SI-R caseness for hoarding and clutter caseness on the CIR. In summary, the "object-affect" cluster of participants felt strongly that letting go of a possession felt like letting a part of themselves go. They also drew a sense of companionship and emotional comfort from their possessions, an experience not shared with any of the other three clusters. Unlike participants in the other clusters they also feel that they are decisive and do not tend to question why they have so many possessions.

"Object-affect fusion" cluster participants strongly agreed (+3) that letting go of an item felt like letting a part of themselves go (S21), that they experienced a buzz from acquiring new things (3), and that they thought about how an object could be used in the future (S6). They shared agreement (+2) that they like being around their possessions (S30), drawing a sense of companionship from them (S31), and they were the only cluster to express any degree of agreement with the later statement. Similarly, they shared slight agreement (+1) with statements 47 "*my possessions provide me with emotional comfort*" and 48 "*I love some of my belongings the way I love some people*", whereas the other three clusters expressed varying degrees of disagreement with these statements. Participants in this cluster expressed strong disagreement (-3) with statements 1 "*if an object looks abandoned, I will feel compelled to rescue it* ", 8 "*I find it difficult to make decisions*", and 33 "*my anxiety causes me to postpone addressing my hoarding*". Of the statements mentioned, only statement 6 "*I think about how I could*

use an object in the future" did not significantly distinguish "object-affect" participants from those in the other clusters ($p < .01$).

Factor comparisons

Table 3 contains the scores on the psychometric measures and time taken on the on line version. Twenty-five participants were included in the time taken analysis, as click data was only collected for online participants (n=34); 3 of which did not meet caseness for hoarding and 6 of which were not factor exemplars. Two data points were removed from the time taken data as they were deemed to be outliers. There were no significant between group differences found for number of clicks or time taken. Similarly, there were no significant between group differences were found between the clusters in terms of hoarding severity, anxiety, depression or impulsivity. Table 4 contains the results for the caseness and cluster analyses. The relationship between cluster and depression caseness (HADS-D) was significant (χ^2 (3, N = 34) = 8.017, p = 0.046). Post-hoc examination of the adjusted standardised residuals was conducted following the method outlined by García-Pérez & Vicente (2003). Residual scores indicated that 'social emotions' cluster were more likely to meet caseness for depression than participants from the other clusters. However, after conducting a Bonferroni correction for multiple comparisons (α = 0.00625), the effect was found to be non-significant p = 0.02. No other significant associations were found between cluster and caseness: HADS anxiety (χ^2 (3, N = 34) = 5.096, p = 0.165), SI-R (χ^2 (3, N = 34) = 3.616, p = 0.306), and CIR (χ^2 (3, N = 34) = 4.108, p = 0.250).

Discussion

The current study sought to investigate emotional phenomena in HD using Q methodology. This has been the first attempt to explore emotions in HD using this

appropriate and innovative method in the field. Participants with the same diagnostic classification, who had no differences in hoarding severity, anxiety, impulsivity and depression appeared to markedly different in relation to the underlying or associated emotions related to their hoarding behaviours. Analysis identified four distinct participant clusters with differing emotional profiles. Within each of the clusters, participants also held common and shared experiences related to their hoarding-related emotions. The overall clinical implication of this is that the emotional experience of hoarding is possibly more heterogeneous then previously considered, and that people that hoard can differ considerably in terms of their emotional experiences. HD therefore may not be a single 'disorder' but rather a set of related (yet heterogeneous) problems centring on the acquisition and retention of possessions, that also might require differing types of treatment on order to be efficacious in the long-term.

The "*emotionally overwhelmed*" cluster appears to exemplify the attentional deficits and organisational problems suggested to contribute to HD, such as indecision and categorization problems (Frost & Gross, 1993; Frost & Hartl, 1996). It has been shown that amongst hoarders, indecisiveness is correlated with the core features of hoarding (Frost, Tolin & Steketee, 2011). It has been suggested that this difficulty with decision-making and the resulting tendency to avoid or postpone making decisions arises from a fear of making mistakes (Warren & Ostrom, 1988). The "emotionally overwhelmed" cluster in the current study reported similar tendencies, for example, they reported that they often postpone addressing their hoarding and procrastinate regarding discard as they find the activity too stressful. This is in line with findings indicating heightened emotional attachment may interact with concerns about making an incorrect decision, with mistaken discard of valued objects being experienced as particularly aversive by people that hoard (Tolin, Kiehl, Worhunsky, Book, & Maltby, 2009).

The "*social emotions*" cluster seems to reflect that these individuals were not ego-dystonically distressed by their hoarding behaviour itself, but rather by the negative social consequences generated (Mataix-Cols et al., 2010). For example, social services may express concerns about the health hazards of their cluttered environment, and family members might be distressed about the clutter. The social emotions cluster was particularly concerned about how others felt and perceived their hoarding. Frost and Gross (1993) reported social emotions in a hoarding sample, with most reporting that their hoarding created embarrassment and led to avoidance of social contact in their homes. Participants in this cluster similarly reported fearing what would happen if someone came to their home and worrying that people would find them socially unacceptable. Given the role of domiciliary visits in hoarding treatment (Koenig, Leiste, Holmes & Macmillan, 2014), this is a particularly useful finding that some people that hoard would possibly struggle with this aspect, due to their social emotions.

The *"object-complexity"* cluster was characterised by beliefs that objects were currently inherently useful or could be in the future. This cluster of people that hoard feel some sense of responsibility towards objects causing them to feel guilt upon discarding them, and aggrieved if forced to discard. At the same time, they do not derive emotional comfort from their possessions. Steketee et al. (2003) found that responsibility towards objects appeared to be a significant dimension of HD. Individuals with HD often report difficulties aligned with those of the object complexity cluster, such as not wanting to "waste" an object that is perceived as potentially useful in the near or distant future and feelings of marked guilt associated with discarding objects (Mataix-Cols & Fernández de la Cruz, 2014). Furby (1978) highlighted object complexity as a specific contributor to possession behaviour, suggesting that this feature was central to problematic hoarding.

Participants within the final "*object-affect fusion*" cluster derived emotional comfort from their possessions, enjoyed being with their possessions, and felt that that letting go of a possession was like letting go of a part of them. This is highly similar to the concept of object-affect fusion proposed by Kellett and Knight (2003), by which a person's emotions associated with an object become merged with the object itself, such that the objects become symbolic tabernacles of affective information. Frost and Gross (1993) found that hoarders reported higher levels of emotional attachment to their possessions than non-hoarding controls. This insight suggests that these individuals do not only feel emotionally attached to objects, but experience the objects as extensions of themselves.

In terms of study limitations, despite opinion being divided (Weingarden & Renshaw, 2015), some research has suggested that hoarding can carry significant shame and stigma (Schmalisch, Bratiotis, & Muroff, 2010), which may have impacted on participants' willingness to participate. Participants were recruited primarily through hoarding support groups and therefore the sample may be biased towards individuals who have accepted the label of "hoarder". The cross-sectional nature of the study means that it is unclear whether the clusters change, fluctuate or evolve (e.g. in response to treatment). The study was wholly reliant on self-report, as independent assessments of hoarding, depression, and anxiety were not made. Q-methodology requires participants to be self-aware and able to reflect on their hoarding, and research has suggested that hoarders may tend to lack insight into their hoarding (Kim, Steketee, & Frost, 2001; Tolin, Fitch, Frost, & Steketee, 2010).

In conclusion, the results of this study provide evidence of emotional heterogeneity within HD. The results divided the emotional experiences of hoarding into four dimensions that appeared reflective of, and extend, current theory and

research. This grounding of the elicited clusters in extant theoretical concepts has helped to develop a more nuanced understanding of emotions in HD. The emotional heterogeneity of HD found suggests that treatments are likely to be most effective when they are matched to the individual and the diagnosis.

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Figure 1: *Flow chart of participation and drop-out*

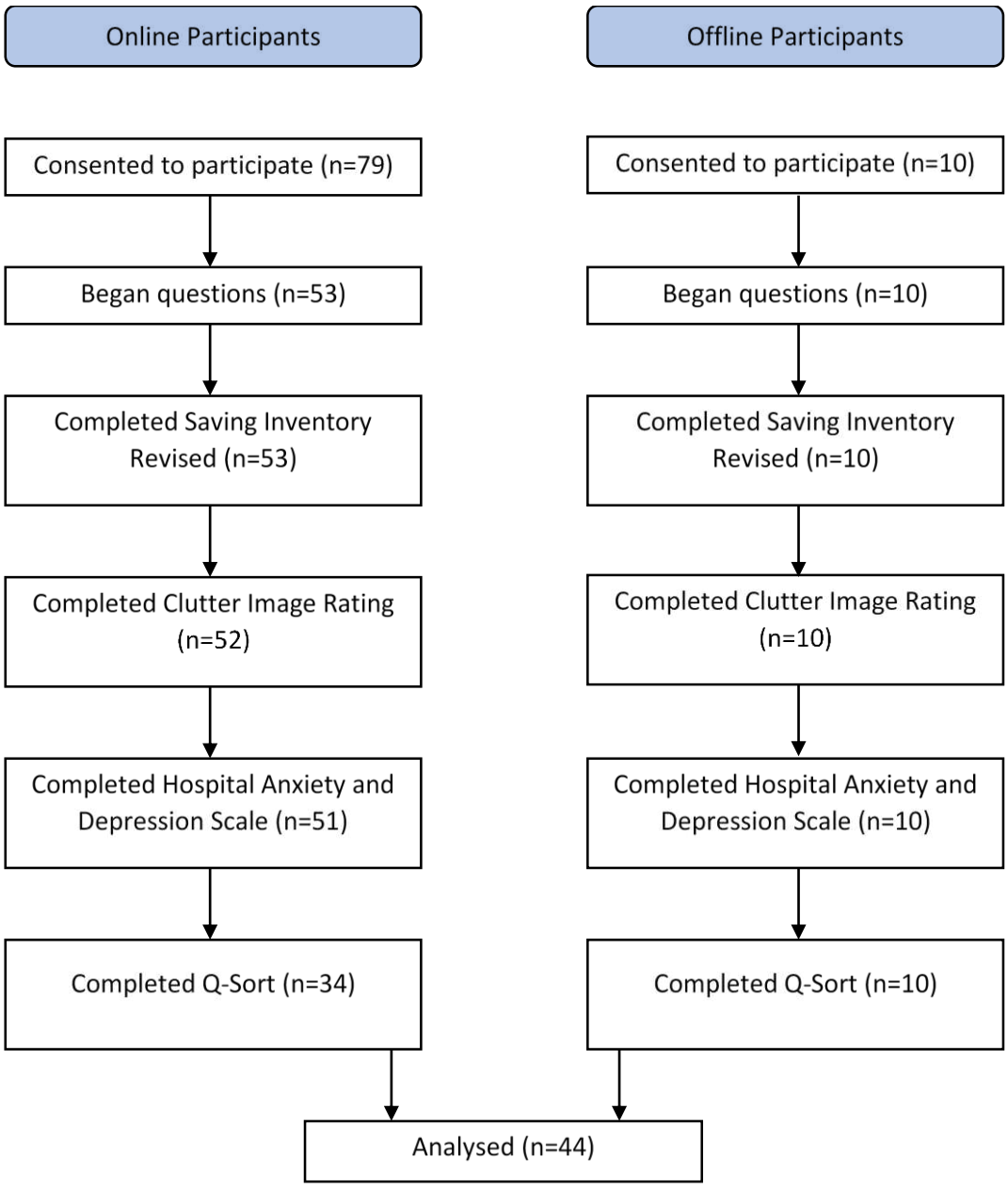

Table 1: *Q-sort loadings for each factor*

Q-Sort	Factor 1	Factor 2	Factor 3	Factor 4
1	0.1473	- 0.0959	0.4524 *	0.3437
2	0.0183	0.6443 *	- 0.3863	- 0.1137
3	0.3169	- 0.1317	- 0.1072	0.6653 *
4	0.0423	0.0621	0.6870 *	- 0.3054
5	- 0.1008	0.5878 *	0.2422	0.4227
6	0.2143	0.5067 *	0.3616	- 0.0275
7	0.5797	0.5978 *	- 0.1285	0.0084
8	0.7600 *	0.0129	0.0250	- 0.0336
9	- 0.1483	0.3188	0.1331	0.5404 *
10	0.2319	0.6297 *	0.2738	- 0.2297
11	0.1742	0.0275	0.5617 *	0.3037
12	0.5762 *	0.2675	0.2979	0.3699
13	0.6295 *	- 0.1557	0.2885	- 0.1956
14	0.5924 *	0.3372	0.2501	- 0.1319
15	0.3002	0.4534 *	0.1358	0.0860
16	0.4837	0.3917	0.3873	- 0.1172
17	0.3365	0.4018	- 0.0672	0.5002
18	0.4029	0.5590 *	0.1709	0.0658
19	- 0.0031	0.4961 *	0.1239	0.4474
20	0.3856	0.3571	0.0269	0.3183
21	0.5386 *	0.2323	0.4536	0.0925
22	0.1367	0.2437	0.5041 *	0.4035
23	0.1787	0.4714	0.2074	0.3861
24	0.6039 *	0.4257	0.3007	- 0.0097
25	0.5449 *	0.2340	0.0181	- 0.0979
26	0.4789	0.3058	0.4717	- 0.1468
27	- 0.0325	- 0.0557	0.0597	0.5557 *
28	0.0240	0.5841 *	0.1843	0.0997
29	0.1544	0.7223 *	- 0.2424	- 0.0098
30	0.4186	0.2536	0.3707	0.0309
31	0.0290	0.1061	0.7693 *	- 0.1632
32	0.4703 *	- 0.0739	0.0238	0.0705
33	0.5033	0.3297	- 0.4627	- 0.1612
34	0.4385 *	0.1631	- 0.0225	0.2033
35	0.0415	0.7119 *	- 0.1644	0.1712
36	0.3969	- 0.5099 *	- 0.0110	0.0641
37	0.3641	0.0313	0.1347	- 0.5914 *
38	0.5708 *	0.3447	0.0426	0.0100
39	0.2104	0.6016 *	0.0009	0.0265
40	0.0400	- 0.1689	0.6235 *	0.1662
41	0.5832 *	- 0.3349	0.0294	0.2346
% Expl.Var.	15	16	10	8

*Factor exemplars

Table 2: *Factor arrays showing both Q-Sort Values (Q-SV) and Z-scores (Z)*

Number	Statement	Factor 1		Factor 2		Factor 3		Factor 4	
		Q-SV	Z	Q-SV	Z	Q-SV	Z	Q-SV	Z
1	If an object looks abandoned, I will feel compelled to rescue it	0	-0.594	-1	-0.878	1	1.064 *	-3	-1.780 *
2	It's exciting when I find bargains	0	-0.055 *	2	1.593	1	0.942	2	1.284
3	I get a buzz from acquiring new things	0	-0.004	2	1.196 *	0	0.378	3	2.264 *
4	Rediscovering items refreshes the positive memories attached to them	2	1.278	0	0.092	0	0.241	1	0.563
5	I care for my possessions in the same way I would like to be cared for	-2	-1.053	0	-0.467	0	-0.592	-1	-1.080
6	I think about how I could use an object in the future	0	-0.339 *	1	1.022	3	2.073	3	1.716
7	I think of the potential that objects have	0	0.152	1	0.878	3	1.719 *	0	0.180
8	I find it difficult to make decisions	1	1.246	0	0.178 *	2	1.237	-3	-1.707 *
9	I sometimes question why I have so much stuff	1	0.667	3	1.780 *	1	0.795	-1	-0.284 *
10	My hoarding is destructive to my relationships	0	0.375 *	3	2.352 *	-2	-1.279	-2	-1.510
11	Thinking about discarding my possessions causes me to feel distressed	3	1.754 *	0	-0.271	0	0.058	-1	-1.002 *
12	Discarding my possessions causes me to feel distressed	3	1.595	0	-0.103	2	1.087	0	-0.259
13	I find it difficult to get rid of items when others tell me that I should	1	0.816	0	-0.236 *	1	0.762	1	0.685
14	I sometimes feel I'm being made to discard things	-2	-0.954	0	-0.121 *	1	0.589 *	-2	-1.496
15	When I'm getting rid of something, I wonder if I am doing the right thing	1	0.987	0	0.024	2	1.629	-1	-0.574
16	I worry that others think I am disgusting	-1	-0.609	2	1.505 *	-1	-0.855	0	0.069
17	I am able to see the unique features in items	-1	-0.698 *	1	0.291	0	0.260	1	0.512
18	I fear what will happen if someone comes to my home	1	0.520	3	1.824 *	0	-0.245	0	0.226
19	I acquire objects and end up forgetting about them	0	-0.472	1	0.886	0	0.277	0	-0.078
20	I feel guilty about throwing items away	1	0.809	-1	-0.576 *	3	1.674 *	0	0.219
21	Letting go of an item feels like letting a part of me go	1	0.455 *	-3	-1.613 *	-1	-0.898 *	3	1.745 *
22	I think my hoarding behaviour is illogical	-1	-0.627	1	0.998 *	-1	-0.771	0	0.040
23	My possessions aren't capable of hurting me	0	-0.185	-2	-0.948	-2	-1.082	0	-0.066
24	Objects are predictable and are not able to let you down like people might #	-1	-0.620	-1	-0.685	-1	-0.706	-1	-0.681
25	My possessions remind me of events in the past	2	1.371	0	-0.390 *	2	1.295	2	1.665
26	Other people don't understand why I hoard things	0	-0.157	1	0.360	1	0.508	0	0.326
27	Others despair about my hoarding	0	-0.066	0	0.126	-1	-0.729	0	-0.135
28	Other people get frustrated by my hoarding #	1	0.427	1	0.681	0	0.297	0	0.020
29	I feel overwhelmed by my hoarding, I don't know where to start	2	1.554	2	1.167	0	-0.135	-1	-0.636
30	I like being around my possessions	-2	-1.380	-1	-0.892	1	0.417 *	2	1.250 *
31	I get a sense of companionship from my possessions	-3	-1.675	-1	-0.781 *	-2	-1.507	2	1.199 *
32	I find tidying and organising is tedious	-1	-0.722	0	0.194	0	0.231	0	-0.273
33	My anxiety causes me to postpone addressing my hoarding	2	1.335 *	1	0.313 *	-1	-0.826 *	-3	-1.678 *
34	I anticipate regretting throwing things away	1	1.158	-1	-0.534	0	-0.130	1	0.583
35	I sometimes feel like I'm rescuing objects	-1	-0.767	-2	-1.227	2	1.159 *	-2	-1.363
36	If an object looks sad I will feel compelled to rescue it	-1	-0.947	-3	-1.784	0	0.317 *	-2	-1.558
37	I feel responsibility towards objects, if they can be used then they should	0	0.094 *	-1	-0.838	1	0.993 *	-1	-0.860
38	It feels rude to throw objects away	-2	-1.448	-2	-1.416	1	0.528	0	0.171
39	I feel safe when I am with my possessions	-2	-1.422	0	-0.267 *	-3	-1.550	1	0.468 *
40	I value my possessions over any potential risks to my safety	-3	-2.114	-2	-1.444	-3	-1.627	-2	-1.434
41	I'm embarrassed at the state of my home	3	1.793	2	1.372	-1	-0.937 *	1	0.956
42	I see beauty in items	0	-0.206	-1	-0.672	0	0.252	0	0.208
43	I feel stuck with my hoarding	0	0.262	0	0.149	-1	-0.834	-1	-0.457
44	I am often torn between needing to discard items and thinking they are still useful #	0	0.158	0	-0.002	0	-0.291	0	0.326
45	Negative moods cause me to hoard	-1	-0.855	0	0.118	-2	-1.225	0	0.326
46	Others might think that my hoarding is a bit odd	0	0.051	1	0.424	0	-0.508	0	0.208
47	My possessions provide me with emotional comfort	-1	-0.716	-2	-1.155	-2	-1.241	1	0.991 *
48	I love some of my belongings the way I love some people	-3	-1.478	-3	-1.711	-3	-1.788	1	0.991 *
49	I avoid discarding possessions because it is too stressful	2	1.307 *	-1	-0.512	-1	-1.025	-1	-0.277

* Distinguishing statements at $p < .01$

Consensus statements that do not distinguish between any pair of factors

Table 3: *Differences between the four participant clusters in terms of psychometric measures, time taken, and clicks used*

Outcome Measure	Mean (standard deviation)				Kruskal-Wallis Test			
	Factor 1 (n=11)	Factor 2 (n=13)	Factor 3 (n=6)	Factor 4 (n=4)	*N*	*df*	*H*	*p*
HADS Anxiety Scale	12.18 (2.79)	11.23 (4.57)	12.33 (5.20)	11.75 (4.79)	34	3	0.291	0.962
HADS Depression Scale	10.00 (4.41)	12.66 (3.26)	10.67 (6.62)	9.75 (2.63)	34	3	3.387	0.336
HADS Overall Distress	22.18 (6.15)	23.89 (7.49)	23.00 (11.45)	21.50 (7.14)	34	3	0.368	0.947
CIR	3.73 (1.33)	4.67 (1.38)	3.56 (1.47)	4.50 (1.00)	34	3	5.497	0.139
SI-R Clutter Scale	24.64 (5.43)	28.46 (4.60)	22.17 (5.49)	25.75 (3.40)	34	3	7.099	0.069
SI-R Difficulty Discarding Scale	20.91 (4.66)	16.69 (5.65)	18.83 (2.71)	21.00 (4.97)	34	3	3.853	0.278
SI-R Excessive Acquisition Scale	14.36 (4.97)	15.00 (4.93)	13.33 (7.37)	14.25 (4.11)	34	3	0.218	0.975
SI-R Total	59.91 (11.89)	60.15 (10.89)	54.33 (13.78)	61.00 (10.55)	34	3	1.271	0.736
Time taken (seconds)	1323.82 (140.90)*	874.24 (332.40)*	1227.99 (352.39)*	1134.02 (701.78)*	23	3	6.193	0.103
Number of clicks used	318.86 (334.71)*	214.10 (236.86)*	270.20 (163.68)*	104.33 (69.04)*	25	3	4.833	0.184

*cases missing (not collected in offline version) or removed from analysis (outliers)

Table 4: *Differences between the four participant clusters in terms of caseness of each of the psychometric measures*

Psychometric Measure	Participants reaching clinical caseness (%)				Chi-Square Test			
	Factor 1 (*n*=11)	Factor 2 (*n*=13)	Factor 3 (*n*=6)	Factor 4 (*n*=4)	*N*	*df*	*?²*	*p*
HADS Anxiety	100	85	67	75	34	3	5.096	0.165
HADS Depression	64	100	33	75	34	3	8.017	0.046*
SI-R	100	100	83	100	34	3	3.616	0.306
CIR	73	92	67	100	34	3	4.108	0.250

CIR = Clutter Image Rating; HADS = Hospital Anxiety and Depression Scale; SI-R = Saving Inventory-Revised.

* significant at p<0.05